Winter 2023

What are our plans missing? What are our missing plans?

Vivien Coop

WHAT ARE OUR PLANS MISSING?
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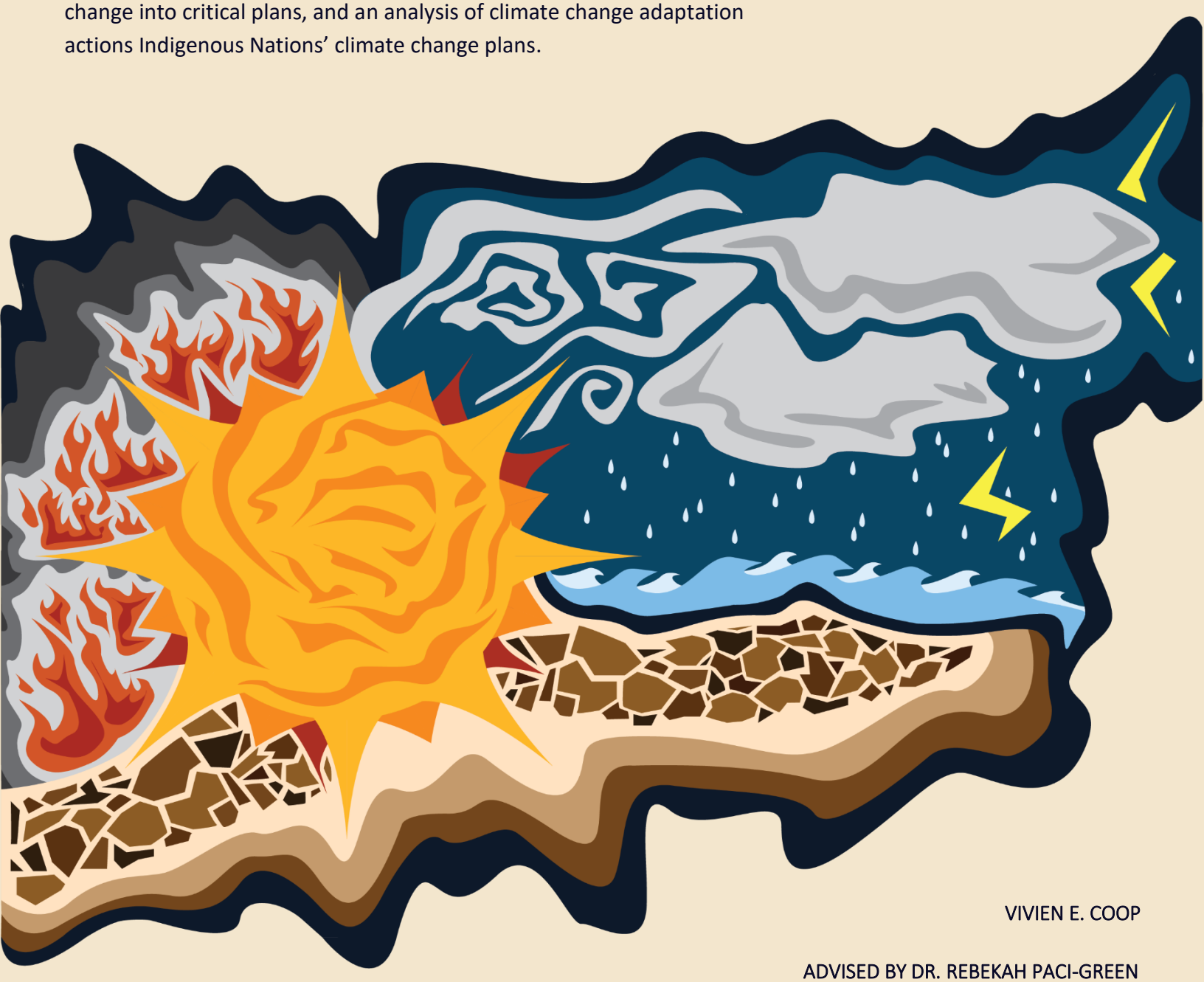
An analysis of how well and to what extent the U.S. has integrated climate change into critical plans, and an analysis of climate change adaptation actions Indigenous Nations' climate change plans.



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INTRODUCTION

The current climate change crisis is a product of human-caused increases in greenhouse gas emissions and the deterioration of Earth's natural counterbalances that absorb greenhouse gas emissions. Greenhouse gases such as Carbon dioxide, Nitrous oxide, and methane trap in heat in the Earth's atmosphere, which, in turn, heat the Earth's atmosphere, lands, and waters.[1] Human activities such as fossil fuel burning and agriculture contribute towards observed increases in greenhouse gas emissions.[2] Furthermore, human activities such as deforestation remove Earth's natural counterbalances that would otherwise absorb greenhouse gases. In removing these counterbalances, they worsen the global warming effect.[3]

On a more local scale, climate change also heightens natural hazards in counties and states across the United States. Climate change heightens hydro-meteorological hazards such that they may occur more frequently and exhibit higher magnitudes and intensities.[4] As climate change exacerbates the number and intensity of natural hazards, costs associated with recovery from these heightened natural hazards also rise. Altogether, U.S. disasters in the last six years have cost the U.S. over $100 billion dollars.[5] The average number of disasters that cost billions of dollars has increased over time as well.[6] Notably, the true cost of climate change heightened hazards is not just a financial one. There is a dire cost to human lives, livelihoods, and property.

PROJECT SCOPE OVERVIEW

Several jurisdiction-based plans in the U.S. set the foundation for how jurisdictions manage the natural environment to balance future development and environmental protection. Two of these plans are comprehensive plans and hazard mitigation plans. Comprehensive plans are long-term visioning documents that guide future development; however, they are not required by all states and jurisdictions.[7] Hazard mitigation plans are designed to encourage jurisdictions to plan ahead for natural and non-natural hazards that pose risk to lives, livelihoods, and property.[8] Hazard mitigation plans are federally required if jurisdictions want access to Hazard Mitigation Grant Program funding following a disaster.[9] Beyond these two plans, some jurisdictions have begun writing and adopting climate change adaptation plans. Leading the way in these adaptation plans are Indigenous Nations.

[1] EPA. (2022). *Causes of Climate Change.*
[2] EPA. (2022). *Causes of Climate Change*
[3] EPA. (2022). *Causes of Climate Change.*
[4] USGS. (2023). *How can climate change affect natural disasters?*
[5] NPR. (2023). *Extreme weather, fueled by climate change, cost the U.S. $165 billion in 2022.*
[6] NPR. (2023). *Extreme weather, fueled by climate change, cost the U.S. $165 billion in 2022.*
[7] MRSC. (2023). *Comprehensive Planning.*
[8] FEMA. (2022). *Hazard Mitigation Planning.*
[9] Paci-Green. (2020). *Natural Hazards Planning Lecture*.

Since time immemorial, Indigenous Nations[10] in the U.S. have adapted to change, and, over the years, this change has taken many forms. Change has manifested as naturally changing climates where our earth transitioned between warmer and cooler epochs for millions of years.[11] Indigenous Nations adapted to those changing climates. Change has also manifested with more catastrophic undertones. Within the last couple hundred years, the U.S. Government forced Indigenous Nations out of their usual and accustomed areas, committed genocide via biological warfare with diseases that were new to what is now North America, took Indigenous children from their families and confined them to boarding schools, and tried to erase Indigenous cultures and languages. Indigenous Nations adapted and are still here and resilient to this day.

Pertinent to the discussion of today's human-influenced climate changes, Indigenous Nations are not only adapting to climate change, many nations have been leading the climate change adaptation movement for years. Indigenous Nations and their reservations are often on the frontlines of climate change where they are exposed climate change impacts sooner and more acutely. Many reservations in the U.S. are in close proximity to natural and non-natural hazards, which puts their communities' lands, traditional foods, and natural resources at risk.[12] A holistic review of Indigenous Nation's historical adaptability paints them as experts in generational adaptability and resiliency. All this considered, this report considers how the United States can learn from Indigenous Nations' climate change plans.

PROJECT ISSUES OVERVIEW

Be it as it may, climate change's current and projected impacts to civilization beg a few questions for local governments, state governments, tribal governments, elected officials, and community members involved in planning processes. Firstly, what are our plans missing? In other words, is climate change integrated into our plans and to what extent is it integrated? Secondly, what are our missing plans? In other words, do jurisdictions have climate change-specific plans, and how do they compare to the adaptability standards Indigenous Nations' plans have set.

This report considers three major issues. Firstly, it analyzes if and to what extent climate change adaptation is integrated into comprehensive plans and hazard mitigation plans – at the state and county level – in the U.S. It does so for 20 counties geographically dispersed across the country's 50 states. Secondly, this report analyzes whether these jurisdictions have created climate change-specific plans to address current and projected climate change impacts. Thirdly, this report analyzes the content of Indigenous Nations' climate change plans across the country.

Segmented into three primary issues, this report begins with a methodology section detailing the rationale behind its qualitative and quantitative research. The methodology also reflects

[10] This report focuses on the climate change adaptation work of federally recognized Indigenous Nations within the U.S.; however, it is important to note that a tribe's status as a non-federally recognized tribe does not imply an absence of adaptation or resiliency to climate change.
[11] National Park Service. (n.d.). *A History of Earth's Climate.*
[12] Yale School of the Environment. (2022). *How Native Tribes Are Taking the Lead on Planning for Climate Change*.

research time constraints. Then, the report transitions to its first issue analyzing climate change's role – or lack thereof – in the United States' planning processes by measuring how climate change is integrated into comprehensive plans and hazard mitigation plans. The second issue takes climate change integration a step further. The second issue analyzes whether the same jurisdictions in question from the first issue have created climate change specific plans for long-range planning to reduce adverse impacts. Lastly, building off the second issue, the third issue analyzes the contents of Indigenous Nations' climate change plans. Specifically, the third issue analyzes common adaptation strategies in Indigenous Nations' plans that the U.S. should apply to their future climate change plans.

METHODOLOGY

This report is segmented into three issues that all build upon each other. The first issue examines if and to what extent climate change adaptation is integrated into comprehensive plans and hazard mitigation plans – at the state and county level – in the U.S. Taking a step further, the second issue analyzes whether these jurisdictions have created climate change-specific plans to address current and projected climate change impacts. These two issues lie completely in the jurisdiction of the United States; thus, they were researched using a similar methodology. Additionally, analyzes the contents of Indigenous Nations' climate change plans. The third issue has a distinctly different methodology in comparison to the first two issues.

ISSUE #1 AND ISSUE #2: CLIMATE CHANGE PLANNING IN U.S. JURISDICTIONS

For the first two issues, counties and states in the United States are not legally required to integrate climate change into their long-range plans and are not required to create climate change specific plans. I sought to explore whether counties and states have either integrated climate change into their long-range planning efforts or created climate change plans of their own initiative. My hypothesis was that more populous counties in the United States would have more plans with climate change integration and more in-depth integration. Furthermore, I thought all states would have climate change plans and in-depth climate change integration on the state level. The time constraints for this project period limited research to ten weeks. Thus, the methodology for the first and second issues aimed to balance maintaining the scope of this research to the entirety of the United States, while decreasing the number of jurisdictions researched altogether.

To maintain the project scope and decrease the number of jurisdictions to research, I first divided the country into ten regions congruent with the EPA and FEMA federal regions (see Figure 1). After dividing the country into geographic regions, I used state population census data to compare the states in each region to each other. I determined the state with the median population for each region and selected that state as a representative state of that region. If the number of states in a particular region was even, I found the two states with populations closest to the median and chose the state with the higher population of the two as the representative of that region. For example, Region 10 includes Washington, Oregon, Idaho, and Alaska. Idaho and Oregon have state populations closest to the median of the whole region, and Oregon has the higher population of the two. Thus, Oregon is the regional

representative state for Region 10. On the state level, this report will determine if and to what extent climate change is integrated into state-level hazard mitigation plans and if each state has a climate change plan.

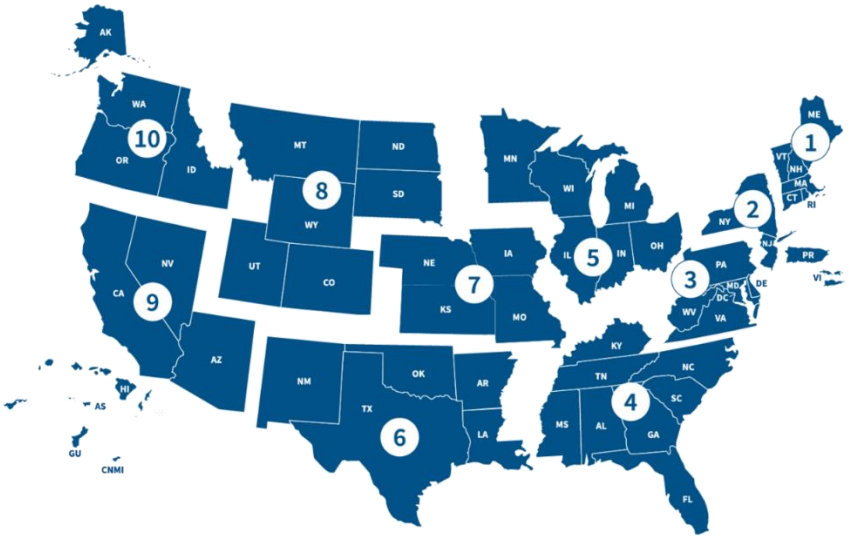

***Figure 1**. A map of the United States and its territories divided into ten federal regions. (Source: FEMA, 2022).*

Notably, U.S. territories are included within the ten federal regions of the U.S (see Figure 1). Because U.S. territories populations are lower than most state populations, they are unlikely to be chosen as the median of one of the ten regions and therefore unlikely to be represented. To mitigate the exclusion of U.S. territories from this climate change integration study, this report created two new regions that differ from the regions defined by FEMA and EPA federal regions: "Region Territories East" and "Region Territories West." U.S. territories located closer to the east coast of the continental U.S. were slotted into Region Territories East, and U.S. territories located closer to the western coast of the continental U.S. were slotted into Region Territories West (see Figure 2). Due to time limitations for this project period, this project was unable to include research on climate change integration into critical plans in the Region Territories West and Region Territories East; however, in the event this research is continued, it is critical to include U.S. territories in future climate change planning research.

Region Territories West	**Region Territories East**
Guam	Puerto Rico
American Samoa	Virgin Islands
Marshall Islands	
Federated States of Micronesia	
Republic of Palau	

***Figure 2.** A table listing the U.S. territories in "Region Territories West" and "Region Territories East" (Source: FEMA, 2022).*

Once all regional representative states were selected for each of the ten regions, then the most populous county and least populous county from each regional representative state was selected (see Figure 3). The intent behind identifying both the most populous (MP) and least populous (LP) counties is to include climate change planning data from both urban and rural county jurisdictions. On the county level, this report will determine if and to what extent climate change is integrated into county comprehensive plans and hazard mitigation plans. Additionally, this report will determine if counties have taken the initiative to create county climate change plans.

REGIONAL REPRESENTATIVE STATE	MEDIAN STATE/ TERRIRORY	STATE/ TERRIRORY POPULATION	MOST POPULOUS (MP) COUNTY / DISTRICT	MP POPULATION	LEAST POPULOUS (LP) COUNTY / DISTRICT	LP POPULATION
Region 1	New Hampshire	1,377,529	Hillsborough County	422,937	Coos County	31,268
Region 2	New Jersey	9,288,994	Bergen County	955,732	Salem County	64,837
Region 3	Virginia	8,631,393	Fairfax County	1,150,309	Highland County	2,232
Region 4	Tennessee	6,910,840	Shelby County	929,744	Pickett County	5,001
Region 5	Michigan	10,077,331	Wayne County	1,793,561	Keweenaw County	2,046
Region 6	Arkansas	3,011,524	Pulaski County	399,125	Calhoun County	4,739
Region 7	Iowa	3,190,369	Polk County	492,401	Adams County	3,704
Region 8	Montana	1,084,225	Yellowstone County	164,731	Petroleum County	496
Region 9	Arizona	7,151,502	Maricopa County	4,420,568	Greenlee County	9,563
Region 10	Oregon	4,237,256	Multnomah County	815,428	Wheeler County	1,451
Region Territories W.	American Samoa	49,710	Western District	31, 819	Manu'a District	832
Region Territories E.	Puerto Rico	3,285,874	San Juan Municipo	342,259	Culebra Municipo	1,792

Figure 3. *A table listing each regional representative state from ten federal regions and two added regions for U.S. territories, regional representative state populations, the most populous county from each regional representative state, the most populous county's population, the least populous county from each regional representative state, and the least populous county's population.*

Altogether, the first and second issues will be analyzing the contents of plans from ten states and twenty counties in three steps:

1) For each regional representative state, this report will analyze climate change integration into hazard mitigation plans and climate change plans on the state level.

2) This report will also analyze climate change integration in hazard mitigation plans and comprehensive plans on the county level for the least and most populous county in each representative state.

3) Lastly, this report details if counties and states have created climate change plans of their own initiative.

ISSUE #3: AN ANALYSIS OF INDIGENOUS NATIONS' CLIMATE CHANGE PLANS

The third issue in this report analyzes the content of climate change plans created by Indigenous Nations. As leaders of the climate change adaptation movement and adaptation experts since time immemorial, Indigenous Nations in the U.S. have several unique and successful adaptation strategies. I sought to research whether there are common climate adaptation strategies between climate change plans created by Indigenous Nations across the U.S.

The University of Oregon created an online "Tribal Climate Change Guide" that catalogs 47 climate change related plans created by tribes across the country through the Pacific Northwest Tribal Climate Change Project.[13] This issue's methodology uses the 47 climate change plans in the "Tribal Climate Change Guide" as the source for different tribal climate change plans. Notably, the 47 climate change plans do not necessarily equate to being sourced from 47 Indigenous Nations as several tribes have created multiple climate change-related plans.

I. CLIMATE CHANGE INTEGRATION INTO PLANS IN THE UNITED STATES

The Earth's climate is changing. The warmest years on record have all occurred since 2010 and it has been nearly half a century since the world has seen "a colder-than-average year."[14] However, climate change is not simply a matter of warmer temperatures. Rather, on a global and localized scale, warmer temperatures are causing cascading changes to hydro-meteorological hazards frequencies, magnitudes, and intensities.[15] When these heightened hazards meet urban developments, it will be up to our preemptive planning to determine whether these heightened hazards become disasters.

Planning must keep up with the increasingly dire hydro-meteorological hazard forecasts. Because of climate change, planning for the hurricanes, floods, and heatwaves of 20 years ago will no longer suffice to protect your community from the hurricanes, floods, and heatwaves of today.[16] In the context of climate change, what are our long-term plans missing? Is climate change integrated into our comprehensive plans and hazard mitigation plans, and to what extent is it integrated?

[13] University of Oregon. (2022). *Tribal Climate Guide.*
[14] Lindsey & Dahlman. (2023). *Climate Change: Global Temperature*.
[15] USGS. (2023). *How can climate change affect natural disasters?*
[16] Tibbon et al. (2022) *Earthstorm.*

CLIMATE CHANGE AND THE PLANNING PROCESS

Comprehensive plans and hazard mitigation plans are important and required documents that local jurisdictions use to guide short-term and long-term planning efforts. Both comprehensive plans and hazard mitigation plans are required to some degree in the U.S. However, neither comprehensive plans nor hazard mitigation plans currently require climate change to be integrated into these plans. Regardless, some states, counties, and cities have integrated climate change considerations in their existing plans; some have even created separate climate change-specific plans to address current and future climate change impacts.

Comprehensive plans are the core of long-term jurisdictional planning efforts on local levels.[17] A comprehensive plan is a guiding document that details a local jurisdiction's future "goals, objectives, policies, actions, and standards."[18] Comprehensive plans are not required in all states and their contents are not consistent across states. However, when required in certain jurisdictions, comprehensive plans are required to include land use, public facilities, levels of service, and implementation elements.[19] However, some comprehensive plans include additional elements such as economic development, parks and recreation, conservation, solar energy, and subarea plan elements.[20]

Hazard mitigation plans are intended to be long-term guiding documents that "reduce loss of life and property by minimizing the impact of disasters."[21] According to the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988 and the Stafford Act's 2000 Disaster Mitigation Act amendment, if states and local jurisdictions want access to Hazard Mitigation Grant Program (HMGP) funding, then they must create a hazard mitigation plan.[22] Hazard mitigation plan include the following primary elements: risk assessment, capability assessment, and mitigation strategy elements.[23]

CLIMATE CHANGE IN HAZARD MITIGAITON PLANS

Addressing Issue #1, this subsection details data gathered regarding climate change integration into hazard mitigation plans from the ten regional representative states on the state level and on the county level. A set of criteria (see Figure 4) was used to determine if and to what extent climate change was integrated into plans when sifting through each regional representative's state-level hazard mitigation plan, most populous county's hazard mitigation plan, and the least populous county's hazard mitigation plan. With a state plan, most populous county plan and least populous county plan from each state, there were thirty total hazard mitigation plans studied. Firstly, the criteria determined if there was or was not a hazard mitigation plan from the jurisdiction in question. If the jurisdiction in question did have a hazard mitigation plan,

[17] MRSC. (2023). *Comprehensive Planning.*
[18] MRSC. (2023). *Comprehensive Planning.*
[19] MRSC. (2023). *Comprehensive Planning*.
[20] MRSC. (2023). *Comprehensive Planning*.
[21] FEMA (2022). *Hazard Mitigation Planning*.
[22] Paci-Green. (2020). *Natural Hazards Planning Lecture*.
[23] FEMA (2022). *Hazard Mitigation Planning.*

then the criteria determined if the plan had no mention of climate change, a brief mention of climate change, a significant mention of climate change, or if climate change was fully integrated into the hazard mitigation plan. In addition to the criteria featured in Figure 4, a "climate change" phrase tally was kept (see Appendix A). For each hazard mitigation plan read, the number of times the plan mentioned "climate change" helped inform which criterion the plan would meet.

PLAN CRITERIA	CRITERIA DESCRIPTION
NO PLAN	No climate change plan found.
YES PLAN, NO MENTION	Does not explicitly mention climate change.
YES PLAN, MENTIONED BRIEFLY	Little to no mention of climate change explicitly.
YES PLAN, MENTIONED SUBSTANTIALLY	Climate change has a thorough, dedicated section in the plan, but is either not referenced outside the section or hardly referenced.
YES PLAN, CC IS FULLY INTEGRATED	Climate change has a thorough, dedicated section in the plan and is referenced outside the section. Alternatively, CC is extensively referenced throughout the whole plan.

Figure 4. *Graphic of the criteria for climate change integration into hazard mitigation plans.*

This report presents the hazard mitigation plan data in two formats. Firstly, Figure 5 visualizes the distribution of plans according to the criteria they meet in a bar graph format with an attached table. Notably, every regional representative state had a state level hazard mitigation plan, and these state plans ranked only in the highest three criteria for climate change integration (represented in blue in Figure 5). Conversely, four out of the ten lowest population counties had no hazard mitigation plan available, and none of the lowest population counties ranked as having climate change fully integrated in their hazard mitigation plans (represented in yellow in Figure 5).

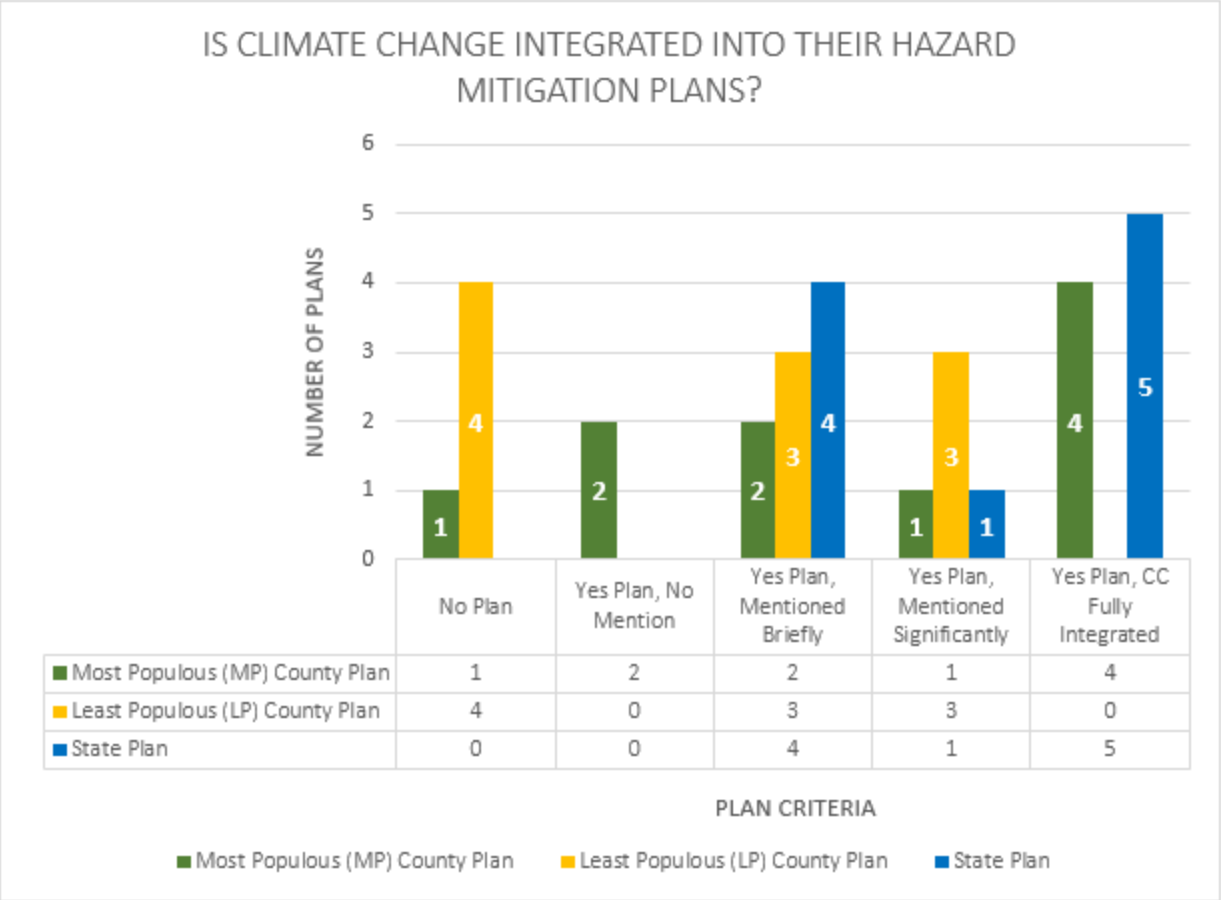

Figure 5. *Graphic depicting climate change integration into county and state level hazard mitigation plans organized by the number of plans (x-axis) and the plan criteria (y-axis).*

Furthermore, Figure 6 again sorts state level plans, most populous county plans, and least populous county plans into an infographic map of the United States. Figure 6 focuses on visually displaying how all plans from each regional representative state compare to each other geographically. The states of Arizona and Oregon performed particularly well with all their state, most populous county, and least populous county hazard mitigation plans falling under the highest two criteria: "plan fully integrated" or "yes plan, mentioned significantly" criteria (see Figure 6 on page 12). Montana also performed well in terms of climate change integration with the state and most populous county's hazard mitigation plans falling under the "plan fully integrated" criterion; however, Montana's least populous county, Petroleum County, seemingly had no hazard mitigation plan available.

Out of the entire data set, Tennessee and Arkansas had rather low climate change integration across their state, most populous county, and least populous county hazard mitigation plans. None of their county plans featured climate change – they were sorted into the "no plan" or "yes plan, no mention" criteria (see Figure 6). Furthermore, Tennessee and Arkansas's state hazard mitigation plans were sorted in the "yes plan, mentioned briefly" category. Notably, Wayne County in Michigan – Michigan's most populous county – was the only most populous

county to not have a county-wide climate change plan. The city of Detroit had a climate change plan, however, there was not a county-wide climate change plan like the other nine regional representative states.[24]

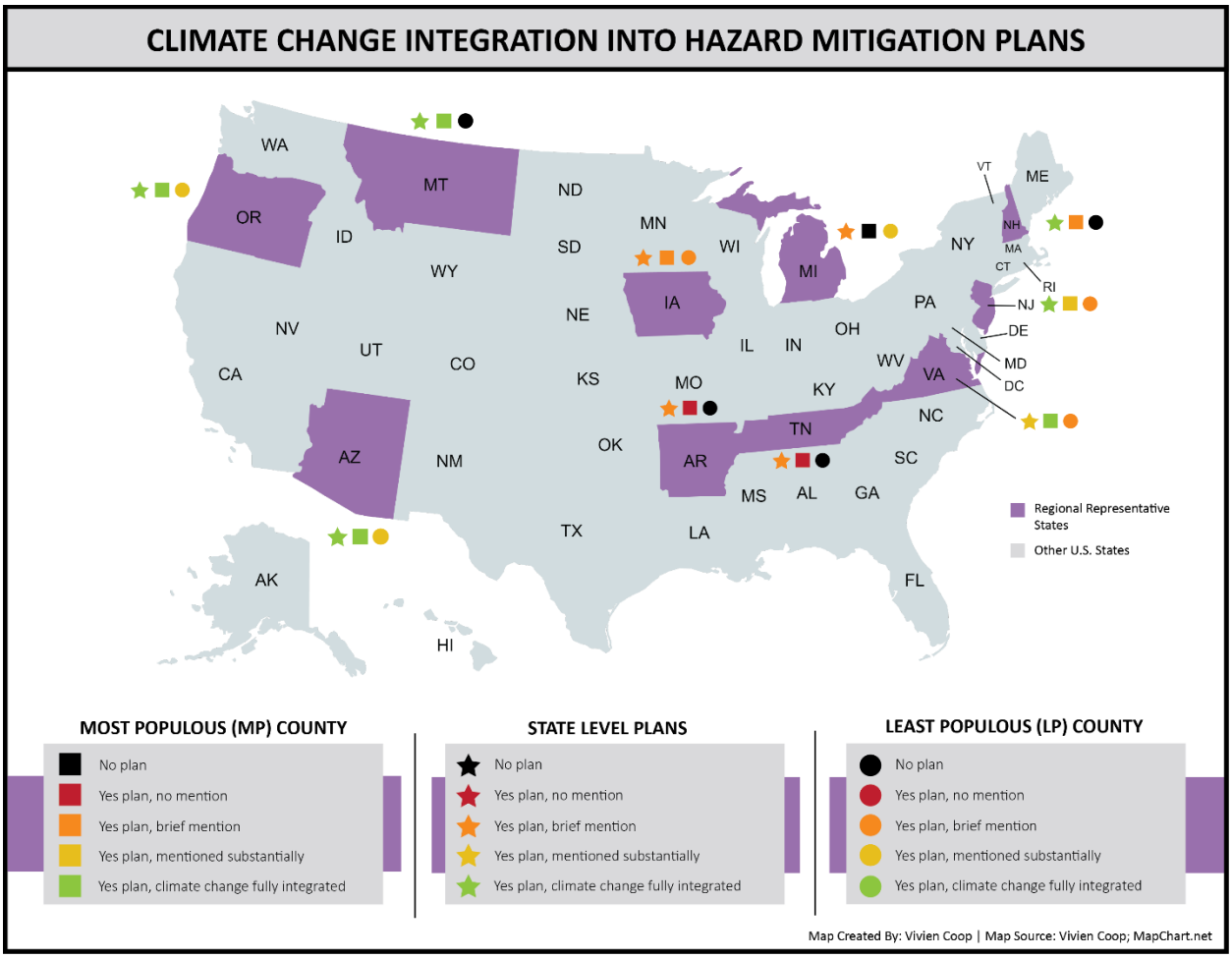

Figure 6. *Hazard mitigation plan criteria and how counties and states' plans are sorted into each criterion.*

[24] City of Detroit. (2022). *City of Detroit Hazard Mitigation Plan*

CLIMATE CHANGE IN COMPREHENSIVE PLANS

Paralleling the hazard mitigation plan subsection, this comprehensive plan subsection addresses Issue #1 in terms of climate change integration into long-term comprehensive plans. Unlike the hazard mitigation plan data, however, this subsection details data gathered regarding climate change integration into comprehensive plans from only county level plans from the ten regional representative states. Comprehensive plans are designed to be local long-term planning documents, which is why there is only county level data included.[25] Altogether, this subsection analyzes twenty comprehensive plans – both most populous and least populous counties for each regional representative state. The data set detailing climate change integration into comprehensive plans follows the same criteria structure as the hazard mitigation plan criteria (see Figure 7). In addition to the criteria featured in Figure 7, a "climate change" phrase tally was kept (see Appendix B). For each comprehensive plan read, the number of times the plan mentioned "climate change" helped inform which criterion the plan would meet.

PLAN CRITERIA	CRITERIA DESCRIPTION
NO PLAN	No climate change plan found.
YES PLAN, NO MENTION	Does not explicitly mention climate change.
YES PLAN, MENTIONED BRIEFLY	Little to no mention of climate change explicitly.
YES PLAN, MENTIONED SUBSTANTIALLY	Climate change has a thorough, dedicated section in the plan, but is either not referenced outside the section or hardly referenced.
YES PLAN, CC IS FULLY INTEGRATED	Climate change has a thorough, dedicated section in the plan and is referenced outside the section. Alternatively, CC is extensively referenced throughout the whole plan.

Figure 7. *Graphic of the criteria for climate change integration into comprehensive plans.*

Data on climate change integration into comprehensive plans is represented in two formats in this subsection: in a bar graph format with an adjoining data table and an infographic map of the United States. Firstly, Figure 8 visualizes the distribution of comprehensive plans according to the criteria they meet in a bar graph format. Comparing the states' ten most populous counties and ten least populous counties' comprehensive plans, most counties either did not have a comprehensive plan or had a comprehensive plan that did not mention climate change (see Figure 8). Eight out of ten least population counties had either no plan or a plan with no mention of climate change. Five out of ten most populous counties had a comprehensive plan with no mention of climate change.

[25] MRSC. (2023). *Comprehensive Planning*.

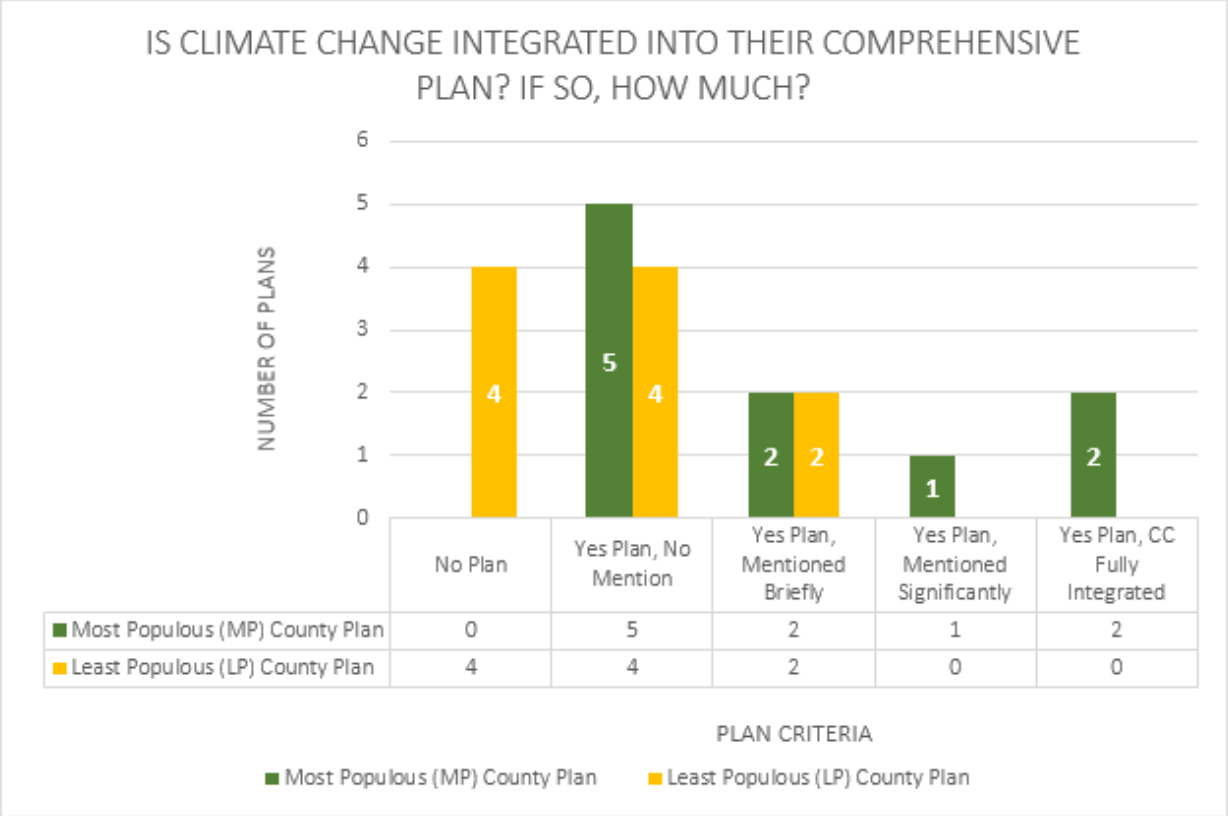

Figure 8. *Graphic depicting climate change integration into county comprehensive plans organized by the number of plans (x-axis) and the plan criteria (y-axis).*

Analyzing climate change integration into comprehensive plans on a geographic scale (see Figure 9), New Jersey had the highest criteria for climate change integration and Arkansas and Michigan tied for the lowest criteria for climate change integration. Regionally, the northeastern region of the U.S. had more in-depth climate change integration comparatively with the rest of the country (see Figure 9). Notably, Oregon came in second in terms of climate change integration, and the Midwest and Southern United States had little to no mention of climate change in any comprehensive plan (See Figure 9).

Figure 9 also visualizes a few contrasting trends between climate change integration in comprehensive plans and hazard mitigation plans. Comparing the hazard mitigation plan map in Figure 6 to the comprehensive plan map in Figure 9, the same counties integrated climate change into hazard mitigation plans to a greater extent than they did in comprehensive plans. Thirteen out of twenty counties had either “no plan” or “yes plan, no mention” for comprehensive plans and only seven out of twenty counties fell into those same criteria for hazard mitigation plans.

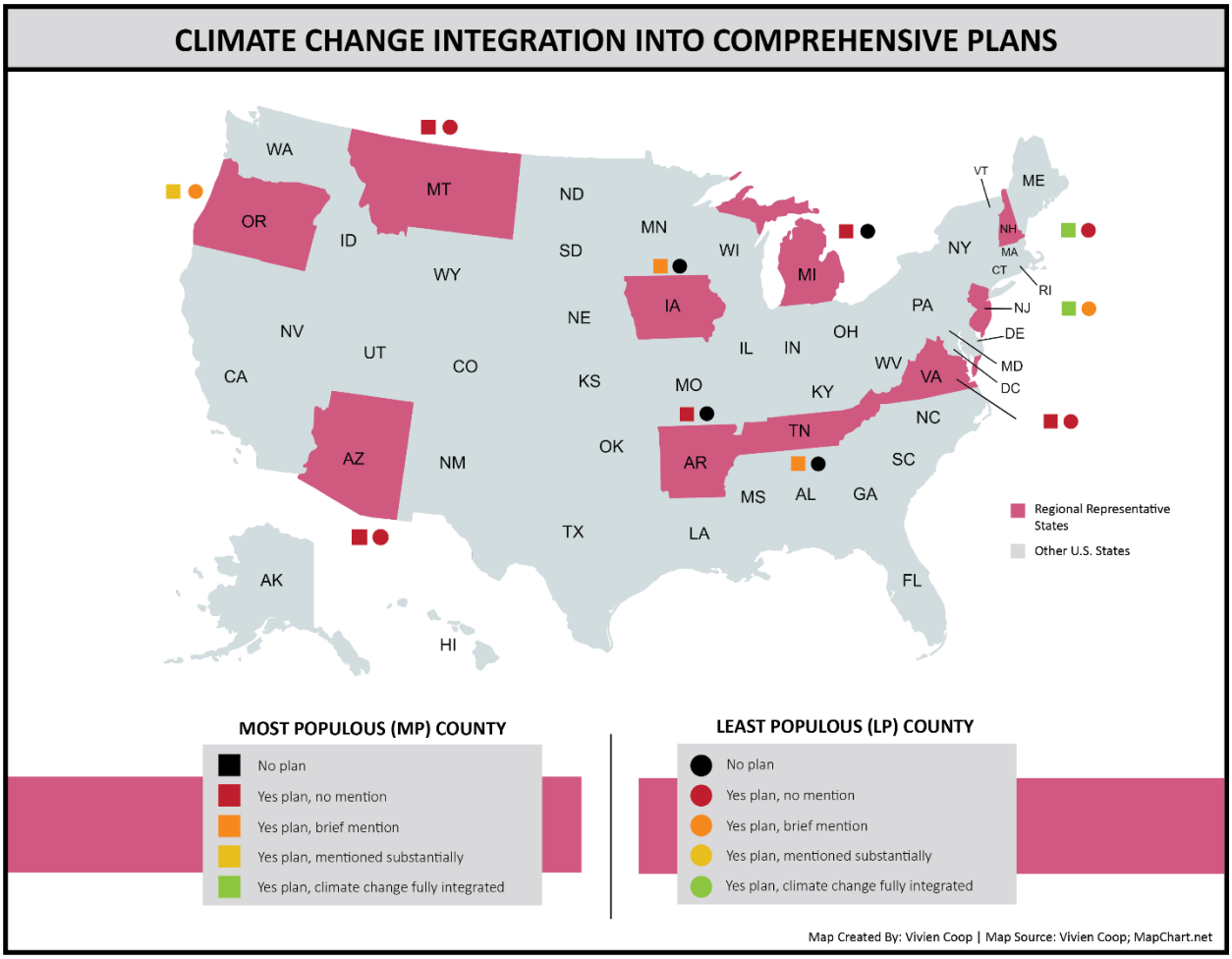

Figure 9. *Comprehensive plan criteria and how counties and states' plans are sorted into each criterion.*

CLIMATE CHANGE PLANS

Issue #2 analyzes whether the same jurisdictions from the first issue have created climate change specific plans to reduce climate change's adverse impacts. There are ten state level plans, ten most populous county plans, and ten least populous county level plans analyzed for this issue for a total of thirty plans. The hazard mitigation plan and comprehensive plan analyses share a set of climate change integration criteria, while the climate change plan analysis has a different set of criteria.

The criteria for this climate change plan analysis are oriented more towards whether the jurisdictions have a climate change plan rather than the content of the plan. The three criteria are as follows: "no plan," "kind of a plan," and "yes plan" (see Figure 10). The "kind of a plan" criterion is, admittedly, not the most technical of phrases. However, it serves an intentional purpose to show the grey area between the more black and white "yes plan" and "no plan" criterion. As displayed in Figure 11, there is one state climate change plan, two most populous county plans, and two least populous plans that are on the cusp of being considered climate change plans by meeting the "kind of a plan" criterion. Specifically, Tennessee is the only state out of the ten regional representative states to not have a state level climate change plan. Tennessee was paired with the "kind of a plan" criterion because there is a "Tennessee Valley Authority Climate Adaptation Plan 2022 Progress Report" that is being led by the Tennessee Valley Authority, which is a federally owned electric utility corporation in the U.S. that covers Tennessee and parts of Alabama, Mississippi, Kentucky, Georgia, North Carolina, and Virginia.[26] Putting Tennessee's state plan in the "kind of a plan" criterion shows the current progress being made towards a state climate change plan.

PLAN CRITERIA	CRITERIA DESCRIPTION
YES PLAN	Clear plan with "climate" in the title that addresses climate change impacts to the jurisdiction in question and goals on how to address those impacts.
KIND OF A PLAN	Ambiguity on whether the document in question is a plan; However, it clearly addresses climate change impacts to the jurisdiction in question. Alternatively, there is documentation that a climate change plan is being drafted.
NO PLAN	No plan with "climate" in the title that addresses climate change impacts to the jurisdiction in question and goals on how to address those impacts.

Figure 10. *Graphic of the criteria for determining whether states and counties have climate change adaptation plans.*

Aside from the "kind of a plan" criterion, Figure 11 illustrates trends between states, most populous counties, and least populous regarding if these levels of government have or have not taken the initiative to create climate change plans. Notably, nine out of ten representative states have state level climate change plans. Five out of ten most populous counties had

[26] Tennessee Valley Authority (TVA). (2022). *Climate Adaptation Plan 2022 Progress Update.*

climate change plans. Alternatively, none of the least populous counties created climate change plans.

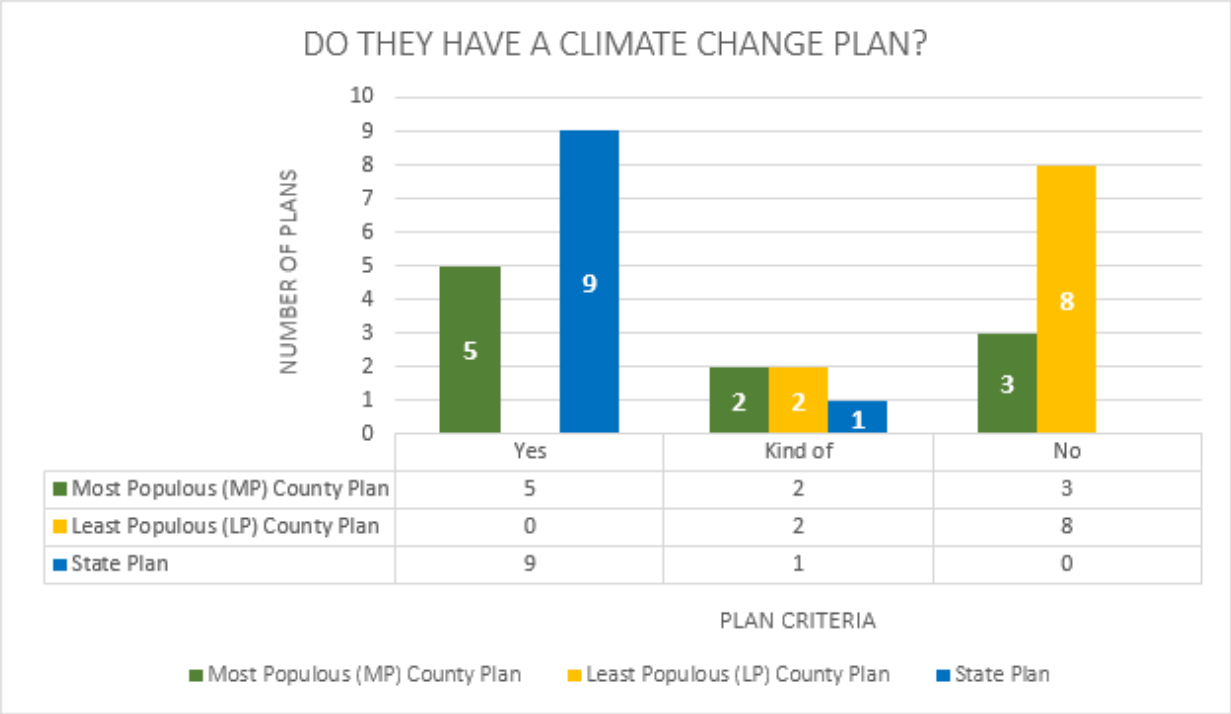

Figure 11. *Graphic depicting whether states and counties have created climate change adaptation plans organized by the number of plans (x-axis) and the plan criteria (y-axis).*

Analyzing climate change plans on a geographic scale (see Figure 12), Virginia, Oregon, New Hampshire, and Arizona had the most climate change plans per state out of all ten regional representative states. Virginia and Oregon had state climate change plans, a most populous county climate change plans, and a least populous county plans that met the "kind of plan criteria" (see Figure 12). New Hampshire and Arizona – paralleling Virginia and Oregon – also had state climate change plans and most populous county climate change plans (see Figure 12). However, these two states had no plans for their least populous counties (see Figure 12). Alternatively, Iowa, Arkansas, and New Jersey all had a state climate change plan and no county level plans (see Figure 12).

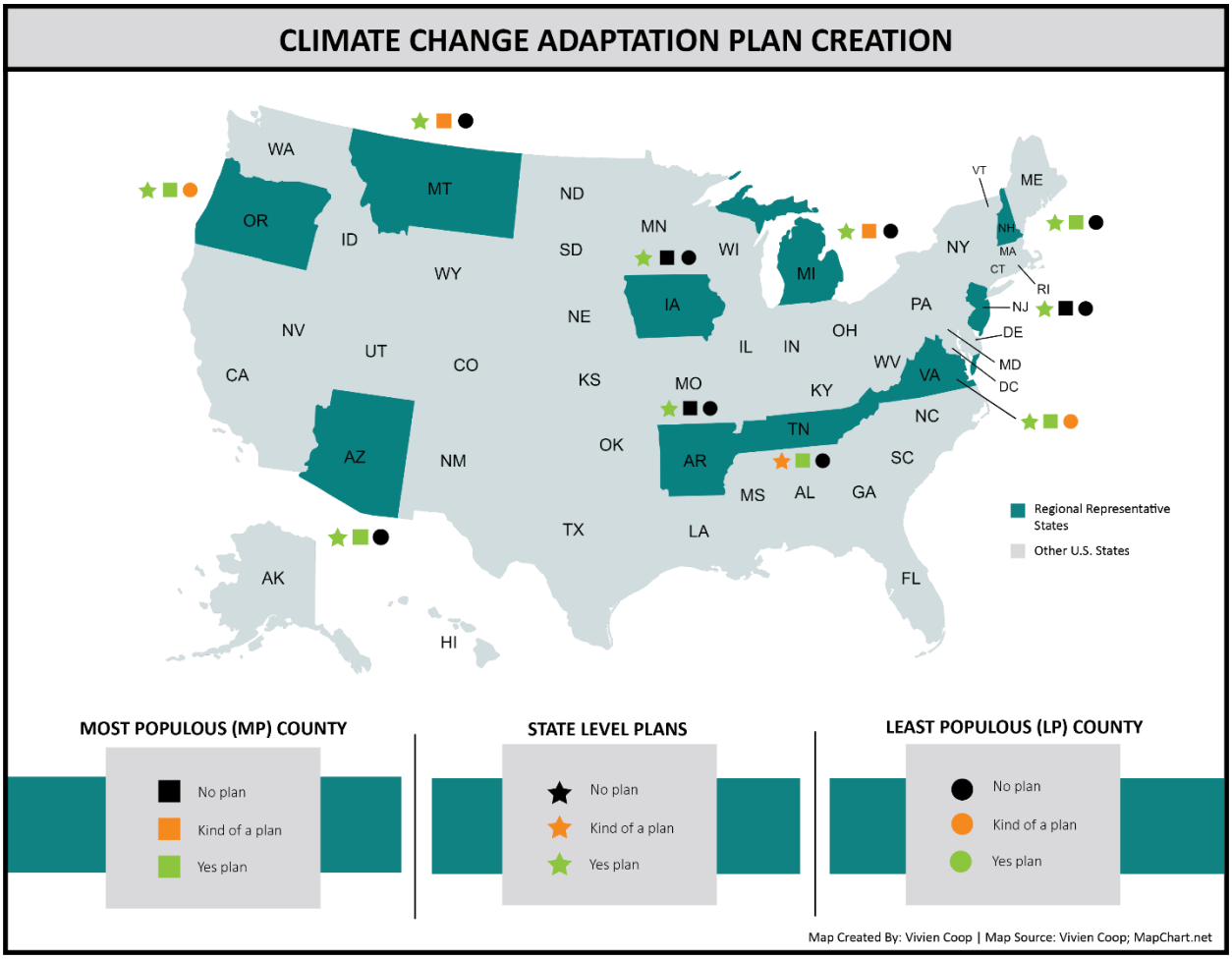

Figure 12. *Hazard mitigation plan criteria and how counties and states' plans are sorted into each criterion.*

CLIMATE CHANGE INTEGRATION AND PLAN COMPARISONS BETWEEEN STATES

As an extension of regional comparisons, this subsection creates a point scoring system (see Figure 13) to compare each regional representative state to each other on their overall climate change integration and climate change plan creation. Each regional representative state receives points for each hazard mitigation plan, comprehensive plan, and climate change plan in that state on both the county and state levels. The number of points given to each plan correlates to the climate change criteria each plan was analyzed by (see Figure 14). For hazard mitigation plans and comprehensive plans, jurisdictions whose plans exhibited higher levels of climate change integration received more points, and jurisdictions that did not have plans or had less climate change integration received fewer points. For climate change plans, jurisdictions that had climate change plans received more points, and jurisdictions who did not have plans or fell into the "kind of" grey area for climate change plan development received fewer points (see Figure 13).

PLAN SCORING SYSTEM (FOR FIGURE 14)

HAZARD MITIGATION PLANS	POINTS
No Plan	0
Yes Plan, No Mention	1
Yes Plan, Mentioned Briefly	2
Yes Plan, Mentioned Significantly	3
Yes Plan, Climate Change Fully Integrated	4
COMPREHENSIVE PLANS	**POINTS**
No Plan	0
Yes Plan, No Mention	1
Yes Plan, Mentioned Briefly	2
Yes Plan, Mentioned Significantly	3
Yes Plan, Climate Change Fully Integrated	4
CLIMATE CHANGE PLANS	**POINTS**
No Plan	0
Kind of a Plan	2
Yes Plan	4

Figure 13. *Table listing the hazard mitigation plan, comprehensive plan, and climate change plan criteria and the points that each criterion is worth.*

Referencing the total scores per state in Figure 14, the highest state total score for climate change integration was Oregon (Representative of Region 10) with a total of 26 out of 32 points. Following Oregon, Virginia (Representative of Region 3) and Arizona (Representative of Region 9) tied for the second highest score with 21 out of 32. Lastly, New Hampshire and New Jersey tied for the third highest score with 19 out of 32. On the other side of the spectrum, Tennessee (Representative of Region 4) and Arkansas (Representative of Region 6) had the two lowest scores – Tennessee scored 11 out of 32 and Arkansas scored 8 out of 32.

CLIMATE CHANGE PLAN INTEGRATION SCORING TABLE

STATES AND COUNTIES	HAZARD MITIGAITON PLAN	COMPREHENSIVE PLAN	CLIMATE CHANGE PLAN	SCORE	MAX SCORE
New Hampshire (State)	4	N/A	4	8	8
Hillsborough County (MP)	2	4	4	10	12
Coos County (LP)	0	1	0	1	12
			New Hampshire Total Score	**19**	**32**
New Jersey (State)	4	N/A	4	8	8
Bergen County (MP)	3	4	0	7	12
Salem County (LP)	2	2	0	4	12
			New Jersey Total Score	**19**	**32**
Virginia (State)	3	N/A	4	7	8
Fairfax County (MP)	4	1	4	9	12
Highland County (LP)	2	1	2	5	12
			Virginia Total Score	**21**	**26**
Tennessee (State)	2	N/A	2	4	8
Shelby County (MP)	1	2	4	7	12
Pickett County (LP)	0	0	0	0	12
			Tennessee Total Score	**11**	**32**
Michigan (State)	2	N/A	4	6	8
Wayne County (MP)	0	1	2	3	12
Keweenaw County (LP)	3	0	0	3	12
			Michigan Total Score	**12**	**32**
Arkansas (State)	2	N/A	4	6	8
Pulaski County (MP)	1	1	0	2	12
Calhoun County (LP)	0	0	0	0	12
			Arkansas Total Score	**8**	**32**
Iowa (State)	2	N/A	4	6	8
Polk County (MP)	2	2	0	4	12
Adams County (LP)	2	0	0	2	12
			Iowa Total Score	**12**	**32**
Montana (State)	4	N/A	4	8	8
Yellowstone County (MP)	4	1	2	7	12
Petroleum County (LP)	0	1	0	1	12
			Montana Total Score	**16**	**32**
Arizona (State)	4	N/A	4	8	8
Maricopa County (MP)	4	1	4	9	12
Greenlee County (LP)	3	1	0	4	12
			Arizona Total Score	**21**	**32**
Oregon (State)	4	N/A	4	8	8
Multnomah County (MP)	4	3	4	11	12
Wheeler County (LP)	3	2	2	7	12
			Oregon Total Score	**26**	**32**

Figure 14. *Table showing state and county hazard mitigation, comprehensive, and climate change plan total scores.*

CONCLUSIONS IN THE CONTEXT OF POPULATION

There are few apparent trends when comparing hazard mitigation, comprehensive, and climate change plans created by different levels of government in the United States. State level hazard mitigation plans had better climate change integration than both most populous and least populous county hazard mitigation plans (see Figure 15). Furthermore, nine out of ten regional representative states had a climate change plan on the state level, while there were only five county level climate change plans. Altogether, state level governments created more climate change plans than county governments and they had better climate change integration into hazard mitigation plans.

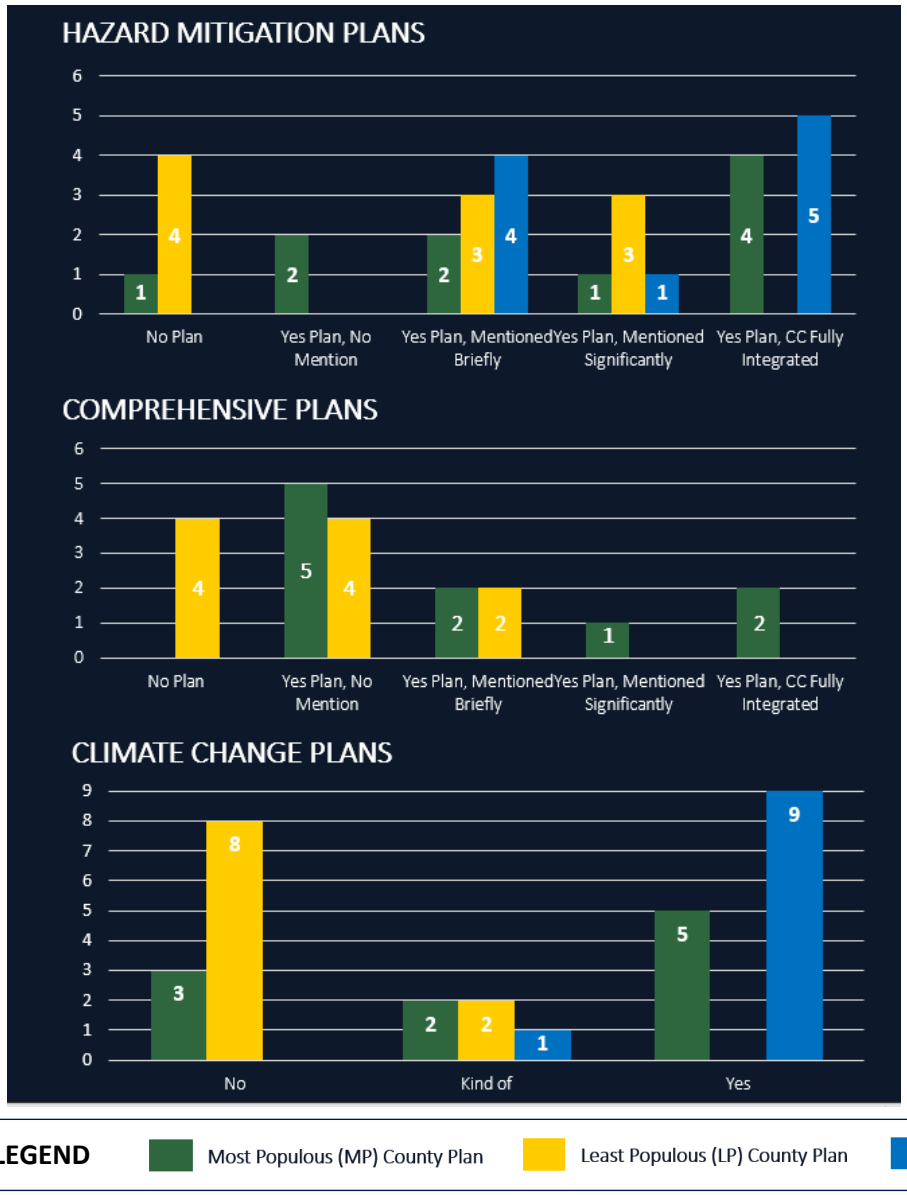

Figure 15. *Graphic comparing plans created by different levels of government – state level and county level.*

Pivoting to trends with county level plans, most populous counties created more climate change plans than least populous counties. Most populous counties had better climate change integration into comprehensive plans than least populous counties. Most populous counties also had more hazard mitigation plans that were fully integrated than least populous county hazard mitigation plans.

The least populous counties consistently lacked plans to be analyzed for climate change integration in this report. Least populous counties had more missing plans than both state and most populous county governments. Four least populous counties were missing hazard mitigation plans, four least populous counties were missing comprehensive plans, and eight least populous counties were missing climate change plans. However, least populous counties likely lack financial resources, staff resources, and a high enough population required for enabling plan development and maintenance. Populations of least populous counties ranged from approximately 500 to 65,000 people whereas populations of most populous counties ranged from approximately 165,000 to 1.15 million people (See Figure 16).

CONCLUSIONS IN THE CONTEXT OF WEALTH

Considering the population and wealth data detailed in Figure 16 for each regional representative state, wealth may be a factor in the extent to which climate change is integrated and if jurisdictions have climate change plans. The "Approximation of Wealth" column in Figure 16 is result of dividing county median household income by state median household income. Values in this column closer to 1 and greater than 1 suggest wealthier counties whereas values less than one suggest poorer counties relative to their state.

Arizona (Regional Representative of Region 9) tied with Virginia for the second highest overall score out of all states in the "Climate Change Plan Integration Scoring Table." Notably, out of all the most populous counties, Arizona's Maricopa County has the greatest population with 4,420,568 people (see Figure 16). In terms of population, a large population likely gave Maricopa greater financial resources and staff resources to complete and update hazard mitigation, comprehensive, and climate change plans. Furthermore, in terms of wealth, Arizona's approximation of wealth for its most populous and least populous county were nearly the same – 0.8921 for the most populous county and 0.8828 for the least populous county (see Figure 16). Furthermore, Arizona's least populous county – with a score of 0.8828 – was also the wealthiest least populous county out of all the least populous counties (see Figure 16). Virginia (Regional Representative of Region 10), given how well it scored, showed similar indicators of wealth that Arizona showed. Virginia's most populous county, Fairfax County, was the wealthiest most populous county out of all the most populous counties (see Figure 16).

Wealth association with climate change integration into plans and the creation of climate change plans continues with Arkansas and Tennessee. Arkansas (Regional Representative of Region 6) and Tennessee (Regional Representative of Region 4) are the two states that scored the lowest on the "Climate Change Plan Integration Scoring Table." Arkansas – with the lowest score overall – also had the lowest state median income out of all the states. Furthermore,

Tennessee – with the second lowest score – had the second lowest median state income out of all the states.

	POPULATION & INCOME ANALYSIS				
	County Population	White Population	County Median Household Income (Dollars)	State Median Household Income (Dollars)	Approximation of Wealth
Region 1: New Hampshire					
Hillsborough County (MP)	422,937	350,270	78,655	88,465	0.8891
Coos County (LP)	31,268	28,946	45,696		0.51654
Region 2: New Jersey					
Bergen County (MP)	955,732	543,849	95,837	89,296	1.0733
Salem County (LP)	64,837	46,600	64,309		0.7202
Region 3: Virginia					
Fairfax County (MP)	1,150,309	569,013	121,133	80,963	1.4962
Highland County (LP)	2,232	2,135	46,147		0.5700
Region 4: Tennessee					
Shelby County (MP)	929,744	326,077	49,782	59,695	0.8339
Pickett County (LP)	5,001	4,829	41,004		0.6869
Region 5: Michigan					
Wayne County (MP)	1,793,561	882,484	45,321	63,498	0.7137
Keweenaw County (LP)	2,046	1,954	49,779		0.7839
Region 6: Arkansas					
Pulaski County (MP)	399,125	199,197	50,093	52,528	0.9536
Calhoun County (LP)	4,739	3,539	44,022		0.8381
Region 7: Iowa					
Polk County (MP)	492,401	373,903	66,044	65,600	1.0068
Adams County (LP)	3,704	3,531	49,229		0.7504
Region 8: Montana					
Yellowstone County (MP)	164,731	139,965	59,117	63,249	0.9347
Petroleum County (LP)	496	466	44,688		0.7065
Region 9: Arizona					
Maricopa County (MP)	4,420,568	2,645,512	61,606	69,056	0.8921
Greenlee County (LP)	9,563	6,584	60,962		0.8828
Region 10: Oregon					
Multnomah County (MP)	815,428	556,202	64,337	71,562	0.8990
Wheeler County (LP)	1,451	1,271	33,456		0.4675

Figure 16. *Table cataloging the population per county, white population per county, the county median household income (in dollars), the state median income (in dollars), and an approximation of wealth (the county median household divided by the state median income) (Source: U.S. Census Data).*

CONCLUSIONS IN THE CONTEXT OF POLITICS

The United States is a politically polarized country between the Democratic and Republican political parties. The term "climate change" is also politicized and associated with both the Democratic Party and liberal ideals. Beginning this capstone project, it was of great interest to determine if states and counties that aligned with more conservative ideals and voted consistently for the Republican Party would have the following trends:

- low levels of climate change integration into their hazard mitigation plans,
- low levels of climate change integration into their comprehensive plans, and
- a low number climate change plans.

In a similar manner, it was of great interest to determine if states and counties that aligned with more liberal ideals and voted consistently for the Democratic Party would have the following trends:

- high levels of climate change integration into their hazard mitigation plans,
- high levels of climate change integration into their comprehensive plans, and
- a high number of climate change plans.

In terms of hypotheses for this project, I did not hypothesize that climate change planning would parallel the aforementioned liberal and conservative trends where predominantly liberal jurisdictions include climate change and predominantly conservative jurisdictions exclude climate change from planning. Rather, I knew that climate change heightened hydro-meteorological hazards do not "care" if you believe in climate change or if climate change is politically popular in your area. These climate change heightened hydro-meteorological hazards will affect the entirety of the United States regardless. So, I wondered if politics – rather than determining the presence or absence of climate change from planning across the country in a polarized manner – instead determined whether states or counties would use climate change proxy phrases.

The purpose of a proxy phrase could be to include strategies for how a region will cope with projected climate change impacts without using the term "climate change." This report's subsection makes the argument that the Tennessee State Hazard Mitigation Plan contains a proxy phrase for climate change based on a contextual comparison between the Tennessee and New Jersey State Hazard Mitigation Plans. Before delving into the proxy phrase argument itself, an overview is needed on the typical organization of hazard mitigation plans.

Hazard mitigation plans are required to have a "hazard profiles" element where the plan lists every natural hazard that may affect the plan's jurisdiction and lists reoccurring subsections that describe aspects of this hazard in greater detail.[27] Figure 17 shows the "Hazard Profiles" subsection organization on flood hazards from both the New Jersey and Tennessee State Hazard Mitigation Plans. For each natural hazard in New Jersey's jurisdiction, there were the following reoccurring subsections: "Hazard Description," "Extent," "Previous occurrences,"

[27] FEMA (2022). *Hazard Mitigation Planning.*

"Probability of Future Occurrences," and "Potential Effects of Climate Change" (see Figure 17). Most pertinent to this report, is the fact that New Jersey's plan had a reoccurring subsection called "Potential Effects of Climate Change" that discusses how climate change will impact every every hazard in the state.

Pivoting to the Tennessee State Hazard Mitigation Plan's flood hazard profiles element, there was a rather similar series of reoccurring subsections when compared to New Jersey's reoccurring subsection titles. For each natural hazard in New Jersey's jurisdiction, these were the following reoccurring subsections: "Location and Extent," "Previous occurrences," "Incidents and Probability," "Changing Future Conditions," and "Future Risk" (see Figure 17). There is no explicit mention of climate change in these subsection titles, but the "changing future conditions" subsection's content talked about climate change's impacts on Tennessee without saying the term "climate change" at all.[28] Figures 17 and 18 show the organization of the New Jersey and Tennessee State Hazard Mitigation Plans and pages from the plans themselves as evidence that "changing future conditions" is a potential proxy for "climate change."

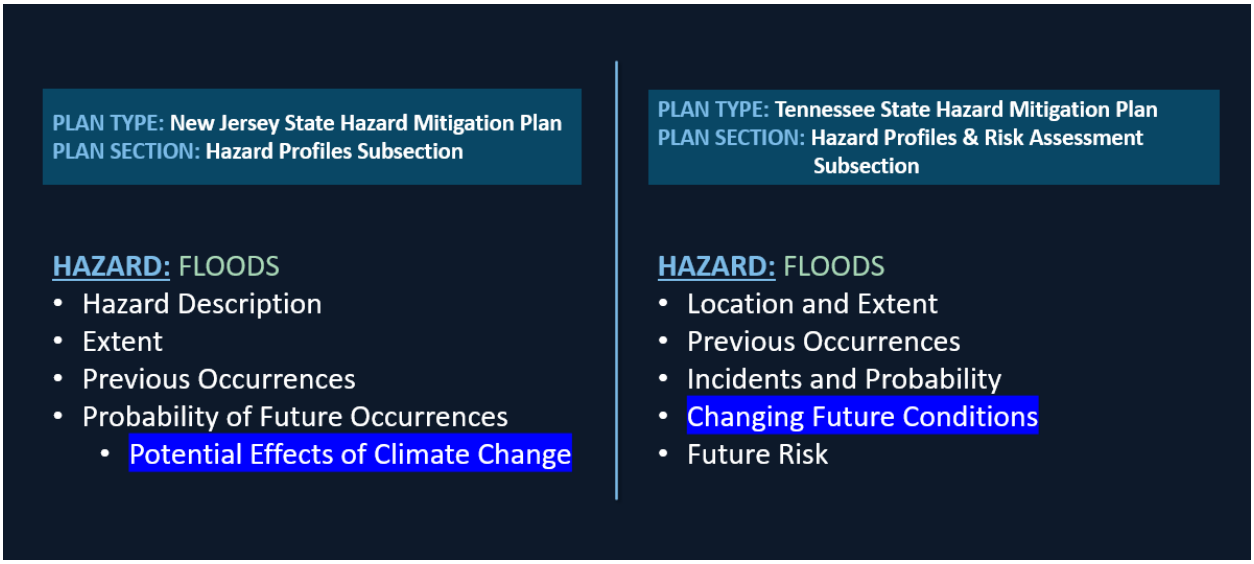

Figure 17. *A graphic comparing the organization of the New Jersey State Hazard Mitigation Plan's Flood Hazard Profile Subsection to the organization of Tennessee's same State Hazard Mitigation Plan's Flood Hazard Profile Subsection (Data Source:* Tennessee Emergency Management Agency, 2018; State of New Jersey Office of Emergency Management, 2019).

[28] Tennessee Emergency Management Agency (2018). *State of Tennessee Hazard Mitigation Plan.*

Figure 18. *A graphic comparing the New Jersey State Hazard Mitigation Plan's Flood Hazard Profile Subsection with that of Tennessee (Data Source:* Tennessee Emergency Management Agency, 2018; State of New Jersey Office of Emergency Management, 2019).

II. INDIGENOUS NATIONS' CLIMATE CHANGE PLAN ANALYSIS

The "Climate Change Integration into Plans in the United States" section addresses the first and second issues of this report by analyzing plans from ten states and twenty counties in three steps:

1) For each regional representative state, the section analyzed climate change integration into hazard mitigation plans and climate change plans on the state level.

2) The section also analyzed climate change integration in hazard mitigation plans and comprehensive plans on the county level for the least and most populous county in each representative state.

3) Lastly, the section detailed if counties and states had created climate change plans of their own initiative.

The "Climate Change Integration into Plans in the United States" section and its conclusions analyzed the content and presence of hazard mitigation plans and comprehensive plans. However, that section did not analyze the content of U.S. climate change plans or the plans' climate change adaptation strategies – only the presence or absence of a climate change plan. Due to time constraints for this project, rather than analyzing the contents of U.S. climate change plans and their adaptation strategies, this report instead analyzed Indigenous Nations' climate change plans and their climate change adaptation strategies as a guide for U.S. climate change plans.

A holistic review of Indigenous Nations' long history in adaptation and more recent history as the leaders of the climate change movement gives sound justification to look to Indigenous Nations as experts in adaptation planning.[29] Indigenous Nations have adapted to many significant events since time immemorial: they have adapted to naturally changing climates, artificially changing climates, and a history of mistreatment from the United States government.[30] This "Indigenous Nation Climate Change Plan Analysis" section analyzes the contents of 47 climate change plans created by Indigenous Nations across the United States (see Figure 17). These plans were sourced from a list of tribal climate change-related plans on the University of Oregon's online "Tribal Climate Change Guide."[31] Furthermore, this section highlights common climate change adaptation strategies found across these 47 Indigenous Nations' plans.

[29] Yale School of the Environment. (2022). *How Native Tribes Are Taking the Lead on Planning for Climate Change*.
[30] National Park Service. (n.d.). *A History of Earth's Climate.*
[31] University of Oregon. (2023). *Tribal Climate Change Guide.*

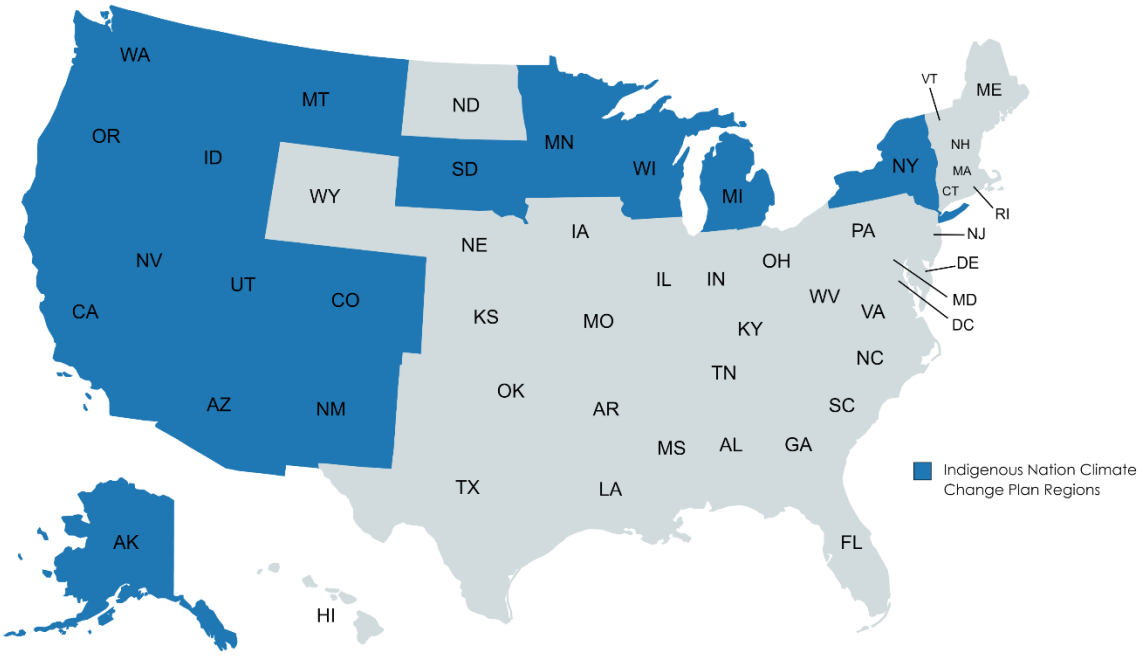

Figure 19. *A map showing the regions in the United States where the Indigenous Nations are located whose plans are analyzed in this report (Data Source: University of Oregon; Map Source: Vivien Coop & datachart.net).*

NOTABLE CLIMATE CHANGE ADAPTATION ACTIONS

Out of the 47 tribal climate change plans studied, there were eleven climate change adaptation strategies that stood out as being featured in multiple of these tribal climate change plans (see Figure 20). Figure 20 shows the eleven common climate change adaptation strategies, the number of plans that mentioned each climate change adaptation strategy, and a ranking system for the most common adaptation strategies. Out of 47 plans, all 47 plans used "data collection, monitoring, and research" as an adaptation action strategy. This is a critical strategy as it allows Indigenous Nations to monitor the states of certain climates, natural habitat, or urban structures over time to see how climate is changing the built and natural environments. Altogether, "data collection, monitoring, and research" was the most common climate change adaptation strategy among the plans studied.

Following in second place – as designated by the "comparative rank for most common adaptation strategy" row in Figure 20 – is "management along regional and watershed boundaries." In this adaptation strategy management along natural boundaries is an alternative to management along political boundaries that don't always align with critical habitats, ecosystems, and watersheds. Lastly, there is a tie for third place between "habitat restoration and protection" and "increased collaboration with external agencies." Habitat restoration is a climate change adaptation strategy that helps both the built and natural environment. For example, marshes, swamps, and coastal ecosystems when restored can help absorb flood water or storm surge that would otherwise flood the built environment. Therefore, this restoration

serves both the built and natural environment. More collaboration with external agencies is a strategy that – much like habitat restoration – can accomplish several climate change adaptation goals at once. Firstly, more collaboration between tribes and outside agencies likely can bring in more funding and more potential partners for certain climate change projects. Secondly, more collaboration with outside agencies can help actualize the "management along regional and watershed boundaries" climate change adaptation strategy where more partners across different jurisdictions can co-manage the region on environmental boundaries rather than political ones.

	CLIMATE CHANGE ADAPTATION ACTIONS										
	Data Collection, Monitoring, and Research	**Habitat Restoration / Protection**	**Appropriate Sharing/ Integration of TEK**	**Increased Collaboration with External Agencies**	**Strong Community Member Participation/ Decision-making**	**Management Along Regional and Watershed Boundaries**	**Build Individual Community Member Soft Skills**	**Build Individual Community Member Hard Skills**	**Increase Renewable Energy Utilization**	**Infrastructure Maintenance**	**General Public Education**
Number of plans that mentioned the climate change adaptation strategy	47	45	19	45	44	46	30	26	15	43	42
Comparative rank for most common adaptation strategy	1st	3rd*	10th	3rd*	4th	2nd	7th	9th	11th	5th	6th

Figure 20. *Common climate change adaptation actions across 47 Indigenous Nations' climate change plans in the United States (Data Source: University of Oregon, 2023).*

RECOMMENDATIONS

I. **A new amendment to the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988 & the Stafford Act's 2000 Disaster Mitigation Act amendment.**

If jurisdictions in the United States want to receive Hazard Mitigation Grant Program (HMGP) funding, I propose that they must integrate climate change as a mandatory element in their hazard mitigation plans. As it stands, jurisdictions do not have to include climate change in their hazard mitigation plans in order to qualify for HMGP funding.[32] However, as this report emphasizes, jurisdictions are no longer facing the natural hazards they have grown accustomed to over the 20st century. Planning for the natural hazards from 20 years ago will no longer be sufficient to protect communities from the climate change heightened hydro-meteorological hazards of today.

II. **Climate change adaptation plan legal enforcement and standardization in the United States**

I propose that climate change adaptation plans must have greater legal enforcement and standardization on the federal level. Climate change plans could be regulated and standardized on the federal level by FEMA (Federal Emergency Management Agency). FEMA could manage climate change plan regulation and standardization in a similar manner to how FEMA manages hazard mitigation plans and their required elements.

III. **Climate change integration into comprehensive plans on the county level**

This report's data on climate change integration into comprehensive plans shows that on the county level, many of our most populous and least populous counties either do not have comprehensive plans or do not have climate change mentioned in them. Climate change must be required to be integrated into comprehensive plans in the United States in counties that have the financial resources, staff resources, and population that can support comprehensive plan creation.

IV. **Make sure all climate change plans in the United States include the following four climate adaptation actions:**

1. data collection, monitoring, and research;
2. management along regional and watershed boundaries;
3. habitat restoration and protection; and
4. increased collaboration with external agencies.

The aforementioned climate change adaptation actions are sourced from the top four most common climate change adaptation strategies across 47 climate change plans studied from Indigenous Nations in the United States. Indigenous Nations are experts in adaptation and

[32] Paci-Green. (2020). *Natural Hazards Planning Lecture*.

leaders of the climate change adaptation movement; the United States can most definitely learn much from tribal climate change adaptation strategies.

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