

Planning for equity: An evaluation of hazard mitigation plans

by

Zachary Hayden Abell

A REPORT

submitted in partial fulfillment of the requirements for the degree

MASTER OF REGIONAL AND COMMUNITY PLANNING

Department of Landscape Architecture and Regional and Community Planning

College of Architecture, Planning, and Design

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2023

Approved by:

Major Professor
Dr. Shakil Kashem, AICP

Copyright

© Zachary Abell 2023.

Abstract

Natural hazards present a significant challenge to communities of all sizes. From a tornado in a small Midwestern town to a hurricane that floods an entire coastal city, their adverse effects can impact a community's social and economic infrastructure for months or even years after the dust has settled or the water receded. Flooding is one of the most deadly and costly natural disasters we face as a society. Prior studies showed that some populations are more prone to experiencing damage from flooding purely based on socioeconomic factors. In this report, I address this disparity in risk exposure and explore the extent to which hazard mitigation plans address this equity issue; and how it varies by cities with different levels of flood hazard exposure.

Using content analysis and plan quality metrics derived from an existing Equity Evaluation Tool, modified for the parameters of this research, I conducted an analysis of the planning documents that are used to guide hazard planning practices in cities around the United States. Seventeen cities were selected for their varying levels of flood exposure amongst vulnerable populations. After analyzing the documents with the modified Equity Evaluation Tool, "Equity Scores" were given to each hazard mitigation plan. It was found that Hazard Mitigation Plans for areas with higher levels of unequal flood exposure receive lower Equity Scores compared to other cities. This finding points to an alarming trend in Hazard Planning practices in riverine communities in the United States.

Table of Contents

List of Figures	v
List of Tables	vi
Acknowledgements	vii
Chapter 1: Introduction	1
Chapter 2: Background	6
Chapter 3: Study Method	11
Chapter 4: Study Findings	19
4.1 Plan Elements	20
4.2 Planning Process	23
4.3 Overall Equity Orientation.....	25
4.4 Environment, Hazards, and Safety	26
Chapter 5: Conclusion.....	29
Bibliography	30
Appendix A: Plans reviewed in this study	32
Appendix B: Summary Scores of all the plans reviewed	33
Appendix C: Scoretable for all Plans and all Metrics.....	34

List of Figures

Figure 1: Clusters of differences between ratios of disadvantaged population in and out of flood zones (Qiang, 2019)	11
Figure 2: Map of plans evaluated.....	18
Figure 3: Final Equity Scores for plans reviewed.....	20
Figure 4: Scores for <i>Plan Elements</i> category.....	20
Figure 5: Scores for the <i>Planning Process</i> Category.....	23
Figure 6: Scores for <i>Overall Equity Orientation</i> category.....	25
Figure 7: Scores for <i>Environment, Hazards, and Safety</i> category	26

List of Tables

Table 1: Equity Evaluation Tool Metrics used in this study.....	12
Table 2: Final set of Hazard Mitigation Plans evaluated in this study.	16
Table 3: Final Equity Scores.....	19
Table 4: Averages Equity Scores for plans in Hot and Cold Spot areas.....	20
Table 5: Average Overall Equity Orientation Scores based on Consultant Use.....	21

Acknowledgements

I want to thank the members of my committee; Drs. Kashem, Rishi, and Nelson for their continued guidance and interest in helping me see this project through. I would be remised if I did not thank my wife for her continued support over the duration of this project and helping me maintain a healthy school/life balance while working arduously to complete this. Thank you to my family; Mom, Dad, and Ben for cheering me on to the finish line and beyond it. I'm lucky to be surrounded by a great support system of friends, family, and faculty both within and outside Seaton Hall and am truly thankful for all of them.

Chapter 1: Introduction

Flooding and other natural hazards have posed threats to cities for as long as cities have been inhabited. Even just in the United States, flooding of riverine settlements predates English colonization (World Meteorological Association, 2011). In the 20th and 21st centuries alone, natural disasters have caused over 8 million deaths and \$7 Trillion in economic losses (globally); with flooding accounting for just over one third of these losses (Daniell, et al., 2016). Over the timeframe of 1900 to 2015, floods have caused the highest amount of economic losses, although in recent times, since 1960, the highest percentage has switched to storm (and storm surge) waters, with around 30% of losses (Daniell, et al., 2016).

So, we have our “why?” for examining flooding; it’s historically the most costly and deadly natural disaster we have faced as a society, but what about our “why?” for equity in the planning process? I see two reasons to focus on equity (and inequity) in the context of hazard mitigation; a) Historically, it is well-known that planning practices have left out certain population groups (either directly or indirectly) from planning decisions and subjected these populations to the adverse effects of urban ills, so focusing on including these voices in constructing new plans is important. b) As more communities plan for their response to climate change, there is a new opportunity to make equity a cornerstone of the planning process in places where this renewed focus is taking place. Hazard mitigation plans that are adopted throughout the country need to be evaluated based on how they address existing inequities in their target communities.

The federal governing body for Disaster Mitigation in the United States, the Federal Emergency Management Agency (FEMA), defined the purpose of mitigation planning as "State, local, and Indian tribal governments to identify the natural hazards that impact them, to identify

actions and activities to reduce any losses from those hazards, and to establish a coordinated process to implement the plan, taking advantage of a wide range of resources” (FEMA, 2005). Federal standards for Hazard Mitigation planning were most recently outlined in the Disaster Mitigation Act (DMA) of 2000, which replaced the Stafford Act with criteria for local governments to receive federal funding for hazard mitigation. The requirements for a Hazard Mitigation Plan, as listed by DMA 2000, fall under the categories of **Planning Process, Plan Content, Mitigation Strategy, Coordination with local plans, and Plan Maintenance** (CFR, 2002). The required elements within those categories are as follows:

Planning Process

An effective planning process is essential in developing and maintaining a good plan. The mitigation planning process should include coordination with other State agencies, appropriate Federal agencies, interested groups, and be integrated to the extent possible with other ongoing State planning efforts as well as other FEMA mitigation programs and initiatives.

Plan Content

Plan content requirements for a Hazard Mitigation Plan include:

- (1) A description of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how other agencies participated.
- (2) Inclusion of risk assessments that provide the factual basis for activities proposed in the strategy portion of the mitigation plan. These risk assessments

must characterize and analyze natural hazards and risks to provide a comprehensive overview and must include the following:

(i) An overview of the type and location of all natural hazards that can affect the area, including information on previous occurrences of hazard events, as well as the probability of future hazard events, using maps where appropriate.

(ii) An overview and analysis of vulnerability to the. It must describe vulnerability in terms of the areas most threatened by the identified hazards, and most vulnerable to damage and loss associated with hazard events.

(iii) An overview and analysis of potential losses to the identified vulnerable structures, based on estimates provided in local risk assessments as well as the State risk assessment.

Mitigation Strategy

To meet all of the requirements for this section, the plan must provide the blueprint for reducing the losses identified in the risk assessment. This section must include:

(i) A description of State goals to guide the selection of activities to mitigate and reduce potential losses.

(ii) A discussion of the State's pre- and post-disaster hazard management policies, programs, and capabilities to mitigate the hazards in the area.

(iii) An identification, evaluation, and prioritization of cost-effective, environmentally sound, and technically feasible mitigation actions and activities the State is considering and an explanation of how each activity contributes to the overall mitigation strategy.

(iv) Identification of current and potential sources of Federal, State, local, or private funding to implement mitigation activities.

Coordination with local plans

Coordinating with the local network of plans (i.e. Parks Master Plans, Comprehensive Plans, Zoning Plans, etc.) varies from jurisdiction to jurisdiction in terms of what is out there to coordinate with. In recognition of this, FEMA outlines an approach to local plan coordination that can be utilized anywhere, this includes:

- (i) A description of the State process to support, through funding and technical assistance, the development of local mitigation plans.
- (ii) A description of the State process and timeframe by which the local plans will be reviewed, coordinated, and linked to the State Mitigation Plan.
- (iii) Criteria for prioritizing communities and local jurisdictions that would receive planning and project grants under available funding programs, which should include consideration for communities with the highest risks, repetitive loss structures, and most intense development pressures.

Plan Maintenance

Once the Hazard Mitigation Plan has been adopted and the metaphorical shovels are “moving dirt”, there needs to be a plan for maintaining those implementations and updating the plan in its entirety every five years to keep up with current needs. FEMA gives these guidelines for maintaining these implementations:

- (i) Establishing a method and schedule for monitoring, evaluating, and updating the plan.
- (ii) A system for monitoring implementation of mitigation measures and project closeouts.
- (iii) A system for reviewing progress on achieving goals as well as activities and projects identified in the Mitigation Strategy.

-Code of Federal Regulations: Part 201 – Hazard Mitigation (CFR, 2002)

I felt it was necessary to include the federal guidelines for Hazard Planning for two reasons; a) to provide a basis of where hazard planning requirements currently stand, and b) highlight the relative lack of requirements discussing equity and vulnerability. “Vulnerability” is only referred to in the above requirements as areas of land and assets most susceptible to impacts from natural hazards as opposed to the *populations* most at risk and affected by them. The assumption is that these policies promote equitable outcomes, but as we have discussed and will further explore, this is not always the case.

Chapter 2: Background

A couple of points in the literature that I have gone through that I want to highlight are how Qiang (2019) points out the existence of inequality in flood exposure, how Berke et al. (2015) points out that losses due to natural disasters caused by climate change are likely to increase, and finally how Kim & Marcouiller (2018) summarize their findings by stating “better plan quality and high levels of community resilience result in reducing disaster losses”. These three points are integral to this study because they point out A) the existence of hazard exposure inequality, B) that this is a problem that will grow in stride with the direction of climate change, and C) that better plan-making practices are positively correlated with an overall better outcome for communities that strive for it.

Qiang (2019) points out the existence of environmental inequality by stating that his study “provides empirical evidence of socio-economic disparities and environmental injustice associated with flood exposure in the U.S.”. By conducting a hot-spot analysis of the United States at the county level, Qiang was able to point out areas where a higher concentration of disadvantaged populations lived in flood zones than outside of it. Based on this analysis, Qiang (2019) concluded that at the national scale, economically disadvantaged populations are more likely to reside in flood zones than outside. On the local scale, economically disadvantaged populations tend to reside in flood zones in inland areas, while coastal flood zones are more often occupied by wealthier and elderly inhabitants. These findings point to an alarming situation of inland communities where people are generally less responsive to flood hazards and people living in flood zones are from a lower socio-economic stratum.

We live in an era characterized by a critical moment in our planet's climate path. Climate change has been an ever-present threat over the past decades leading up to our current situation. The effects of climate change are very broad, but one specific effect brought up in a Newcastle University (UK) Study (Fowler et al., 2021) was the increase in intensity and frequency of thunderstorms and the rainfall they produce. These are the conditions in which most inland river and creek watersheds experience flooding; in short-span, heavy-pour deluges. The scientists found that rainfall extremes intensify with warming, generally at a rate consistent with increasing atmospheric moisture, which is what would be expected. However, this study has shown that temperature increases in some regions affect short-duration heavy rainfall extremes more than the increase in atmospheric moisture alone. Climate change is bringing with it hotter, drier summers and at the same time, warmer, wetter winters (Fowler, et al., 2021). In the past, researchers have struggled to capture the detail in extreme rainfall events as these can be highly localized and occur in a matter of hours or even minutes (Fowler, et al., 2021). Evidence is emerging that sub-daily rainfall intensification is related to an intensification of flash flooding, at least locally; but it should be noted that this increase may not be universal due to changes in catchment moisture conditions and stormwater infrastructure. It has been established that at least some of this enhancement of rainfall intensities is from local in-storm effects and urbanization. In summary, the atmospheric changes brought on by climate change play a significant role in the increase in intensity and frequency of short-term heavy rainfall events.

As suggested by numerous studies (Berke et al., 2015; Lyles et al., 2014; Koks et al., 2015) planning and public policy, an important local resilience factor, involves the extent to which the community has local emergency management plans, land use planning, development regulations, building standards, property acquisition, critical public facilities, and taxation

information. To emphasize the role of high-quality planning in community disaster risk reduction, Wang (2016) argues that since " ... planning is both a tool and a predictive take ... ", disaster management in planning can provide "... ability to decrease future uncertainties." More specifically, high-quality plans are a function of community resilience and community resilience can be a result of high-quality plans. In other words, having a high-quality hazard mitigation plan, particularly in disaster-prone areas, can lead to lower vulnerability and higher social and economic resilience (Kim and Marcouiller, 2018).

An "Equity Focused" approach to plan document analysis is going to focus heavily on the qualitative elements of said documents rather than the traditional quantitative elements that other plan quality studies have examined. There are some precedents for this type of analysis (Kim, 2017) where researchers examined the role of hazard mitigation plan quality in risk reduction and the relationship between plan quality measures and community resilience. Using content analysis and qualitative principles of plan quality measures outlined in Berke et al. (2015), Kim's study evaluated the local hazard mitigation plans of 160 counties within the US Mississippi River Basin to determine how well they supported disaster risk reduction. Findings of this study suggest that "better plan quality and high levels of community resilience result in reducing disaster losses" (Kim and Marcouillier, 2017).

These First-order plan quality principles used in Kim and Marcouiller's study (2017) are normative standards that correspond to the different components plans should include and have been applied in numerous ways to evaluate planning documents. The principles can be applied across multiple planning domains, such as hazard mitigation, sustainable development, housing,

and other topics (Berke et al. 2015). Consensus has yet to emerge around a core set of interdependent principles of plan quality, as multiple researchers have employed different tactics in plan analysis. (Berke et al. 2015) conceptualized eight principles, divided into internal plan quality involving “the content and format of key components of the plan” and external plan quality dealing with “the relevance of scope and coverage of the plan in fitting the local situation”. Berke and Godschalk’s meta-analysis (Berke & Godschalk, 2009) of 16 plan quality studies also used this internal/external conceptual division. Alternatively, (Norton, 2008) has distinguished between a plan’s policy focus - specific to the planning domain - and its analytical quality, which determines the plan’s effectiveness as a communicative tool. (Bunnell & Jepson, 2011) argued for increased attention to the qualities of plans that enhance their communicative and persuasive impact. In (Lyles et al., 2014), the focus is on 7 principles of plan quality; three direction-setting principles (goals, facts based, and policies) form the foundation for a “future vision”, while four action-oriented principles (participation, inter-organizational coordination, implementation, and monitoring) “organize the uses of the plan”.

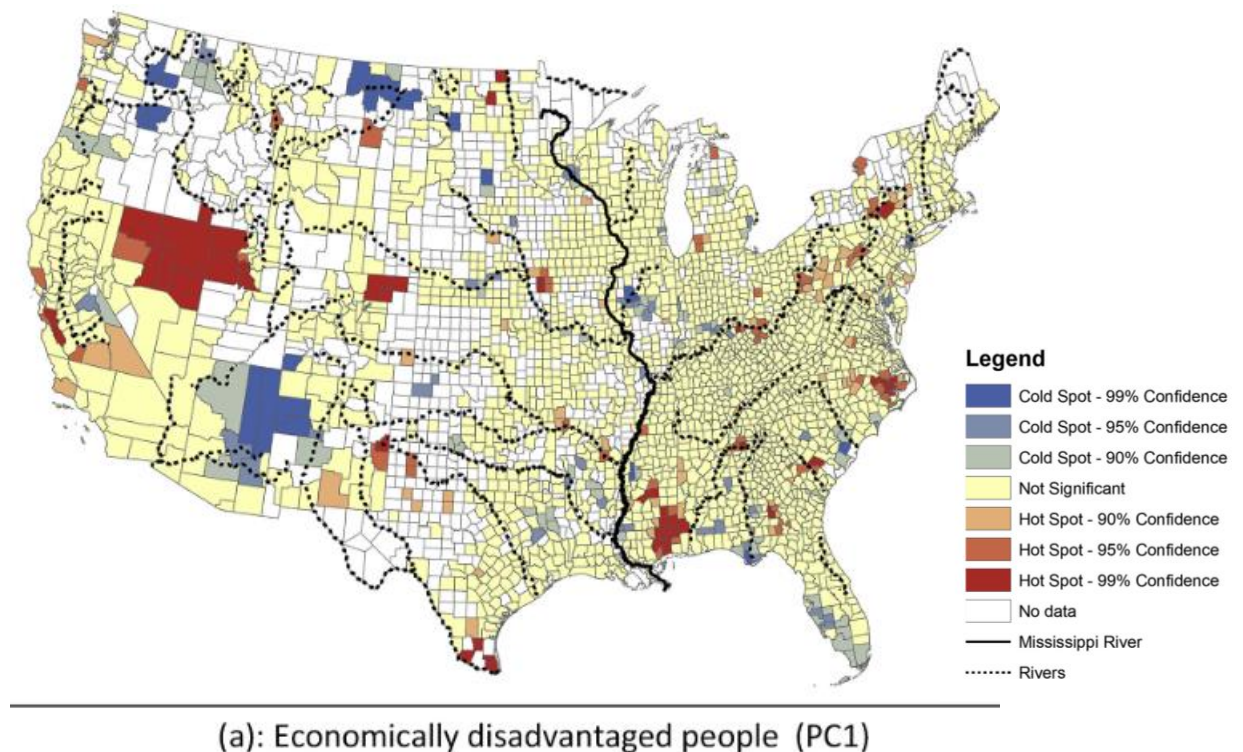
“Are we Planning for Equity” (Loh and Kim, 2020) was the first of these studies to incorporate equity evaluation in evaluating a plan’s quality. They used an “Equity Evaluation Tool” that lists the recommendations that go beyond the agreed-upon practices of “good planning” to specifically focus on equity and advancing it as a goal in planning documents. It is important to note that in this study, an “equitable” plan is defined as one that “Identifies vulnerable people and geographic areas and ensures equitable protection from hazards and equitable distribution of amenities”. This research produced a publicly available plan equity evaluation tool to investigate to what extent and in what ways local governments incorporate

goals and recommendations that would advance equitable outcomes in their comprehensive plans. The approach used in the creation of the Equity Evaluation Tool, I believe, is the best way to come up with a comprehensive analysis of equity in planning documents, and therefore it is the approach I am employing when exploring equity in Hazard Mitigation Plans in this study.

Chapter 3: Study Method

The two main literary works my project relies on are Qiang (2019) Flood Zone Demography report (which produced the map shown in Figure 1 below), and the Equity Evaluation Tool of Loh and Kim (2020) that I modified to evaluate the Hazard Mitigation Plans in my study.

Figure 1: Clusters of differences between ratios of disadvantaged population in and out of flood zones (Qiang, 2019)



In his flood demography report, Qiang (2019) illustrates the nature of populations that reside in flood zones around the United States. The general findings of this study indicate that wealthier and older populations tend to reside in flood zones in coastal areas, whereas inland flood zones are usually populated by economically disadvantaged populations. This led to the creation of three “Hot Spot” maps, which locate where (a) Economically Disadvantaged people

(b) Households with limited English ability, and (c) People above the age of 75 reside in flood zones. A “Hot Spot” in this case would be a location where this population disparity is taking place with 90-99% confidence, whereas a “Cold Spot” indicates locations where socioeconomic status is NOT a factor in flood zone population, also with a 90-99% confidence. For the purposes of this project, I will be using the Hot Spot map that investigates Economically Disadvantaged populations in flood zones (as shown in Figure 1) in selecting jurisdictions to evaluate.

Justification for Equity Evaluation Metrics

The actual criteria for creating the Equity Evaluation Tool (Loh and Kim, 2020) were pulled from multiple works of literature as well as multiple readings from the American Planning Association on the subject of Equity; including the AICP Code of Ethics and Professional Conduct (APA, 1991), AICP Code of Ethics and Professional Conduct (APA, 2016), and the Planning for Equity Policy Guide (APA, 2019). The complete list of metrics for equity evaluation used in my modified version of the Equity Evaluation Tool is as follows:

Table 1: Equity Evaluation Tool Metrics used in this study

Plan Element
Did consultants assist in writing the plan?
Does the plan include any provisions for monitoring implementation progress?
Does the plan include a demographic analysis?
Overall equity orientation
Do the words equity/equality/fairness/justice appear anywhere in the plan?
Does the plan mention any obstacles (technical, political, legal, etc.) to implementing equitable policies?
Does the plan identify geographic areas that are underserved or that have particular social needs to be addressed?
Does the plan identify geographic areas that are more prone to environmental hazards?
Does the plan identify groups of residents who are underserved or who have particular social needs?
Does the plan identify groups of residents who are more prone to environmental hazards?
Planning Process
Does the plan describe the public participation process for this plan?
Did the plan include:
In-person visioning session(s)

Survey
Focus group(s)
Charrette(s)
Scenario planning
Neighborhood workshop(s)
Educational presentation(s)
Other
Does the plan mention how officials and/or staff incorporated that community feedback?
Does the plan mention efforts to engage historically marginalized groups?
Environment, hazards, and safety
Does the plan mention/define environmental justice?
Does the plan mention environmental protection (air quality, noise mitigation, surface and stormwater quality)?
Does the plan identify natural hazards?
Does the plan identify man-made hazards?
Does the plan talk about ensuring equitable protection from said hazards?
Does the plan talk about the impact of climate change?
Does the plan contain a zoning plan?

The evaluation metrics themselves were selected from a wider array of metrics in Loh and Kim (2020); of which there were originally 84, and tailored down to the ones that could be applied to the topic of Hazard Mitigation. This was done by selecting evaluation metrics that included topics such as “Planning Process” or “Environment”, or “Hazards”, while leaving out metric topics such as “Food” or “Transportation” since those topics didn’t apply to this study. The resulting table was 27 metrics that were further edited to better fit the parameters of Hazard Mitigation Plan review. There are some points in this tool that directly ask about measurable equitable acts and whether they took place; these include:

- **“Does the plan mention efforts to engage with historically marginalized groups?”**
- **“Does the plan identify geographic areas/groups of residents that are underserved or have particular social needs?”**
- **“Does the plan identify geographic areas that are more prone to environmental hazards?”**

- **“Do the words equity/justice/fairness/equality appear anywhere in the plan?”**
- **“Does the plan talk about ensuring equitable protection from said hazards?”**

Other metrics that indirectly speak to a plan’s equity orientation include:

- **“Does the plan include a zoning plan?”** Plans that described how they worked externally within the jurisdiction’s network of existing plans were positively correlated with social equity in (Meerow, et al., 2019).
- **“Did a consultant(s) assist in writing this plan?”** It was found in Loh and Kim (2020) that communities with more planners on staff had stronger equity orientation, this point was created with the intent that communities that did not have the resources to acquire a full-time planner could still use a knowledgeable replacement.
- **“Inclusion of multiple opportunities for public input”** – Plans with a multipronged public participation approach have a stronger equity focus (Loh and Kim, 2020).
- **“Does the plan identify geographic areas that are underserved or have particular social needs?”** – Plans that acknowledge and address the specific local needs will produce a more localized and equitable plan that is tailored to the needs of said area.
- **“Does the plan talk about the impact of climate change”?** – Discussing climate change and the disproportionate impacts it has on the lower socioeconomic stratum and tailoring mitigation strategies to address these concerns will hopefully lessen the impact of these inequalities.

The remaining metrics addressed the Hazard Mitigation aspects of a plan, such as:

- **“Does the plan identify natural/man-made hazards”**
- **“Does the plan identify groups of residents who are more prone to environmental hazards?”**
- **“Does the plan identify geographic areas that are more prone to environmental hazards”?**

Scoring the plans:

Plans are given an overall score based on the 27 equity metrics as shown in Table 1. Besides overall equity score, categorical scores for *Plan Elements*, *Planning Process*, *Overall Equity Orientation*, and *Environment, Hazards, and Safety* are calculated. These are four of the original ten categories used to group equity metrics in Loh and Kim (2020). Having scores at a categorical level will provide a clearer picture as to what a plan is lacking in or exceeding in with regards to their equity orientation. Having the metrics established, one point was given for each metric a plan included. For example, a plan document that included a public survey as part of their participation process would receive a “1” in their overall score. Conversely, points were not subtracted for lack of elements, points were only added for inclusion of elements.

Criteria for selecting plans

Inland riverine communities are more likely to experience flood exposure inequalities than coastal communities (Qiang, 2019). Based on this finding, I conducted my analysis of Hazard Mitigation plans on communities that are prone to inland flooding. Because I want to examine the areas where this inequality is taking place, I selected “Hot Spot” and “Cold Spot” locations from the map (Figure 1) created by Qiang (2019) to evaluate equity scores and

compare between the two groups of communities. The last criteria for selecting jurisdictions to evaluate was the presence of a publicly available Hazard Mitigation plan, either at the city or county level. In cases where there was both a city and a county Hazard Mitigation Plan in place, I chose to evaluate the County-level plan since this is geographic level at which Qiang's study took place. For jurisdictions where a county-level plan was not available, I chose to evaluate the Hazard Mitigation Plan of the largest city in that county, since this is where the largest population center is located. I did not include a population threshold as a part of this process, as there was no previous literature on how to incorporate that kind of criteria into a study like this, and what analyses had been done had been on a national scale, irrespective of population. However, I did assume that having a variety of different population sizes would provide a good breadth of plans.

After examining the Hot Spot and Cold Spot locations on the map, I researched publicly available Hazard Mitigation Plans whose jurisdiction covered the Hot/Cold Spots. For example, Broome County, NY was listed as a "Hot Spot" (Qiang, 2019). I then looked to see if this county's major population center(s) was a riverine location away from coastlines (other counties like Curry County, NM or Eureka County, NV were listed as "Hot Spots" but did not have any significant population centers located along riverfronts). After the above criteria had been met, I then checked to see if the community had a publicly available Hazard Mitigation Plan. Terre Haute, IN, Coeur D'Alene, ID, and Pine Bluff, AR were all Hot/Cold Spots on the map (Qiang, 2019) and were all riverine communities. However, due to the lack of a publicly available hazard mitigation plan the evaluation of these communities could not move forward. Table 2 shows the final set of plans evaluated in this study.

Table 2: Final set of Hazard Mitigation Plans evaluated in this study.

City Name	Plan Title	Adoption Year	Hot/Cold Spot
Minneapolis, MN	Minneapolis Portion of State HMP	2019	Cold
Eugene, OR	Natural Hazards Mitigation Plan	2020	Cold
Peoria, IL	Peoria County MHM Plan	2018	Cold
Racine, WI	Ready Racine County	2022	Cold
Bismarck, ND	2020 MHM Plan	2020	Cold
Monroe, LA	Ouchita Parish HM Plan Update	2017	Cold
Cape Girardeau, MO	Cape Girardeau County MJHMP	2021	Cold
Kearney, NE	Central Platte NRD HMP	2017	Cold
Memphis, TN	Shelby County HMP	2016	Hot
Salt Lake City, UT	Salt Lake County HMP	2019	Hot
Provo, UT	Pre-Disaster Mitigation Plan	2022	Hot
Greeley, CO	Weld County MJ HMP	2021	Hot
Greenville, NC	Regional Hazard Mitigation Plan	2015	Hot
Kalamazoo, MI	Kalamazoo County HMP	2021	Hot
Twin Falls, ID	Twin Falls County HMP	2020	Hot
Binghamton, NY	Broome County HMP	2019	Hot
Hattiesburg, MS	Forrest County CEMP	2016	Hot

**This analysis was carried out in 2023 and in most cases will not align with the year the plan document adoption year.*

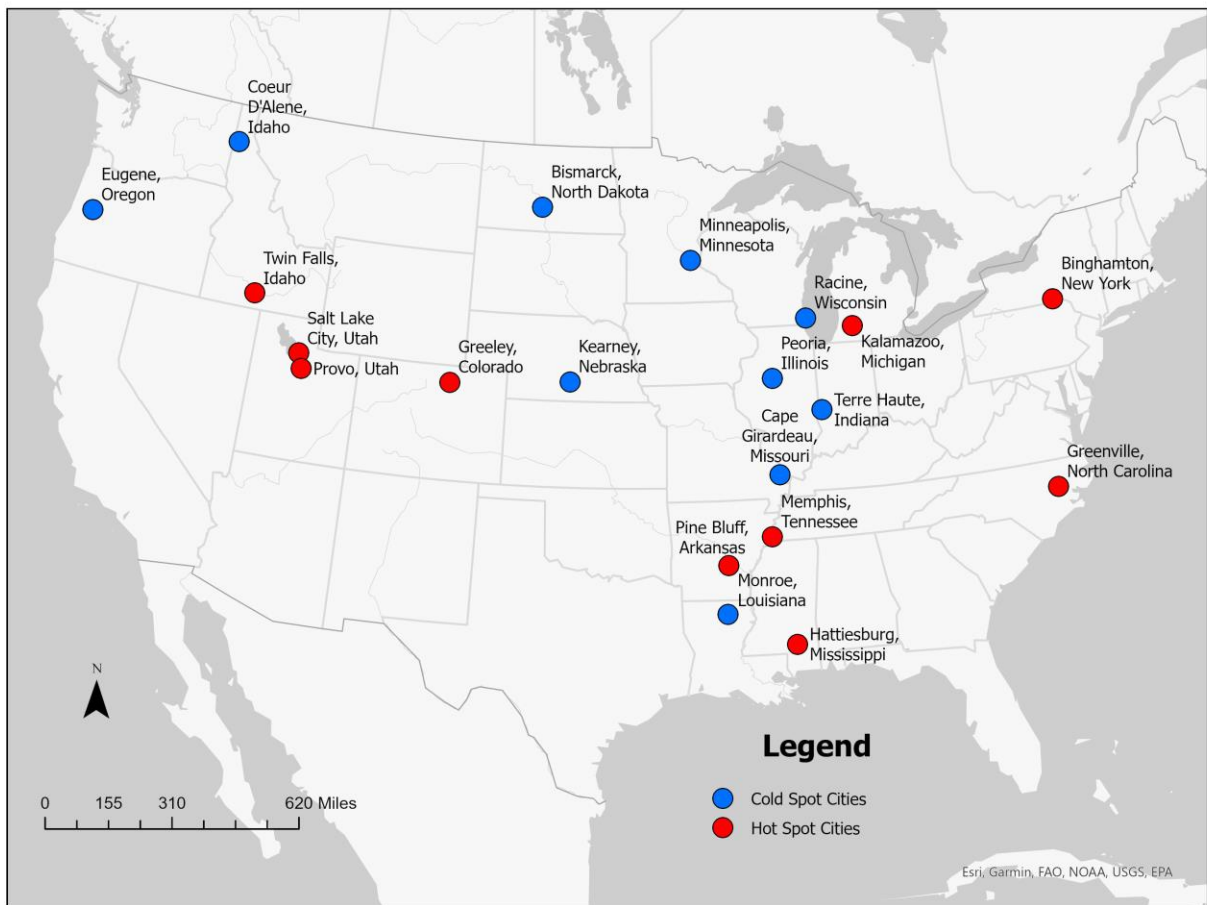


Figure 2: Map of plans evaluated.

Chapter 4: Study Findings

To understand the phenomena taking place in Hazard Planning with regards to Equity, I will be displaying the scores from the Equity Scorecard on both an aggregate level, as well as the broad categorical level to paint a clearer picture of why plans are being awarded or deducted points for addressing or not addressing equity concerns.

Table 3: Final Equity Scores

City Name	Score (out of 27)	Location in Hot/Cold Spot
Minneapolis, MN	18	Cold Spot
Eugene, OR	17	Cold Spot
Peoria, IL	13	Cold Spot
Racine, WI	13	Cold Spot
Bismarck, ND	15	Cold Spot
Monroe, LA	10	Cold Spot
Cape Girardeau, MO	13	Cold Spot
Kearney, NE	15	Cold Spot
Memphis, TN	7	Hot Spot
Salt Lake City, UT	7	Hot Spot
Provo, UT	12	Hot Spot
Greeley, CO	21	Hot Spot
Greenville, NC	9	Hot Spot
Kalamazoo, MI	13	Hot Spot
Twin Falls, ID	10	Hot Spot
Binghamton, NY	16	Hot Spot
Hattiesburg, MS	3	Hot Spot

Figure 3: Final Equity Scores for plans reviewed

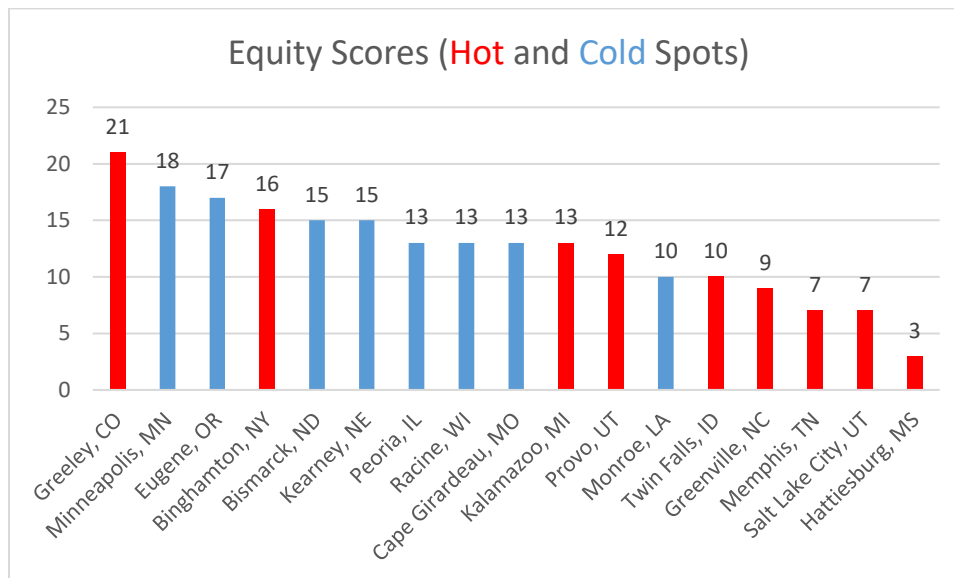


Table 4: Averages Equity Scores for plans in Hot and Cold Spot areas

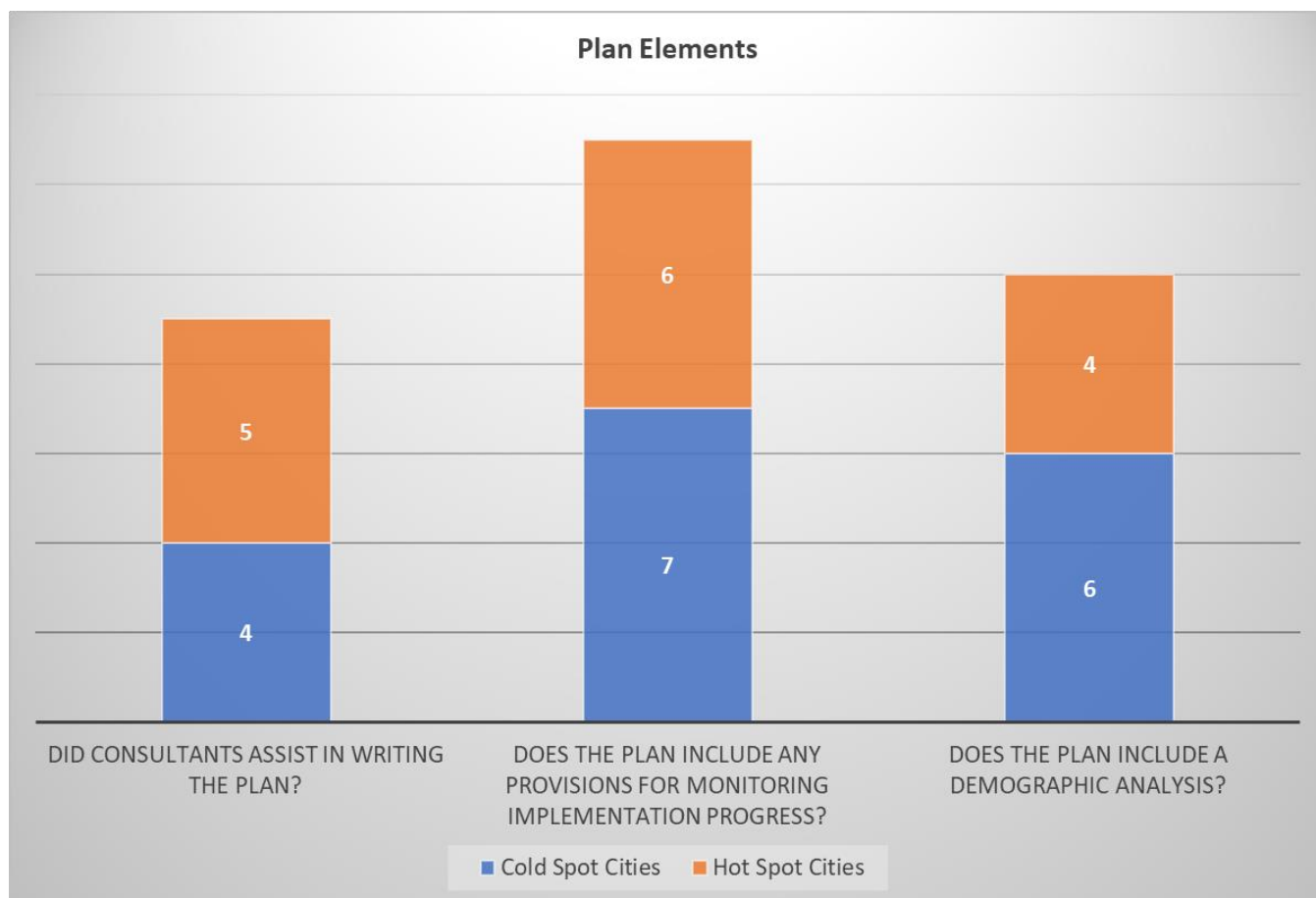
	Overall Score (out of 27)	Plan Elements (Out of 3)	Planning Process (Out of 11)	Equity Orientation (Out of 6)	Environment, Hazards, and Safety (Out of 7)
Cold Spots	14.25	2.125	4.25	3.25	4.25
Hot Spots	10.88	1.67	3.55	2.11	3.44

When compared to each other, Hazard Mitigation Plans from Cold Spot areas scored an average of about 4 more points in their overall score than their Hot Spot counterparts. However, we cannot infer that this will always be the case, as Greeley’s Hazard Mitigation plan was the highest overall score while still being a Hot Spot, indicating that we need to look at the disaggregated level scores for the study communities.

4.1 Plan Elements

Here’s what these scores look like when broken down by category:

Figure 4: Scores for *Plan Elements* category



For the *Plan Elements* category, we can see that there were more plans from Hot Spot areas that brought in a consultant to assist in the plan-writing process than Cold-Spot areas. Having more staff members during the creation of a planning document was positively correlated with greater equitable outcomes (Loh and Kim, 2021), so bringing in a consultant was also used as a metric in this study following the same logic of increasing staff counts. These hot-spot plans that brought in a consultant to assist in the plan-writing process scored about twice as high in the Overall Equity Orientation category on average than other hot-spot plans that did not utilize a consultant (as shown in Table 5). The same phenomena were observed in cold-spot areas, only on a smaller scale.

Table 5: Average Overall Equity Orientation Scores based on Consultant Use

	Used a consultant	Did not use a consultant
Hot Spot Cities	3/6	1.5/6
Cold Spot Cities	3/6	2.5/6

In almost all cases, aside from Peoria, Illinois (whose plan stated that citizens “voted not to participate in the planning process”), plans that utilized the help of consultants also had more public participation modes and conducted more outreach in their plan-making process; Kalamazoo, Michigan was the only plan that scored as high (scoring a 6 in this category) in the *Planning Process* category without the use of a consultant.

The majority of plans in both Hot and Cold spots had measures in place to monitor implementation progress of the plan actions, for example in Eugene, Oregon’s plan where it was stated that:

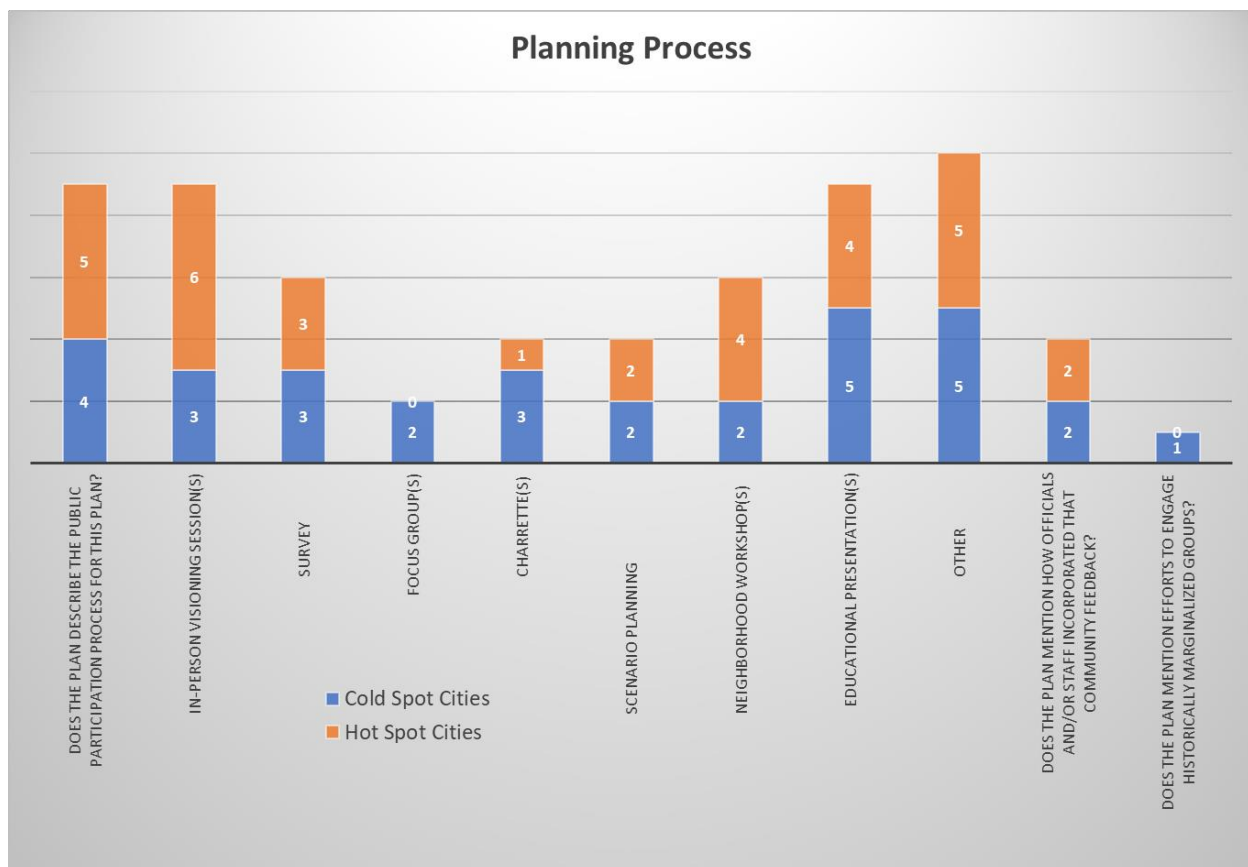
“Eugene and Springfield Emergency Management will jointly maintain a Project Team to oversee the implementation, by the Steering Committee, of the Eugene Springfield NHMP”.

This is most likely due to FEMA regulations stating that these measures need to be in place for a complete Hazard Mitigation plan. However, there were three Hot-Spot plans (Greenville, Kalamazoo, and Twin Falls) and one Cold-Spot (Kearney, NE) that did not clarify the monitoring the implementation progress of their plan; though those measures may exist, they were not written into the plan document.

4.2 Planning Process

First thing to discuss in the *Planning Process* category are the points for “describing the public participation process”; this means that the reasoning and the methods for public outreach were laid out in the plan rather than just a list of meetings and minutes that took place. With this in mind, there were nine total plans that presented the public outreach plan in this way (Figure 4).

Figure 5: Scores for the *Planning Process* Category



The most popular public outreach mode was the “other” option, which generally meant online posts relaying pertinent information. The most popular in-person option for public

outreach amongst these plans was an “educational presentation”, usually taking place at a local school or library. Most plans included a variety of outreach modes, however four plans (three hot-spots, one cold-spot) used one or fewer modes of public outreach.

One other finding to note- there was only one plan (Bismarck, ND’s) that made efforts to engage with historically marginalized populations. They did this by including a “Vulnerability Assessment” in every hazard discussion that identified those most at risk for each hazard event. Many of these populations overlapped (i.e., the elderly, disabled, or economically disadvantaged) but the reasons for their vulnerability were tailored and addressed with each hazard discussion.

One example of a point scored in this category would be from the Central Platte Natural Resource District’s Hazard Mitigation Plan:

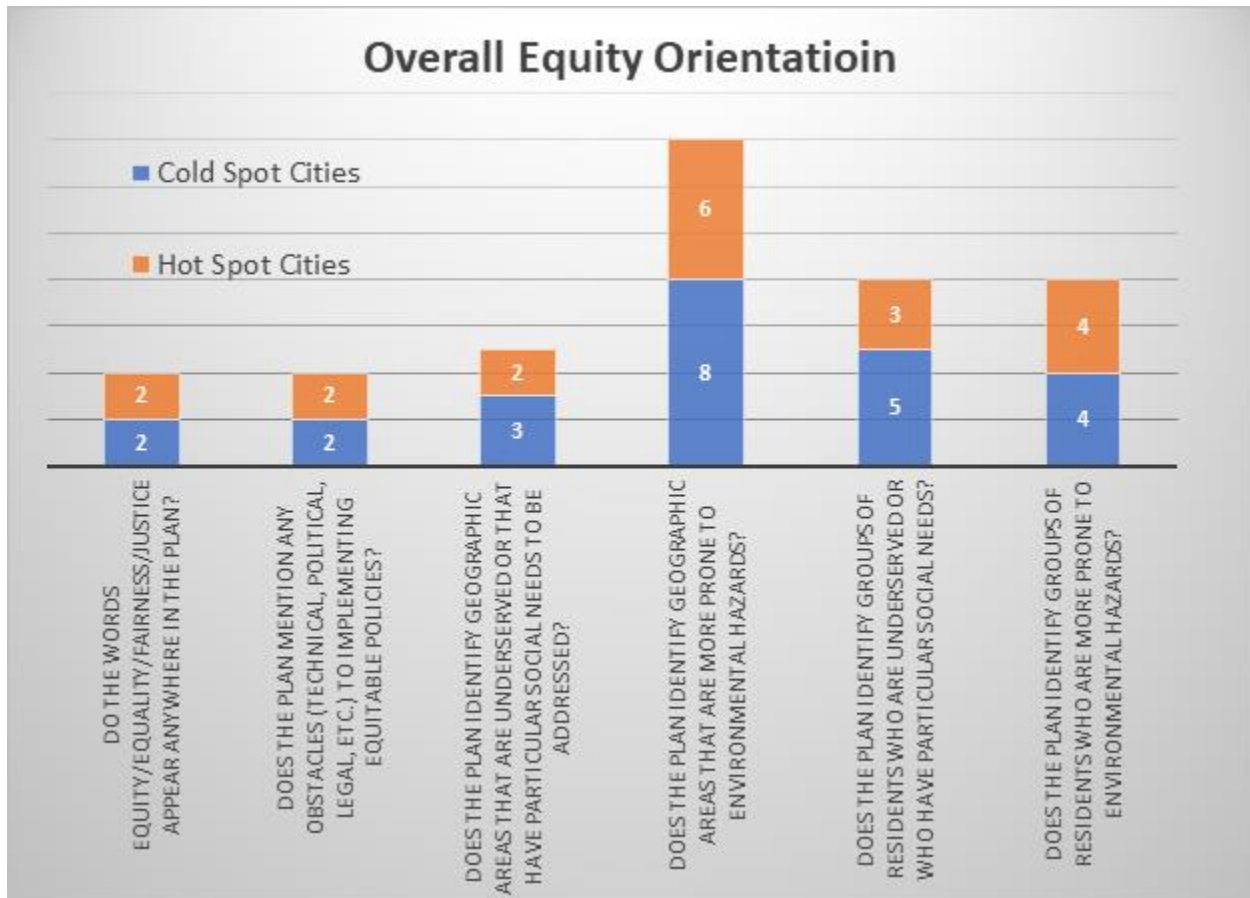
Once the draft of the HMP was completed, a public review period was opened to allow for participants and community members at large to review the plan and provide comments and changes, if any at that time. The public review period was open from March 15, 2017 through April 17, 2017. Participating jurisdictions were emailed and mailed a letter notifying them of this public review period. The HMP was also made available on the [consultant website] for download. Received comments and changes were incorporated into the plan.

- Central Platte Natural Resource District Hazard Mitigation Plan (2017)

This portion of the plan earned a point for “mentioning how staff incorporated community feedback into the plan. Some organizations may approach this differently than this plan did, for instance, holding public meetings before the plan is written and include the feedback in the first iteration; whereas the Central Platte HMP was already written once and then put on display for residents to comment on. Both of these ways would count as incorporating community feedback, only they took place at different stages of the planning process.

4.3 Overall Equity Orientation

Figure 6: Scores for Overall Equity Orientation category



The most frequent way these plans incorporated equity into their Hazard Mitigation practices was by identifying geographic areas that are most prone to environmental hazards, though this is common practice in Hazard Mitigation planning. While most plans identified these areas of concern, only half of the plans (4 hot-spot and 4 cold-spot) identified populations or groups of people that are more prone to these hazards. I think one reason for this is that this specific analysis of populations is not required in the FEMA outline for a “complete” hazard plan. Few plans (four in total) touched on the subject of equity, equality, or justice.

One example of a plan that scored a point in this category was Eugene, OR and their inclusion of equity discussion in their “Economic Analysis of Natural Hazard Mitigation

Projects” section of the plan. In this section, the authors posited questions to consider when writing and applying them to the approach of the plan. Some of these questions included:

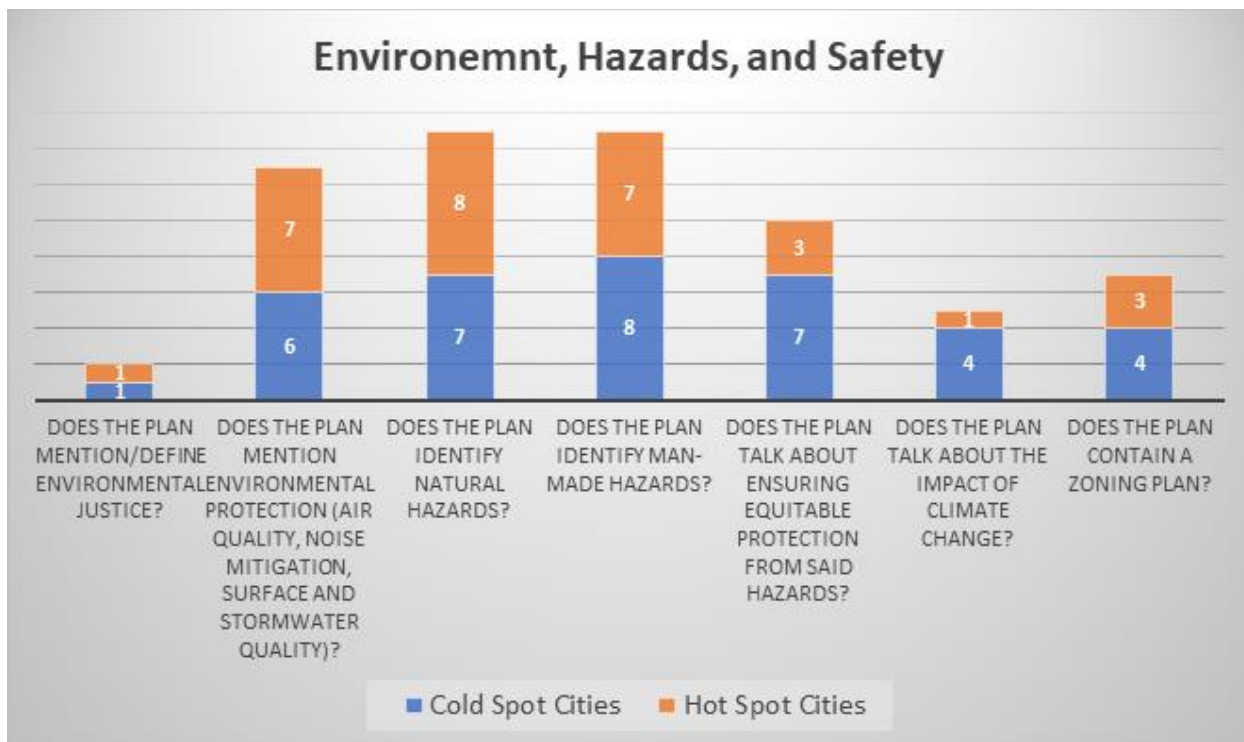
- *Is the proposed action socially acceptable to the community?*
- *Are there equity issues involved that would mean that one segment of the community is treated unfairly?*
- *Will the action cause social disruption?*

- Eugene-Springfield Area MJNHMP (2020)

The considerations made in this passage earned the plan a point for including the words “Equity/Equality/Fairness/Justice” as outlined in the scorecard.

4.4 Environment, Hazards, and Safety

Figure 7: Scores for *Environment, Hazards, and Safety* category



The key data point to look at in the *Environment, Hazards, and Safety* category is “Does the plan talk about ensuring equitable protection from said hazards”, which ten plans (7 cold-spot and 3 hot-spot) accomplished out of the group. Some examples of plans that accomplished this include Eugene, Oregon, and their use of material from Portland’s hazard planning process that included readings in equity in mitigation practices, or this excerpt from Greeley, CO’s public participation section:

“Social and economic factors have an effect on the safety of community members, decrease the ability of communities to recover from a disaster and inhibit the building of resilience against future disaster events. Because these factors create unequal conditions outside of disasters too, it is clear that planning with non-traditional community partners who understand everyday community experiences will be critical for planning inclusive emergency responses”.

-Weld County (CO) Multi-Jurisdictional Hazard Mitigation Plan, 2021

The recognition that this inequality in impact of environmental hazards exists was the first step in leading these ten jurisdictions to act in ensuring equitable protection against them.

What the Weld County plan has begun to reference here is how to incorporate thinking on environmental justice into practice and implementing change. Environmental justice is a fairly new concept as far as its application to hazard planning, as it was first coined in the late twentieth century in conversations surrounding pollutants in air and water in urban areas (MobilizeGreen, 2018). Clean drinking water, toxic waste dumping, and clean air were the catalysts for conversations about “environmental justice”, but their foundational concepts are also lessons that can (and should) be applied to hazard mitigation practices. Take this excerpt from the United States Department of Energy’s definition of “Environmental Justice”:

“Environmental justice is the fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and

enforcement of environmental laws, regulations, and policies. Fair treatment means that no population bears a disproportionate share of negative environmental consequences... ”

- (USDOE, 2021)

Recognizing that there are some populations (as evidenced in the Qiang study) that bear a heavier burden with regards to resiliency and recovery from environmental disasters, and acting on that recognition, is a key tenet in environmental justice that municipalities and jurisdictions creating hazard plans can put into action.

One other interesting finding in this category is that less than a quarter of all plans identified obstacles that could hamper the implementation of their hazard interventions. While it can be difficult to conceptualize possible obstacles before embarking on the implementation process, it is important to the future of the plan to account for any and everything possible.

Chapter 5: Conclusion

In summary, equity has been displayed to be an important tenet of planning, both in theory and in practice. It is referenced in mission statements, mottos, and action plans in organizations ranging from non-profit community organizations to local and state governments, all the way up to federal programs and office like the Community Development Block Grant and Department of Housing and Urban Development. Equity is approached and accomplished in varying ways across the country, but rarely do you find ways to quantify the equity element of a given planning document like the one used in this study. The equity evaluation tool created for this study to evaluate hazard mitigation plans is not a predictive tool to gauge the outcome of a plan's impact on the local community; rather it is an effective tool for planners and leaders to use while in the process of writing their hazard plans or to evaluate their past plans in preparation for writing up-to-date ones. It was believed that planners in these hot-spot areas would be more aware of the inequalities taking place in their own backyard and would make decisions based on that realization. However, after examining the Hazard Mitigation plans using the modified Equity Evaluation Tool, we saw that this was not the case and they frequently scored lower than their cold-spot counterparts. Moving forward, the hope is that planners and policymakers are able to use this tool to guide the writing and implementation processes of their Hazard Mitigation plans in their own communities.

Bibliography

- Berke, P., & Godschalk, D. (2009). Searching for the Good Plan: A Meta-Analysis of Plan Quality Studies. *Journal of Planning Literature*, 23(3), 227–240.
<https://doi.org/10.1177/0885412208327014>
- Berke, P., Newman, G., Lee, J., Combs, T., Kolosna, C., & Salvesen, D. (2015). Evaluation of Networks of Plans and Vulnerability to Hazards and Climate Change: A Resilience Scorecard. *Journal of the American Planning Association*, 81(4), 287–302.
<https://doi.org/10.1080/01944363.2015.1093954>
- “Code of Federal Regulations.” *Part 201 - Mitigation Planning*, National Archives, 26 Feb. 2002.
- Bunnell, G., & Jepson, E. J. (2011). The Effect of Mandated Planning on Plan Quality. *Journal of the American Planning Association*, 77(4), 338–353.
<https://doi.org/10.1080/01944363.2011.619951>
- Collins, M., & Senior, C. A. (2002). Projections of future climate change. *Weather*, 57(8), 283–287. <https://doi.org/10.1256/004316502320517371>
- Daniell, James. (2016) “Natural Disasters since 1900:” *ScienceDaily*,
<https://www.sciencedaily.com/releases/2016/04/160418092043.htm>.
- “Regulations and Guidance.” *FEMA.gov*, 2000
- Fowler, H. J., Wasko, C., & Prein, A. F. (2021). Intensification of short-duration rainfall extremes and implications for flood risk: Current state of the art and future directions. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 379(2195), 20190541. <https://doi.org/10.1098/rsta.2019.0541>
- Glavovic, B. C., & Smith, G. P. (Eds.). (2014). *Adapting to Climate Change: Lessons from Natural Hazards Planning*. Springer Netherlands. <https://doi.org/10.1007/978-94-017-8631-7>
- Kim, H., & Marcouiller, D. W. (2018). Mitigating flood risk and enhancing community resilience to natural disasters: Plan quality matters. *Environmental Hazards*, 17(5), 397–417.
<https://doi.org/10.1080/17477891.2017.1407743>
- Koks, E. E., Jongman, B., Husby, T. G., & Botzen, W. J. W. (2015). Combining hazard, exposure and social vulnerability to provide lessons for flood risk management. *Environmental Science & Policy*, 47, 42–52. <https://doi.org/10.1016/j.envsci.2014.10.013>
- Carolyn G. Loh & Rose Kim (2021) Are We Planning for Equity?, *Journal of the American Planning Association*, 87:2, 181-196, DOI: 10.1080/01944363.2020.1829498
- Lyles, W., Berke, P., & Smith, G. (2014). A comparison of local hazard mitigation plan quality in six states, USA. *Landscape and Urban Planning*, 122, 89–99.
<https://doi.org/10.1016/j.landurbplan.2013.11.010>
- Masozera, M., Bailey, M., & Kerchner, C. (2007). Distribution of impacts of natural disasters across income groups: A case study of New Orleans. *Ecological Economics*, 63(2), 299–306. <https://doi.org/10.1016/j.ecolecon.2006.06.013>
- MobilizeGreen. “Environmental Equity vs. Environmental Justice: What's the Difference?” MobilizeGreen, MobilizeGreen, 10 Feb. 2021,
<https://www.mobilizegreen.org/blog/2018/9/30/environmental-equity-vs-environmental-justice-whats-the-difference>.

- Norton, R. K. (2008). Using content analysis to evaluate local master plans and zoning codes. *Land Use Policy*, 25(3), 432–454. <https://doi.org/10.1016/j.landusepol.2007.10.006>
- Qiang, Y. (2019). Disparities of population exposed to flood hazards in the United States. *Journal of Environmental Management*, 232, 295–304. <https://doi.org/10.1016/j.jenvman.2018.11.039>
- Wang, J. (2012). Integrated model combined land-use planning and disaster management: The structure, context and contents. *Disaster Prevention and Management: An International Journal*, 21(1), 110–123. <https://doi.org/10.1108/09653561211202746>

Appendix A: Plans reviewed in this study

Minneapolis: <https://lims.minneapolismn.gov/Download/RCAV2/6312/Minneapolis-Mitigation-Portion.pdf>

Eugene: <https://www.eugene-or.gov/DocumentCenter/View/48415/Eugene-SpringfieldAreaMJNHMP2020?bidId=>

Peoria: <https://www.peoriacounty.gov/DocumentCenter/View/5870/Adopted-Hazard-Mitigation-Plan>

Racine: <https://www.sewrpc.org/SEWRPCFiles/Publications/CAPR/capr-266-racine-county-hazard-mitigation-plan-update-3rd-ed.pdf>

Bismarck: <https://www.bismarcknd.gov/DocumentCenter/View/22621/Bismarck-MHMP-2020-Public?bidId=>

Monroe: <https://hmplans.sdmi.lsu.edu/api/Parishes/377>

Cape Girardeau: <https://semorpc.org/wp-content/uploads/2022/09/2021-Cape-County-HMP-approved-2021-09-30.pdf>

Kearney: <https://cityofkearney.org/DocumentCenter/View/28112/2017-CPNRD-Hazard-Mitigation-Plan---City-of-Kearney-Chapter?bidId=>

Memphis:

https://www.staysafeshelby.us/sites/default/files/2016%20Hazard%20Mitigation%20Plan%20Final_0.pdf

Salt Lake City: https://slco.org/globalassets/1-site-files/planning--transportation/wasatch-canyons/22f580_1ab1800491bb4237b00b19043b39314e.pdf

Provo: <https://hazards.utah.gov/wp-content/uploads/2022-Pre-Disaster-Mitigation-Plan-for-Summit-Utah-and-Wasatch-Counties.pdf>

Greeley: <https://www.weld.gov/files/sharedassets/public/departments/office-of-emergency-management/documents/haz.-mitigation-plan/weld-hazard-mitigation-plan-2021.pdf>

Greenville: <https://www.pittcountync.gov/DocumentCenter/View/3228/2015-Regional-Hazard-Mitigation-Plan>

Kalamazoo:

https://www.kalcounty.com/em/pdf_files/Kalamazoo%20County%20Hazard%20Mitigation%20Plan%202022.pdf

Twin Falls: https://twinfallscounty.org/wp-content/uploads/Twin-Falls-Final-Multi-Jurisdiction-AHMP_2020_Entire-Combined.pdf

Binghamton: <https://www.gobroomecounty.com/planning/2019HMP>

Hattiesburg: <https://www.hattiesburgms.com/wp-content/uploads/Forrest-County-CEMP-Basic-Plan-2016-merged-compressed.pdf>

Appendix B: Summary Scores of all the plans reviewed

City Name	Score	<i>Plan Elements</i>	<i>Overall Equity Orientation</i>	<i>Planning Process</i>	<i>Environment, Hazards, and Safety</i>
Minneapolis, MN	18	2	6	5	6
Eugene, OR	17	2	5	6	4
Peoria, IL	13	3	5	1	4
Racine, WI	13	2	1	5	5
Bismarck, ND	15	2	1	5	6
Monroe, LA	10	2	1	4	3
Cape Girardeau, MO	13	2	4	4	3
Kearney, NE	15	2	3	4	6
Memphis, TN	7	1	2	1	3
Salt Lake City, UT	7	2	2	0	3
Provo, UT	12	2	2	4	4
Greeley, CO	21	3	6	7	5
Greenville, NC	9	2	1	4	3
Kalamazoo, MI	13	0	3	6	4
Twin Falls, ID	10	1	1	5	3
Binghamton, NY	16	3	2	7	4
Hattiesburg, MS	3	1	0	0	2

Appendix C: Scoretable for all Plans and all Metrics

Plan Element	Minneapolis, Eugene, OR	Peoria, IL	Racine, WI	Bismarck, MN	Cape Gir., MO	Keamey, CO	Hot Spot totals	Memphis, SL, UT	Provo, UT	Greely, CO	Greenville	Kalamazoo	Twin Falls, ID	Brighton	Hattiesburg, MS	Hot Spot totals
Did consultants assist in writing the plan?	1		1				1	4								5
Does the plan include any provisions for monitoring implementation progress?	1	1	1	1	1	1	1	7	1	1	1	1			1	6
Does the plan include a demographic analysis?	1	1	1	1	1	1	1	7		1		1			1	4
Overall equity orientation																
Do the words equity/equality/fairness/justice appear anywhere in the plan?	1	1						2								2
Does the plan mention any obstacles (technical, political, legal, etc.) to implementing equitable policies?		1	1					2		1					1	2
Does the plan identify geographic areas that are underserved or that have particular social needs to be addressed?	1		1				1	3		1						2
Does the plan identify geographic areas that are more prone to environmental hazards?	1	1	1	1	1	1	1	8	1	1	1	1	1	1	1	6
Does the plan identify groups of residents who are underserved or who have particular social needs?	1	1	1	1	1	1	1	5		1	1	1	1			3
Does the plan identify groups of residents who are more prone to environmental hazards?		1	1				1	4	1	1			1			4
Planning Process																
Does the plan describe the public participation process for this plan?		1	1	1	1	1	1	6		1	1	1	1	1	1	6
Did the plan include:								0		1						1
In-person visioning session(s)?		1							2	1		1	1	1	1	6
Survey?		1	1		1		1	4			1		1	1	1	3
Focus group(s)						1	1	2								
Charrette(s)?		1	1		1		1	3					1			1
Scenario planning?					1			2				1			1	2
Neighborhood workshops?					1		1	2								4
Educational presentation(s)		1	1		1		1	5		1	1	1	1	1	1	4
Other?		1	1		1		1	5		1	1		1	1	1	5
Does the plan mention how officials and/or staff incorporated that community feedback?			1				1	2			1				1	2
Does the plan mention efforts to engage historically marginalized groups?					1			1								
Environment, hazards, and safety																
Does the plan mention/define environmental justice?		1						1								1
Does the plan mention environmental protection (air quality, noise mitigation, surface and stormwater quality)?		1	1		1		1	6	1	1	1	1	1	1	1	7
Does the plan identify natural hazards?		1		1			1	5	1	1	1	1	1	1	1	8
Does the plan identify man-made hazards?		1	1	1	1	1	1	8	1	1	1	1	1	1	1	7
Does the plan talk about ensuring equitable protection from solid hazards?		1	1	1	1	1	1	7		1	1		1			3
Does the plan talk about the impact of climate change?		1		1		1	1	4							1	1
Does the plan contain a zoning plan?			1		1	1	1	4			1		1		1	3
	18	17	13	12	13	10	13	15								