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Leading with Local Knowledge: Climate Adaptation, Local Knowledge, and Participation in Austin, Texas' Network of Plans and the Co-Designed Climate Navigators' Tool and Process

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Abstract
Planning theory scholars and practitioners have identified the need to include residents most affected by climate change in the development of climate adaptation planning, for reasons of justice and effectiveness. This article investigates whether Austin, Texas' network of plans includes participation by residents and incorporation of local knowledge into climate adaptation. This research finds that these plans contain limited material about participation, engagement, equity, and local knowledge. In response to this gap, the article presents a case study of the Dove Springs Climate Navigators, a residents-nongovernmental organization-municipal-university collaboration working to co-create an online portal, training system, and process to incorporate local knowledge into adaptation planning.

Keywords
climate adaptation, community-based climate planning, community-based participatory research, local knowledge, participation

Resumen
Los académicos y profesionales de la teoría de la planificación han identificado la necesidad de incluir a los residentes más afectados por el cambio climático en el desarrollo de la planificación de la adaptación climática, por razones de equidad y eficacia. Este artículo investiga si la red de planes de Austin, Texas, incluye la participación de los residentes y la incorporación del conocimiento local en la adaptación climática. Esta investigación encuentra que estos planes contienen material limitado sobre participación, compromiso, equidad y conocimiento local. En respuesta a esta brecha, el artículo presenta un estudio de caso de los navegadores climáticos de Dove Springs, una colaboración de residentes, ONG, municipio y universidad que trabaja para crear conjuntamente un portal en línea, un sistema de capacitación y un proceso para incorporar el conocimiento local en la planificación de la adaptación.Liderar con conocimiento local: adaptación climática, conocimiento local y participación en la red de planes de Austin, Texas, herramienta y el proceso codiseñados de navegadores climáticos

Palabras clave
Adaptación climática, planificación climática comunitaria, investigación participativa comunitaria, conocimiento local, participación

摘要
规划的理论学者和实践者已经确定出于公正和有效性的原因，需要将受气候变化影响最大的居民纳入气候适应规划的制定。 本文调查了德克萨斯州奥斯汀的规划网络是否包括居民的参与，以及是否将本地知识纳入气候适应。本研究发现，这些规划包含的有关参与、投入、公平和本地知识的材料有限。 针对这一差距，本文介绍了 Dove Springs Climate Navigators 的案例研究，这是一个居民—非政府组织—市政—大学的多方合作项目，主要致力于共同创建在线门户、培训系统和流程，以将当地知识纳入适应规划。以本地知识为主导：气候适应、本地知识和参与德克萨斯州奥斯汀的规划网络以及共同设计的气候导向工具和流程

关键词
气候适应, 基于社区的气候规划, 基于社区的参与性研究, 本地知识, 参与

Introduction

Local communities experience firsthand the impacts of climate events, such as flooding, extreme heat, and wildfire. Marginalized and oppressed populations see these effects magnified by chronic stressors such as poverty and poor health (Dow, Kasperson, and Bohn 2006; Klinsky and Mavrogianni 2020; Marino and Ribot 2012). At the same time, residents on the frontline of climate events often have critical knowledge about the characteristics of these challenges, the harms they cause, and potential solutions. This valuable local knowledge can be difficult to integrate into climate planning and decision-making (Corburn 2009; Haverkamp 2017). In response, local agencies, nonprofit organizations, researchers, and communities have identified the urgent need to better link everyday knowledge about people's experiences of climate events to adaptation planning (Lieberknecht 2022; Meyer et al. 2018).

This research asks: to what degree does the City of Austin's network of plans include participation by residents (including those disproportionately affected by climate change), as well as incorporation of local knowledge[1]? The article first reviews literature focused on climate adaptation planning and equity, community engagement, participation, and local knowledge. It then uses plan evaluation criteria to review seven plans identified by the City of Austin as relating to climate adaptation: the Imagine Austin Comprehensive Plan; the Resilience Action Plan for City Assets and Operations; the City of Austin Hazard Mitigation Plan; Austin Water Utility's Water Forward Plan; Austin/Travis County Community Wildfire Protection Plan; the City of Austin Urban Forest Plan; and the City of Austin Climate Equity Plan. It finds that Austin's plans include very little focus on adaptation's relationship to participation, engagement, equity, and local knowledge. For the most part, the plans frame engagement around information sharing, rather than information receiving: most plans describe a "one-way street" for knowledge transfer, with few goals or processes focused on gathering and incorporating local knowledge into adaptation planning. As a result, Austin's adaptation planning experiences a gap in the way the city pursues equitable climate adaptation. This gap can be addressed in part by creating systems and tools to more successfully integrate residents' participation in and contributions toward adaptation planning. To illustrate an example of such a tool and process, the article then presents a case study of the Dove Springs Climate Navigators, a collaboration among neighborhood residents, the Go Austin! Vamos Austin! (GAVA) community-based organization, the City of Austin, and university researchers to co-create an online portal, training system, and planning process to incorporate residents' knowledge into adaptation planning.

This article contributes to the growing knowledge base about equitable climate adaptation by providing an evaluation of a municipality's climate adaptation elements contained within its plans. It focuses on the degree that municipal adaptation planning incorporates participation, engagement, equity, and local knowledge—all identified as key aspects of equitable climate adaptation in the planning literature. The Dove Springs Climate Navigators project presented here provides an important case study of how planners and residents can co-produce "innovative governance structures and decision-making tools" (Berke and Stevens 2016, 287) to increase inclusion of local knowledge in adaptation planning, addressing in part Meyer et al.'s (2018) call for adaptation planning systems to incorporate residents' knowledge.

Literature Review

Equitable Climate Adaptation Planning

People who contribute the least to climate change conversely suffer the most harm from it (Dow, Kasperson, and Bohn 2006; Klinsky and Mavrogianni 2020; Van Zandt et al. 2012). In addition, climate adaptation—planning and actions focused on reducing harm already occurring from climate crisis—can also deepen climate injustice (Anguelovski, Connolly, and Brand 2018; Barnett and O'Neill 2010; Marino and Ribot 2012). In response, scholars maintain that equitable climate adaptation planning must center participation from and leadership by communities most impacted by climate crisis. Adaptation that "respond[s] to local needs and aspirations" can in part ensure that policies and actions do not create further inequity (Marino and Ribot 2012, 323). In particular, participation, inclusive representation in decision-making, and knowledge co-production can mitigate inequity (Berke and Stevens 2016; Eakin et al. 2021; Yarina, Mazereeuw, and Ovalles 2019).

Shi (2021) argues that inadequate participation limits climate adaptation, since underserved, under-resourced, and marginalized people have specific climate adaptation requirements that need to be identified and prioritized via residents' participation. However, participation alone may not promote equitable adaptation if planning processes neglect to address environmental justice (Shi et al. 2016). In particular, planners and activists working toward equitable adaptation should seek to more strongly tie procedural justice, including participation of frontline communities in

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climate solutions, to distributive justice (Shi 2021). Eakin et al. also emphasize procedural justice ("the capacity to participate in the decision process") and distributive justice, that is, the need for frontline communities to "have the resources and capacities to implement strategies" (Eakin et al. 2021, 3). Climate adaptation also relates to recognitional justice: respect for identities, cultures, and lived experience (Fraser and Honneth 2003; Klinsky and Mavrogianni 2020; Martin et al. 2016).

Community Engagement, Participation, and Use of Local Knowledge in Climate Adaptation Planning

Scholars have long emphasized the importance of, and challenges associated with, public engagement and participation in planning and policymaking (Arnstein 1969; Forester 1988; Innes 1995; Lyles and Swearingen White 2019; Slotterback and Lauria 2019). Innes and Booher (2004) recount the purposes of participation in planning, including sharing preferences of the public with decision makers, incorporating local knowledge into policymaking, increasing justice through inclusion, and building support for public decision-making. In particular, participation may create conditions in which wicked problems (Rittel and Webber 1973), such as climate adaptation, can be addressed.

Residents' participation in adaptation planning increases their understanding and awareness of environmental risks as well as their capacity to work toward equitable climate adaptation (Brody et al. 2008; Meyer et al. 2018; Wachinger et al. 2013). Benefits from participation include development of trust and feelings of responsibility, capacity, and agency (Sheppard et al. 2011). Wachinger et al. reviewed literature on risk perception of hazards and concluded that

> . . . public participation measures are probably the most effective means to create awareness of potential disasters, to enhance trust in public authorities, and to encourage citizens to take more personal responsibility for protection and disaster preparedness. (Wachinger et al. 2013, 1063)

As a result, participation can benefit climate adaptation by both increasing procedural justice and generating a suite of positive outcomes stemming from participation itself.

Residents' information contributes toward effective policy decisions (Fischer 1993, 2000; Innes and Booher 2004), including increasing knowledge for professionals and improving overall plan quality (Crewe 2001; Van Herzele 2004). However, planners and aligned professionals often privilege experts' knowledge and participation over that of communities. In particular, climate adaption planning frequently does not include community engagement (Archer et al. 2014; Hurlimann et al. 2014; Meyer et al. 2018), and frontline communities often have scarce opportunity to participate in climate adaptation planning (Shi et al. 2016; Van Zandt et al. 2012).

Meyer et al. (2018) attributes this to "a lack of appreciation for community expertise in built environment adaptations and educational tools to support resident involvement in the often technical built environment planning processes" (p. 404). They identify the critical challenge of missing, incomplete, or inaccessible data about the built environment and climate adaptation, matched by the unrealized opportunity of local knowledge about climate events and impact held by residents:

> [. . .] residents have local knowledge about problematic areas in their neighborhoods, such as areas impassable after a heavy rain, but lack the capacity or forum to turn that knowledge into useable data. No such systems to incorporate resident knowledge are currently widely available to planners. (Meyer et al. 2018, 404)

Residents' awareness of neighborhood challenges can provide researchers with critical information throughout the adaptation planning process (Sansom et al. 2016). These empirical data corroborate participatory planning theory, which argues that residents' local knowledge improves plans by including residents' values, information, and experiences in planning strategies (Forester 1999; Innes 1998). Planning scholars have described the usefulness of local knowledge for climate adaptation broadly, including specific related concerns such as urban heat island effect, extreme heat events, hazards, and land use planning (Berke and Stevens 2016; Corburn 2009; Lieberknecht 2022; Peters-Guarin et al. 2012). Inclusion of local knowledge into climate adaptation planning draws on hazards planning scholarship, which argues that local knowledge complements technical and professional planning knowledge (Berke and Stevens 2016; Brody et al. 2003). Integration of local knowledge into climate adaptation planning also has been found to improve outcomes (Bassett and Shandas 2010; Haverkamp 2017). In addition, local knowledge—particularly residents' perceptions of the environment and climate risk— may more powerfully shift climate-related behavior than information shared through education or outreach (Egan and Mullin 2014; Meyer et al. 2018; Yeh 2016; Zaval et al. 2014).

Network of Plans

A *network of plans* is the "collection of plans in a city that guide future land use and development patterns" (Berke et al. 2019, 901), often including a comprehensive plan along with special area or focus plans (Kim and Rowe 2013; Malecha, Brand, and Berke 2018). These documents sometimes complement but also may counteract, necessitating evaluation and coordination of the network (Berke et al. 2016, 2019). Consistency of goals and strategies presents a major

challenge to both plan evaluation and outcome success and remains largely unexplored by scholars (Berke et al. 2019).

This article seeks to examine Austin's network of plans. Austin does not yet have a climate adaptation plan to evaluate, but the area's network of plans may provide important climate adaptation value, similar to the role that local plans play in hazard mitigation (Berke et al., 2015). However, this study does not attempt to evaluate the integration of these plans; rather, it treats the network of plans as a structure within which to better understand the City of Austin's existing adaptation planning, and specifically, how these plans relate to community engagement, public participation, equity, and local knowledge. This evaluation is important given the rapid growth, inequality, and climate risk of the Austin area.

Austin, Texas

The Austin-Round Rock-San Marcos metropolitan area (2.3 million residents) is the fastest growing large U.S. metro (U.S. Census Bureau 2021). Austin's diverse population is also one of the nation's most economically segregated, and the city has experienced the fastest rate of black outmigration of any rapidly growing U.S. city (Florida and Mellander 2015; Tang and Falola 2016). Increasing gentrification and displacement intensify infrastructure inequity, which has existed since at least the *de facto* segregation codified by Austin's 1928 city plan (Koch and Fowler 1928).

Austin is located in "Flash Flood Alley," recognized for extreme seasonal flooding (Saharia et al. 2017). Floods continue to intensify in frequency and size, due in part to expansion of impervious cover (Guerra and Debbage 2021). In addition, scientists project that the climate crisis is amplifying Austin's "feast or famine" weather patterns, resulting in increased rain events bookended by more severe and frequent droughts, higher temperatures, and growing risk of wildfire (Hayhoe 2014). As such, Austin combines diversity, growth, and vibrancy with inequality, segregation, displacement, and extreme weather. While every community needs climate adaptation planning, Austin's characteristics highlight the urgency of this work, as well as potential challenges of incorporating participation and local knowledge into planning.

Method

This article uses content analysis (Neuendorf 2017) to review and analyze Austin's network of plans to investigate the role of participation, community engagement, equity, and local knowledge. Planning scholarship and practice have a rich history of plan evaluation based on content analysis (e.g., Berke and Godschalk 2009; Berke et al. 2006, 2015; Bunnell and Jepson 2011; Godschalk and Rouse 2015; Woodruff and Stults 2016). This study uses the general framework of plan evaluation—development of a set of criteria and then systematic evaluation of a group of plans to determine whether they meet these criteria (Lyles and Stevens 2014)—but does not use a plan evaluation method developed by an earlier study, given that none of the reviewed methodologies fully matched this study's purpose and structure. An overview of this study's criteria and systematic evaluation is presented below.

The City of Austin Office of Sustainability has identified several plans as relating to climate adaptation (City of Austin, n.d.), listed and described in Table 1.

As noted earlier, Berke et al. (2019) identify the need to more closely examine interactions among planning documents within a network of plans. This study focuses on the content from the individual plans but does not explicitly address how this group of plans functions synergistically or counterproductively. Future research using interviews or surveys to discover how these documents work together (or against each other) would accelerate understanding of the complex ecosystem of climate-adaptation-related plans in Austin and in other municipalities.

Each plan was read independently by two different readers, in line with best practices for content analysis (Krippendorff 2018; Stevens et al. 2014). Readers excerpted sections that relate to climate adaptation and public participation, community engagement, equity, and local knowledge. To increase content validity, both readers also examined plan documents using search functions to identify terms developed from the literature review (Supplemental Appendix, Table 1). Excerpts related to adaptation were grouped and summarized to create an overview of climate adaptation policies and actions. Next, any information related to participation, community engagement, equity, and local knowledge was linked with each adaptation excerpt.

A quantitative scale was not developed since the purpose of the study is not to compare the plans to each other or to another municipality's plans, but rather to use qualitative content analysis to explore the extent to which Austin's plans incorporate information about climate adaptation as it relates to participation, community engagement, equity, and local knowledge (Prasad 2019). This qualitative description of each plan was developed based on the evaluation criteria (Table 2). This methodology allows for replication because descriptions are based on set and publicly available criteria. However, since this study did not assign quantitative scores to the plans' content, it was not possible to evaluate intercoder reliability scores using a Krippendorff alpha or a percentage of agreement calculation (Krippendorff 2018; Yu, Brand, and Berke 2020), which can be used to increase reliability of quantitative content analysis.

The "Findings" section describes adaptation actions included in the plans and then examines residents' participation, community engagement with residents, and the role of local knowledge in the plans. Plans are presented in chronological order. For most plans, the excerpts are presented in

Table 1. Plans Reviewed, Date of Adoption, and Overview.

Plan	Date of adoption	Plan overview and length in pages
Imagine Austin Comprehensive Plan	2012 (amended 2013–2018)	Focused on land use and transportation, housing and neighborhoods, economy, conservation and environment, city facilities and services, society, and creativity (348 pages)
Austin/Travis County Community Wildfire Protection Plan	2014	"cohesive strategy for dealing with three key wildland fire issues: restoring and maintaining landscapes, creating fire-adapted communities, and risk-based management response to wildfires" (p. 1) (685 pages)
City of Austin Urban Forest Plan	2014	"comprehensive plan for management of trees and other vegetation located on Austin public property" (p. iii) (123 pages)
City of Austin Hazard Mitigation Plan	2016	Update of the 2004 hazard mitigation plan approved by Federal Emergency Management Agency (331 pages)
Austin Water Utility's Water Forward Plan	2018	"long term integrated water resources plan for the next 100 years" (p. 1) (494 pages)
Climate Resilience Action Plan for City Assets & Operations	2018	"provides an overview of climate projections for Austin, an assessment of potential extreme weather impacts to City-owned assets and operations, and strategies to mitigate those impacts" (p. 2) (66 pages)
City of Austin Climate Equity Plan	2020	Sets goals for sustainable buildings, transportation and land use, transportation electrification, food and product consumption, and natural systems to equitably reach net-zero community-wide greenhouse gas emissions by 2040 (162 pages)

the "Findings". Austin's comprehensive plan had a larger number of excerpts; a summary is provided in the "Findings" section, but the excerpts in their entirety are provided in Supplemental Appendix Table 2. In three cases, Reader 1 identified climate-adaptation-related material that Reader 2 did not make note of; the list of excerpts presented in the "Findings" section and Supplemental Appendix Table 2 reflects the complete list of excerpts identified by the two readers in combination. The "Findings" section concludes with a case study of a community-based participatory approach to co-designing a tool and planning process to better incorporate local knowledge into Austin's adaptation planning. Interviews, participant observation, and document review were used to develop this case study.

Findings

Table 3 summarizes climate adaptation and participation, engagement, equity, and local knowledge elements in the seven plans evaluated. In addition, highlights from each plan are presented below.

Imagine Austin Comprehensive Plan (2012)

Imagine Austin begins by listing guiding principles, including one that relates to adaptation (italics added for emphasis):

> As a city, we need to respect our natural constraints, mitigate and *adapt to climate change*, and conserve water, energy, land, and other natural resources. (p. 11)

However, adaptation planning receives scant attention throughout the 343-page document. Imagine Austin Comprehensive Plan is the oldest plan analyzed for this study, with a publication date of 2012. Given planners' increasing recognition of climate adaptation and equity, it is likely that updated plans will have more material focused on both climate adaptation and equity. Despite this limitation, it is still informative to examine how Austin's existing comprehensive plan approaches adaptation, equity, and participation, given that this plan has only been updated every several decades in the past and continues to serve as a guiding document for a fast-growing municipality (Gregor 2010).

Overall, the plan identifies the need for adaptation planning in regard to economic competitiveness (p. 142) and overall "resiliency" (p. 159). The plan also includes a few policies and actions related to adaptation. Two specific policies (of 187 total) specifically refer to adaptation:

> CFS P5 (City Facilities and Services Policies). *Plan for and adapt to increased drought, severe weather, and other potential impacts of climate change* on the water supply. (p. 16)
>
> CE P9 (Conservation and Environment Policies). Reduce the carbon footprint of the city and its residents by implementing Austin's Climate Protection Plan and *developing strategies to adapt to the projected impacts of climate change.* (p. 152)

Seven additional policies relate to adaptation but do not specifically reference the term "adaptation" (Supplemental Appendix, Table 2). Of these nine total policies in the plan that directly or indirectly refer to adaptation, none addresses

Table 2. Evaluation Criteria (Based in Part on Godschalk and Rouse 2015).

	Participation	Engagement	Local knowledge	Additional equity criteria
	Does the plan refer to public participation in the planning process?	Does the plan refer to other types of engagement with the public (e.g., communication about the plan or planning process, gathering of residents' opinions or knowledge, etc.)?	Does the plan refer to processes to obtain information (i.e., local knowledge) held by residents?	Does the plan refer to disproportionate impacts on marginalized populations by climate change, etc.?
	If yes, what participation processes does the plan include, and in what stages of the process?	If yes, what engagement processes does the plan include, and in what stages of the process?	If yes, what information sharing processes does the plan include, and in what stages of the process?	Does the plan include processes to include marginalized populations?
				If yes, how likely will these processes lead to inclusion?
Equity	If yes, does the plan seek diverse participation?		If yes, does the plan seek diverse participation in the sharing of information, etc.?	
Equity	If yes, does the plan provide information about tools and strategies used to ensure diverse participation?	If yes, does the plan provide information about tools and strategies used to ensure engagement with diverse populations?	If yes, does the plan provide information about tools and strategies to ensure diverse participation in the sharing of local knowledge, etc.?	
Equity	If yes, how likely will these tools and strategies lead to diverse participation?	If yes, how likely will these tools and strategies lead to engagement with diverse populations?	If yes, how likely will these tools and strategies lead to diverse participation in information sharing?	
Equity	Does the plan track demographic information about participants?	Does the plan track demographic information about populations involved in engagement activities?	Does the plan track demographic information about populations involved in information sharing?	
Equity	If yes, does the plan share demographic information about the participants?	If yes, does the plan share demographic information about populations involved in engagement activities?	If yes, does the plan share demographic information about populations involved in information sharing?	
Equity	If yes, how does it compare to the City of Austin's population as a whole?	If yes, how does it compare to the City of Austin's population as a whole?	If yes, how does it compare to the City of Austin's population as a whole?	

participation, community engagement, equity, or disparate impacts on populations.

Similarly, of the 17 actions (of 231 total) that relate to adaptation (Supplemental Appendix, Table 3), none mentions participation, community engagement, equity, or disparate impacts on populations. In addition, no broader policy or action in the plan mentions these elements. The plan does detail 18,000+ pieces of public input from meetings, surveys, and other events, but it does not document any efforts to ensure that participation was equitable or that input was incorporated into the plan.

Austin/Travis County Community Wildfire Protection Plan (2014)

In 2014, the City of Austin adopted the Austin/Travis County Community Wildfire Protection Plan to "expand the number of fire-adapted communities and the area of fire-resilient landscapes within the city and county in support of public safety and healthy ecosystems" (p. 10). The plan included engagement to "gather input on community concerns and values" (p. 12). Residents were informed of meetings through city and county websites, media, and email invitations to "several hundred individuals representing local government, homeowners' associations, neighborhood groups, civic organizations, fire departments, professional organizations, and environmental groups" (p. 13). The plan reports no effort to recruit diverse populations, besides holding meetings in five different geographic areas. All meetings were held in the evening, no child care was offered, and no demographic data were collected at the meetings.

An online survey received an additional 125 responses from people who did not attend public meetings, but did not collect demographic data. Both the meetings and survey focused on two areas of input: residents' major concerns related to wildfire and community values at risk due to wildfire. However, the plan's engagement goals appear to be more focused on information sharing and education than information gathering or receiving.

Table 3. Summary of Climate Adaptation and Participation, Engagement, Equity, and Local Knowledge Elements in the City of Austin's Network of Plans.

Plan	Climate adaptation elements	Participation, engagement, equity, and local knowledge elements
Imagine Austin Comprehensive Plan (2012)	7/187 policies and17/231 actions relate to adaptation	Not mentioned within any policy or action; no broader policy or action included participation, community engagement, equity, and inclusion of local knowledge. Planning process included 18,000+ pieces of public input; does not describe how input was incorporated into the plan or efforts to ensure equitable participation
Austin/Travis County Community Wildfire Protection Plan (2014)	Plan focuses on wildfire preparation, response, and recovery	Included public engagement to "gather input on community concerns & values" used to customize the plan (p. 12). Held meetings in five different geographic areas; no other effort to recruit diverse populations. Plan's engagement goals focus on information sharing/education but not information gathering/receiving
City of Austin Urban Forest Plan (2014)	Plan includes adaptation efforts such as expansion of tree canopy cover; "citizen goals" include adaptation	Included a "public engagement & education process" which included public meetings and online surveys; used info to develop "citizen goals"; not clear how these goals incorporated (p. 10)
City of Austin Hazard Mitigation Plan (2016)	Plan focuses on hazard and disaster preparation, response, and recovery	Planning process involved public meetings, online survey, and sharing draft plan for comment. No information about participation from diverse residents; did not collect demographic information. Expresses commitment to participation to increase outreach, education, and inclusion of local knowledge, but planning process did not seek input into the plan from residents
Austin Water Utility's Water Forward Plan (2018)	Develops a set of water portfolios that provide different options for future water use, in part to adapt to climate change	Used public input to develop the plan. Used meeting, survey structure, and recruitment to include underrepresented groups. Participation still skewed toward wealthier, white, and older residents
Climate Resilience Action Plan for City Assets & Operations (2018)	Plan focuses on climate adaptation related to City-owned assets and operations	Acknowledges disproportionate harm caused by climate change. Recommends development of resources to connect City services to frontline communities
City of Austin Climate Equity Plan (2020)	Plan primarily focuses on mitigation; has adaptation-related goals of equitable tree canopy expansion	Developed the Climate Ambassador Program, an innovative strategy to increase diversity/equity of participation. Plan includes equitable tree canopy expansion

City of Austin Urban Forest Plan (2014)

The Urban Forest Plan includes minimal material that addresses adaptation and participation and does not mention equity or local knowledge. However, the plan does discuss expansion of the tree canopy cover, which is an adaptation strategy (p. PCM-5). In addition, the plan describes a "public engagement and education process" including public meetings and online surveys (p. 10) They received 2,360 responses and used this information to develop a list of "top 5 citizen goals for the urban forest" which include an adaptation-related goal of "sustainability of the urban forest (i.e., resistance to drought, climate conditions, etc.)" (p. 11).

City of Austin Hazard Mitigation Plan (2016)

In 2016, the City of Austin updated its Hazard Mitigation Plan. The plan commits to participation as a means of increasing outreach and education as well as a pathway for better understanding local knowledge:

> An *important component of hazard mitigation planning is public participation and stakeholder involvement. Input from individual citizens and the community as a whole provides the Planning Team with a greater understanding of local concerns, and increases the likelihood of successfully implemented hazard mitigation actions*. (p. 10)

Staff involved the public through meetings, an online survey, and sharing the draft plan for public review and comment. Public meetings were held on five dates at library branches across the city. Staff invited residents by contacting neighborhood associations, using social and local media, and posting meeting notices. However, despite commitment to "greater understanding of local concerns," the plan only describes public meetings focused on information sharing

(from City staff to residents) but not gathering information from residents. A survey (170 respondents) solicited local information from residents about hazard mitigation actions and hazard risk areas. The City of Austin website included a link to the survey, which was shared by local officials and at public meetings. Plan authors report that they reviewed survey data and incorporated some into the plan. For example,

> Many citizens mention concerns about flooding, watershed protection, and the effects of increasing development, including development in areas that are flood-prone. *In response to public input several hazard mitigation actions were added to the Plan Update* to control flooding. (p. 10)

The plan does not describe any attempts to obtain participation from diverse residents and did not collect demographic information.

In addition to the engagement activities described above, the plan's Goal 2 states, "Build and support local capacity and commitment to continuously become less vulnerable to hazards" (p. 2). This goal includes objectives to develop a group of volunteers to assist with preparedness, response, and recovery and increase public understanding of hazards and mitigation, which could provide a pathway for future participation.

Climate Resilience Action Plan for City Assets and Operations (2018)

The 2018 Climate Resilience Action Plan for City Assets and Operations "provides an overview of climate projections for Austin, an assessment of potential extreme weather impacts to City-owned assets and operations, and strategies to mitigate those impacts" (p. 7). The plan focuses on city-owned utilities, transportation infrastructure, and community facilities. It does not mention much about participation or engagement, but does acknowledge the disproportionate harm caused by climate change:

> *Climate hazards do not impact everyone equally, but disproportionally affect Austin's most vulnerable communities*. (p. 50)

After identifying these disparities, the plan's authors suggest that the City increase education and outreach to frontline communities, including information sharing about disaster preparedness, climate-related health impacts, and resources. In addition, the plan recommends connecting services to frontline communities to prepare for, respond to, and recover from climate-related events.

Austin Water Utility's Water Forward Plan (2018)

Austin Water Utility's Water Forward Plan centered around creation of a set of water portfolios for future use, developing in part using public input. The utility eventually chose a hybrid portfolio based on maximum conservation, which relates to adaptation by reducing water demand:

> The Water Forward recommendations will . . . *prepare the city to manage the effects of climate change, droughts worse than those we have experienced in the past, and other uncertainties in the future*. (p. 9-1).

Austin Water described the purpose of participation as "gather[ing] meaningful public input to develop a plan that is representative of Austin community values" (A-1). The utility created a framework to ensure participation was linked to planning objectives and transparent and accountable communication with the public. Specifically, the utility set out to seek input from a diverse set of residents, including but not limited to underrepresented groups.

Austin Water targeted outreach to a range of groups, email lists, and social media. The utility hosted five workshops and ten public meetings to collect input; staff shared information about the plan with participants and then gathered input about portfolio evaluation criteria, modeling, water management options, and recommendations. The ten public meetings were held in diverse geographic locations, at different times of day/week, and were advertised as being child-friendly and having snacks. The five workshops were held in the evenings and were mostly hosted in locations in central Austin.

Staff requested that participants provide demographic information and received 783 responses, which show that residents who were older, wealthier, white, and who lived in single-family residences were overrepresented.

City of Austin Climate Equity Plan (2020)

The Austin Climate Equity Plan updates the 2015 climate mitigation plan with a new focus on racial equity. Planning staff developed the Climate Ambassador Program, an innovative strategy to increase diversity and equity of participation. A city-wide call sought ambassadors willing to liaison with residents systematically excluded from climate-related issues. Twelve racially diverse Climate Ambassadors were recruited and paid a stipend to facilitate discussions with residents about challenges, barriers, and opportunities, which led to sixty interviews used by the steering committee to incorporate resident input into the plan.

Although the Austin Climate Equity Plan is a climate mitigation plan, at least one goal overlaps with adaptation: to increase city-wide tree canopy in an equitable way (p. 6). In addition, one strategy relates to climate adaption:

> Goal 3: By 2030, legally protect an additional 20,000 acres of carbon pools on natural lands and manage all new and existing natural areas (approximately 70,000 acres total), *focusing on resilience*. Strategy 2: *Manage natural lands for resilience*. (p. 6)

Discussion

City of Austin's Network of Plans

The City of Austin's network of plans provides a spectrum of information about adaptation, participation, engagement, equity, and local knowledge. These evaluated plans all mention climate change and the need for adaptation; all also include specific policies focused on adaption (Table 3). Given that statewide plans in Texas do not yet acknowledge climate change and the need for climate adaption, Austin's inclusion of climate change and adaptation in a variety of plans can be considered a modest success story (Lieberknecht 2022). And the creation of a city-wide adaptation plan, as resolved by city council, is an important next step (City of Austin, n.d.). The plans do address many of the main climate-related events that occur, and these plans also, to different degrees of detail, present programs, actions, and strategies to prepare for, respond to, and recover from these events. As plans are updated, climate adaption may receive a stronger focus, given growing urgency.

However, the plans include minimal focus on adaptation's relationship to participation, engagement, equity, and local knowledge. All the plans, with the exception of the Climate Resilience Action Plan for City Assets and Operations, include some sort of public participation and opportunity for input, although some plans more clearly state how this input was used. Most planning processes did not attempt to recruit or accommodate participation from diverse populations; very few collected demographics of participants to track success of recruitment. Austin Water attempted to use meeting and survey structure to increase diversity of participation in the Water Forward Plan; even with these efforts, participating residents did not represent Austin's diverse population. The Climate Equity Plan, although primarily focused on climate mitigation, goes the furthest in ensuring diverse participation through the use of their Climate Ambassador Program.

For the most part, plans framed engagement around information sharing, rather than information receiving—in other words, most plans described a "one-way street" when it came to knowledge transfer. Plans describe opportunities for residents to receive information and education but few include processes or goals focused on gathering and incorporating local knowledge into adaptation planning. Exceptions were the Water Forward Plan and the Climate Equity Plan, which both consistently used public input. The Hazard Mitigation Plan also includes one description of the use of local knowledge which spurred the addition of strategies to the plan.

This examination identifies a gap in the way the Austin approaches equitable climate adaptation. As discussed earlier, planning theory and practice have identified the need for residents most impacted by climate change to have a lead role in adaption planning to ensure equitable adaptation outcomes. The literature suggests that residents can contribute to adaptation planning through participation and community engagement processes that incorporate local knowledge into adaptation planning as well as opportunities to help co-design adaptation strategies. In particular, Berke and Stevens (2016) identified a need for "innovative governance structures and decision-making tools" to move along inclusion of local knowledge in adaptation planning (p. 287). Over the past two years, a collaboration of residents, researchers, City of Austin staff, and a community-serving organization (GAVA) has developed a model for a co-designed tool and process to better incorporate local knowledge into municipal adaptation planning. The following section describes this model as a case study of how gaps in the City of Austin's adaptation planning may be filled in part through community engagement and incorporation of local knowledge.

Dove Springs Climate Navigators (Austin, Texas): A Tool and Process for Participation and Knowledge Sharing in Climate Adaptation Planning

Residents of the Dove Springs neighborhood live in a diverse, socially vibrant, and economically challenged neighborhood experiencing repeated and severe flooding and increasing urban heat. About forty-eight thousand residents live within the 78744 zip code which comprises the neighborhood's boundary. Dove Springs includes many families (71% of households vs. 36% City of Austin), Hispanic/Latinx residents (75% vs. 34% City of Austin), and residents who are not citizens of the United States (25% vs. 13% City of Austin); the median income is $45,000 ($87,000 City of Austin), with 25 percent of households below the poverty line (13% City of Austin) (ACS 2018). Climate and social vulnerability analyses identify the neighborhood as one of the most at-risk areas of Austin (Bixler and Yang 2020) (Figure 1).

After a severe flood that resulted in loss of life and extensive property loss, residents and a community-serving organization, GAVA, identified the need for a safe and secure online portal where residents can both share knowledge about their community, climate events, and other chronic stressors and find information needed to prepare for and respond to climate events. GAVA works on several climate-adaptation-related projects in partnership with residents, the City of Austin, and university researchers, including an urban heat analysis of a frontline neighborhood in Austin, input into the city's efforts to create resilience hubs for climate preparation, response, and recovery, and leadership of the development of neighborhood-based disaster preparedness materials. More broadly, the organization spearheads efforts focused on health equity and neighborhood permanency (anti-displacement) work (GAVA n.d.).

In 2019, as a first step, GAVA created the Dove Springs Climate Navigators program, supported with a grant from the City of Austin to train neighborhood residents how to

locate, understand, and use information related to disaster preparation, response, and recovery. Through the program, neighborhood residents received an iPad in exchange for their work to train other residents in how to access disaster-related information. A few months later, GAVA, City of Austin staff, and university researchers and staff developed a proposal focused on expanding the Climate Navigators program. It advanced a process to develop an online portal to expand the one-way flow of information sharing into a two-way street that equally values information sharing and information receiving.

In the fall of 2020, the team won a three-year National Science Foundation grant focused in part on building upon the Climate Navigators program to develop a community-designed online portal where residents can access and share information related to urgent concerns such as climate disasters, as well as long-term challenges such as food insecurity. The vision for the project is to (1) produce a community-led, innovative data interface to help residents prepare for acute shocks while reducing chronic stressors, (2) use the portal to collect information that can be used to integrate local knowledge with existing data about adaptation, and (3) increase community-organizing knowledge and skills held by residents. Municipal, nongovernmental organization (NGO), and household decision makers can then use these new data and strengthened relationships to address climate and health stressors.

Climate Navigators can be thought of as boundary-spanning individuals who connect residents and other groups with information and resources focused on a topic of interest or a system that is difficult to understand or access (Tushman and Scanlan 1981). The Climate Navigator program uses a "train the trainer" approach adapted from public health to build a network of community members who gather and disseminate climate-related local knowledge (Orfaly et al. 2005). In the first phase, GAVA and university team members conducted trainings for neighborhood-based Climate Navigators, who receive payment for their participation, on climate-related event preparedness, response, and recovery. This phase finished in September 2021, with thirty residents having completed the training. The team completed its second phase in spring 2022: baseline interviews with the Navigators, focused on their existing perspectives about climate events, community resilience, and disaster preparedness, response, and recovery. Due to the Covid-19 pandemic, the team first moved these interviews online to a virtual setting, which proved difficult in terms of scheduling with residents. As a way to increase trust building and increase the pace of the interview scheduling, the team held an in-person, outdoor kick-off event in October 2021. In response to participant requests after this event, the team offered to conduct interviews virtually, in-person and outside at the neighborhood community center, or in-person at the participant's home. It is likely that the pandemic will continue to impact the research plan, but so far, residents and community partners have demonstrated flexibility and creativity as the team seeks to create safe opportunities for interaction and collaboration.

In the third phase, Navigators are participating in design workshops, focus groups, and individual interviews to co-design the data portal. Once the portal is fully launched, the Navigators will train other residents in its use. The team will also conduct another round of interviews to compare with the baseline interviews. Finally, if the portal is successful, researchers, city staff, and community-serving organizations will receive and then analyze residents' data, link them to existing information about climate and social risk, and use them to develop local and regional climate planning and implementation.

Other programs exist that have similarities in name and structure to GAVA's Climate Navigator program. The first use of the phrase "navigators" in this context appears to be "patient navigators," who are health care system staff members or other people who work with patients to understand and access the medical system (Freeman 2012). The navigator concept appears to have evolved from programs to improve the speed and quality of cancer treatment for marginalized populations (Freeman, Muth, and Kerner 1995). Land grant extension offices have adapted navigator programs for healthy living and well-being; other extension offices and public agencies have used the navigator framework to promote and accelerate clean energy programs (Tompkins County Extension, n.d.; University of Maryland Extension, n.d.).

Municipalities also use the navigator or ambassador moniker to describe other climate mitigation and adaptation programs. As discussed earlier, the City of Austin adopted a Climate Ambassador program for development of their Climate Equity Plan. In addition, the Ann Arbor (MI) City Council created the A2Zero Climate Ambassador Program in 2020 (Halek 2020). This program provides fifteen to twenty volunteers with nine weeks of training focused on climate mitigation and sustainability tools and resources. Program staff emphasize that participants need no previous experience and that the only requirement is passion about climate action. However, participants are not paid for training or work, which possibly limits who serves as ambassadors. Although ambassador/navigator programs appear to be growing in popularity, these programs will not be inclusive until they structure engagement so that people who cannot afford to volunteer their time can participate. Potential participants may need transportation, child care, flexible meeting schedules, language translation and interpretation, stipends to compensate time away from paid work, and other supports that allow for broad participation. As discussed earlier, the City of Austin Climate Equity Plan's Climate Ambassadors program addresses some of these needs by providing stipends and Spanish translation for participants. As other municipalities adopt similar programs, it will be critical to design these programs in ways that support inclusion;

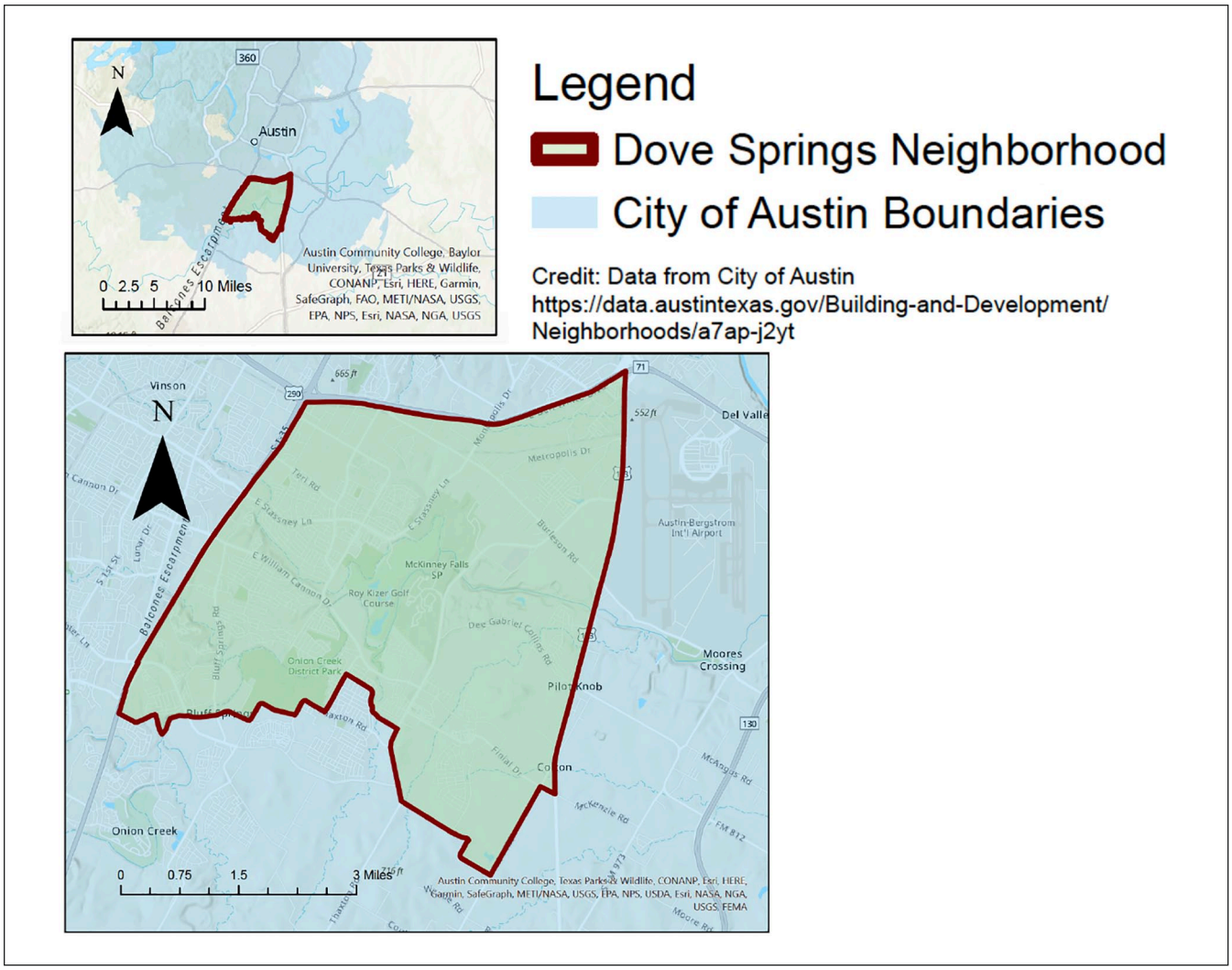

Figure 1. Dove Springs neighborhood, Austin, Texas (Audrey Matthews).

otherwise, ambassador/navigator programs will exacerbate inequities, despite good intentions.

Participants in the Dove Springs Climate Navigators program receive compensation for each hour of work related to the program. Materials are provided in both Spanish and English, and all meetings and trainings are offered with interpretation for Spanish and English, with a preference for conducting meetings in Spanish, as most participants are most fluent in and comfortable using Spanish. Participants frequently comment on how important it feels to center interactions around Spanish language use, despite the time needed to set up interpretation services, which adds about fifteen minutes to Zoom-based meetings and up to thirty minutes to in-person meetings (to fit and test interpretation headsets for all participants). Project events are held at times/days and in locations that provide flexibility for work and family schedules; most popular times seem to be virtual weekday evening events and in-person Saturday morning events. Due to the pandemic, the program has only hosted two in-person events, but both included food and children's activities. In addition, the team shifted communication methods from email to phone calls and text messages, to better match systems most frequently used by Navigators. To increase trust and accountability, the team provides meeting summaries to participants after each event as a one-page infographic image sent via text (since most participants don't use email or QR codes), and the research team ends each participant interaction with information and a timeline about next steps.

The Climate Navigators program and process is evolving, and only final outcomes will demonstrate whether this model successfully increases inclusion of participation and local knowledge in adaptation planning. However, the design of the Navigators program does encompass many of the elements needed for successful participation in adaptation planning. The team designed the Navigators program to increase procedural justice in three ways: by providing a place for

residents to (1) learn more about adaptation and train other residents about this knowledge, (2) co-design the structure and function of the portal, and (3) contribute knowledge that can be incorporated into municipal adaptation planning. Navigators' stipends, training, and access to devices and Wi-Fi all increase distributive justice. Recognitional justice is supported in part by research activity design— primarily guided by input from the community partner and the participants—that centers interactions around Spanish-language use, ensures that refreshments and meeting times are culturally appropriate, and provides communications that complement participants' preferences and technology access. Recognitional justice also will be partially achieved as the Navigators co-design the portal to reflect how they and their neighbors will use the portal. Once launched, the portal will encourage community engagement with and participation in adaptation planning. Although the portal cannot guarantee that city climate adaptation staff will value local knowledge, the portal and Navigators network will ensure that city staff will at least have access to local knowledge. In addition, involvement of city staff in the portal design process, as well as a later stage of the project focused on creating stronger connections between staff and local knowledge, is intended to support development of mechanisms useful for staff.

Conclusion

Climate and environmental justice theory maintains that those most impacted by climate change (i.e., residents of frontline communities) should have strong participation, power, and leadership in adaptation planning (Eakin et al. 2021; Marino and Ribot 2012; Shi et al. 2016; Yarina, Mazereeuw, and Ovalles 2019). In addition to furthering justice, local knowledge held by residents also serves as a valuable input into adaptation planning (Berke and Stevens 2016; Corburn 2009; Lieberknecht 2022; Peters-Guarin et al. 2012; Sansom et al. 2016). Despite the importance of power sharing and local knowledge, adaptation planning often does not include residents' participation and lived experiences, and planners and residents lack systems to better incorporate local knowledge into climate adaptation planning (Hardy et al. 2017; Meyer et al. 2018). This research finds that Austin's network of plans echoes this broader gap in local knowledge transfer. The plans contain only limited material on adaptation's relationship to participation, engagement, equity, and local knowledge. Most provide some opportunity for participation and public input, but only two plans targeted participation from diverse populations or tracked demographic information. In addition, very few of the plans aim to incorporate local knowledge; most focus on sharing information with residents but not listening to residents' input. This study serves as an initial baseline of Austin's adaptation-related planning, but future research should consider other documents in the Austin network of plans as new plans are adopted or existing plans are updated.

This divergence can be addressed in part by creating systems and tools to more successfully integrate residents' participation in and contributions toward adaptation planning. This article presents a case study of the Dove Springs Climate Navigators program, which is creating a data portal and planning process to incorporate local knowledge into adaptation planning. Initial outcomes include establishment of processes for inclusion, a group of thirty trained residents who are now co-designing the data portal and policy process, and stronger ties among municipal and NGO staff, residents, and university researchers.

This study provides two new dimensions of knowledge relevant to the planning discipline. First, this article contributes to the growing knowledge base about equitable climate adaptation by providing an evaluation of a municipality's plan elements related to climate adaptation, with a particular focus on participation, engagement, equity, and local knowledge—all identified as key aspects of equitable climate adaptation in the planning literature. Even a municipality like Austin, which has a reputation for trying to implement participatory planning processes (Busch 2016; Minner 2015; Wilson 2021) and early adoption of climate planning (Lieberknecht 2022), shows little evidence of integration of participation and local knowledge in existing plans related to climate adaptation. These findings underscore a critical omission that other municipalities may share. More broadly, given that both theory and practice highlight the importance of including local knowledge in climate adaptation planning, this research identifies the need for more scholarship focused on evaluating this potential gap. Second, this study presents an example of a tool and process that in part can help address the lag in incorporating local knowledge in climate adaptation planning. The Dove Springs Climate Navigator program joins community-organizing knowledge and skills with a process to provide flows of local knowledge into adaptation planning while helping communities prepare for climate events. This framework, which integrates social, environmental, and technological systems, may be helpful for other municipalities planning for climate adaptation.

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Supplemental Material

Supplemental material for this article is available online.

Note

1. In this article, I use the term "adaptation," but some City of Austin documents and plans use the term "resilience" to refer to adaptation planning and activities.

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