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Benchmarking Plans for Community-Based Small Business Resilience across Gulf Coast Counties

Ziyi Guo[1] and Yan Wang[1]

Abstract
Community-based small businesses (CSBs) bear the brunt of environmental hazards aggravated by climate change, thus requiring appended community support. This research addresses the knowledge gap in the increasingly convergent field of hazard and climate adaptation planning research. It aims to benchmark the commitments of local plans toward CSB resilience (CSB-R). We develop a CSB-R Framework with eleven planning objectives across five dimensions and evaluate relevant plans of fifty-six Gulf Coast counties using a Natural Language Processing method. Our evaluation results outline the inadequate planning focus on CSB-R that is distinct by community contexts, which requires tailored improvement strategies accordingly.

Keywords
climate adaptation planning, community typology, plan evaluation, resilience, small businesses

Resumen
Las pequeñas empresas comunitarias (CSB) son las más afectadas por los peligros ambientales agravados por el cambio climático, por lo que requieren apoyo comunitario adicional. Esta investigación aborda la brecha de conocimiento en el campo cada vez más convergente de la investigación de la planificación de la adaptación al clima y los peligros. Su objetivo es comparar los compromisos de los planes locales hacia la resiliencia de la BSC. Desarrollamos un marco de resiliencia CSB con 11 objetivos de planificación en cinco dimensiones y evaluamos planes relevantes de 56 condados de la Costa del Golfo utilizando un método de procesamiento del lenguaje natural. Los resultados de nuestra evaluación describen el enfoque inadecuado de la planificación en la resiliencia de la BSC que es distinta según los contextos comunitarios, lo que requiere estrategias de mejora adaptadas en consecuencia.

Palabras clave
Planificación de la adaptación climática, tipología comunitaria, evaluación de planes, resiliencia, pequeñas empresas

摘要 以社区为基础的小型企业（CSB）首当其冲地受到气候变化加剧的环境危害的影响，因此他们需要额外的社区支 持。 这项研究解决了灾害和气候适应规划研究日益融合领域的知识差距。 它旨在衡量地方计划对 CSB 韧性恢复的 承诺。 我们开发了一个 CSB- 韧性恢复框架，涵盖五个维度的十一个规划目标，并使用自然语言处理方法评估 56 个 墨西哥湾沿岸县的相关规划。 我们的评估结果概述了对 CSB 韧性复原力的规划关注不足，这种复原力因社区环境 而异，因此需要相应定制的改进策略。

关键词
气候适应规划, 社区类型学, 计划评估, 弹力, 小型企业

Introduction

Weather and climate extremes will likely increase in frequency and intensity due to climate change (IPCC 2022). The projected escalation in rapid- and slow-onset coastal hazards might then stress the built environment, society, and local economies of coastal communities (Kim and Lim 2016). Community-based small businesses (CSBs), referring to locally owned and operated businesses that actively engage with and serve their communities, bear the brunt of these disruptions while being particularly sensitive to natural hazards (Lo et al. 2019). CSBs are vital in channeling goods, services, and resources, building place attachment, and creating employment opportunities, especially for historically marginalized groups (Harries 2021; Watson 2021). Since the resilience of CSBs is closely intertwined with that of communities, their significance becomes even more pronounced under communities' recovery from and adaption to weather and climate extremes (Adekola and Clelland 2020; McKnight and Linnenluecke 2016; Sauser et al. 2018). For example, small businesses have played crucial roles in providing essential services and employment during the recovery of Houston from Hurricane Harvey (R. Norton, Venkateswarn, and MacClune 2018). However, past hazards have exposed the vulnerability of CSBs to withstand disruptions and maintain long-term post-disaster operations caused by limited physical, financial, or social resources. Particularly, communities along the U.S. Gulf Coast are susceptible to frequent exposure to multiple types of recurrent coastal extremes, such as tropical cyclones and tidal floods, which are especially sensitive to climate change (Marsooli et al. 2019). After the Hurricane Harvey disruptions over southeastern Texas and Louisiana, a survey reported that 56 percent of CSBs underwent temporary closure for over a month (Lee 2019). Hurricanes Katrina and Rita also caused 26.5 percent business failure in southeast Louisiana, resulting in the loss of 5,000 jobs (Terrell and Bilbo 2007). Thus, we focus on this region to explore community-driven supports to enhance CSBs' resilience.

Lessons from past extremes have revealed that resilient CSBs require abilities to facilitate rapid recovery (Meerow, Newell, and Stults 2016) and competencies to adapt to chronic hazards (Harries 2021; Kim and Lim 2016). The resilience of CSBs is commonly inhibited by unfavorable internal characteristics (e.g., smaller business size, financial inability, vulnerable employees, or operating in sensitive industries). Meanwhile, adverse external factors impede their resilience, including limited access to assistance and unsupportive local business climates (Baker 2009; Marshall et al. 2015; Zhang, Lindell, and Prater 2009). At present, the primary recovery support received by CSBs is direct financial assistance from federal-level agencies, such as the Federal Emergency Management Agency (FEMA) or Small Business Administration (SBA). However, these federal resources are not always available, especially for CSBs with internal drawbacks (Watson 2022). Thus, local resilience efforts (e.g., planning) are demanded to address barriers to CSB resilience (CSB-R; McKnight and Linnenluecke 2016).

Local plans direct communities' policy-making efforts, addressing the hazard vulnerability, overcoming recovery barriers, and building resilience to climate change (Berke et al. 2014). Particularly for CSBs, their vulnerability highlights the extra need for local planning commitments to enhance their resilience in anticipation of climate challenges (Zhang, Lindell, and Prater 2009). However, it remains unclear how planning approaches can effectively support the multifaceted barriers toward CSB-R and how different community features shape local planning foundations, capacities, expectations, and improvement strategies. Such under-investigated relationships call for a holistic evaluation of local plans in terms of community commitment to CSB-R. This helps identify local planning strengths and weaknesses and advances future planning by dedicating policy efforts to CSB-R (Horney et al. 2017; R. K. Norton 2008). Abundant studies on plan evaluation have focused on hazard mitigation and climate adaptation. They have also contributed to establishing criteria that investigate the extent of documentation (Horney et al. 2017; Lyles, Berke, and Overstreet 2018). However, limited research focuses on assessing plans with policies committed to a particular focus, such as CSBs (Connell 2020). Few studies have attempted to investigate how planning efforts are associated with community characteristics, which enables the sharing of "best practices" among counties of similar typologies and informs context-based planning strategies (Bierbaum et al. 2013; Lehmann et al. 2021; Shi, Chu, and Debats 2015).

Thus, we propose a CSB-R framework, which comprises five dimensions: physical resistance (P), financial availability (F), social inclusiveness (S), information accessibility (I), and business operational capacity (O). We develop the CSB-R framework through an extensive literature review on CSB recovery, continuity, and adaptation. Furthermore, we have formulated a set of planning evaluation criteria encompassing eleven resilience planning objectives across the five dimensions. Using these criteria,

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[1]University of Florida, Gainesville, FL, USA

Corresponding Author:
Yan Wang, Department of Urban and Regional Planning, Florida Institute for Built Environment Resilience, University of Florida, P.O. Box 115706, Gainesville, FL 32611, USA.
Email: yanw@ufl.edu

we evaluated resilience-related plans obtained from fifty-six coastal counties across five states along the Gulf Coast, answering the following two research questions (RQ).

> **Research Question (RQ 1):** Whether and to what extent do Gulf Coast counties vary in planning for CSB-R? How do states and community contexts correspond with local planning strength if variations exist?
> **Research Question (RQ 2):** What CSB-R planning objectives have been emphasized or overlooked? What pioneering planning policies have been proposed to address low-rated objectives when benchmarking plans across Gulf Coast counties?

Specifically, we code and assess 126 planning documents using Natural Language Processing (NLP) with pre-trained keyword filters guided by our proposed CSB-R evaluation criteria. Our quantitative analyses, along with the in-depth content review, illuminate "best practices" for planning CSB-R. To the best of our knowledge, this study is among the first to embed the resilience of small businesses in the groundwork of community resilience planning, which fills the vacuum for both fields. Our CSB-R planning framework bridges the multidimensional demands of CSBs with local resilience methods. It provides comprehensive guidance that applies to both research and planning practices in other coastal areas. By evaluating local plans, we assess the support for CSBs from coastal communities in recovering from hazards and adapting to climate change. Our analysis correlates the results with different community contexts and generates tailored recommendations for plan improvement priorities, strategies, and specific objectives.

Literature Review

Existing Research on Evaluation of Community Hazard and Adaptation Planning

Plan evaluation research assesses whether current planning efforts have achieved their goals to facilitate improvements in planning practice (Guyadeen and Seasons 2018). Planning documents provide insights into past compliance and future attentiveness of local governments, reflecting the plan-making processes (R. K. Norton 2008). Evaluating plan quality involves documentation, policy focus, and discourse (Connell and Daoust-Filiatrault 2017). Many studies have focused on assessing documentation comprehensiveness, often utilizing the influential evaluation framework proposed by Berke and Godschalk (2009). This framework incorporates seven internal and three external plan quality characteristics. It has been applied to assess the quality of a wide range of plans at various levels of municipals in terms of their contents and formats (Horney et al. 2017; Stevens 2013; Tang and Brody 2009). In contrast, fewer evaluations have assessed policy focus and discourse (R. K. Norton 2008); for example, Connell (2020) measured the strength of policy focus on farmland protection.

Emerging research has started to evaluate plans that address resilience and climate adaptation, considering the projected threats that local communities will face (Lambrou and Loukaitou-Sideris 2022). Bassett and Shandas (2010) assessed twenty climate action plans of municipalities; they scored the presence of desired action strategies in the plan and found great diversity among them. Shi, Chu, and Debats (2015) examined the standalone climate adaptation plans for 156 selected municipalities with a survey, showing that local political commitment, municipal expenditure, and climate change awareness were associated with engagement in adaptation planning, while the presence of state policies was irrelevant. These studies built up a solid understanding of pioneered climate adaptation planning practices, yet primarily investigated big cities. Marginal communities (e.g., small towns and rural communities) were underrepresented in previous evaluations as they often lacked standalone plans to be included in the evaluations (Hamin, Gurran, and Emlinger 2014).

Additionally, as community resilience and climate adaptation are complex efforts that are ascribed to a wide range of plans (Berke et al. 2021; Lyles, Berke, and Overstreet 2018), there have been increasing attempts to assess the corporation of multiple local plans in climate adaptation (Brody, Highfield, and Carrasco 2004; Woodruff et al. 2022). Philip Berke led two research that assessed how well the collection of local plans coordinated land-use development in hazard-prone areas in Washinton, NC, and six other coastal cities using a resilience scoreboard (Berke et al. 2019). These assessments at the inner-city level focused on spatial vulnerability, with limited attention to different facets of community resilience, such as social and financial concerns. So far, holistic plan assessment frameworks addressing multiple dimensions of resilience demands are yet to be developed and used to understand community planning efforts systemically.

Planning Efforts for Resilient CSBs

A few research studies have investigated planning and policy efforts, often focusing on specific aspects (e.g., fiscal) of resilience strategies. For instance, Xiao et al. (2018) identified that small businesses received insufficient support from community boards, governments, and associations. Watson (2021) highlighted that while financial loans (i.e., SBA loans) were major measures of business recovery from natural hazards, smaller businesses and sole proprietors benefited less from existing loans compared with larger ones. These crucial studies unveiled the insufficiency of local and federal-level support backing CSB-R, highlighting the urgency to understand how community plans, policies, and programs should contribute to small businesses' resilience. However, extant studies on the resilience of small businesses are more business-focused than community-centric (Lo et al. 2019; Xiao et al. 2018) concerning emergency response to rapid

Table 1. Framework of Planning for Community-Based Small Business Resilience.

Resilience dimensions	Community-based small business resilience planning objectives
Physical resistance	P1 Enhance structural robustness
	P2 Mitigate locational risk
Financial availability	F1 Provide financial assistance
	F2 Support financial security
Social inclusiveness	S1 Build social support
	S2 Encourage social participation
	S3 Consider social characteristics
Information accessibility	I1 Provide preparation information
	I2 Provide recovery information
Business operational capacity	O1 Incentive business internal robustness
	O2 Improve local business environment

recovery, as well as long-term adaptation to address pre-conditional capacities or vulnerabilities (Cutter, Burton, and Emrich 2010; Harries 2021; Sutton 2010).

The review of planning efforts toward small business resilience highlights a gap in bridging the well-developed community resilience theory with the interests of CSBs, especially regarding how communities can support them. A comprehensive evaluation framework is further needed to assess local planning efforts in effectively addressing the hazard and climate adaptation demands of CSBs.

Building CSB-R Framework

This study proposes a novel CSB-R framework based on a comprehensive literature review on business-centric resilience. The framework comprises five dimensions that facilitate community capital in fostering the resilience of CSBs, focusing on the scopes of hazard recovery and climate adaptation. To align the two scopes, we adopt a classic community resilience theory emphasizing four key properties: rapidity, resourcefulness, robustness, and redundancy (Bruneau et al. 2003). In the immediate aftermath of extreme hazards, the emphasis lies on the *resourcefulness* required for adaptation and rebound, aiming to achieve *rapid* recovery and ensure continued operation. For climate change adaptation, the focus shifts toward planning *redundant* alternatives to alleviate chronic vulnerability and enhance the *robustness* of CSBs against future hazards.

To assess the community's current efforts in addressing the issues mentioned above, we introduce the CSB-R Framework for evaluating planning policy focus. This framework comprises eleven specific planning objectives under the five dimensions mentioned earlier (refer to Table 1). Each objective is associated with various community-driven planning strategies and policy tools. Please refer to Supplemental Appendix A for detailed information on the related planning approaches. The purpose of the framework is to provide a benchmark for evaluating plans across different communities, with the aim of guiding comprehensive improvements in community-specific planning and resilience aspects. The following sections will explain each criterion, highlighting its underlying rationale and relevance to the evaluation process.

Physical resistance. The resourceful rehabilitation of the damaged physical environment has long been recognized as a crucial component of rapid community disaster recovery (Dahlhamer and Tierney 1998; Zhang, Lindell, and Prater 2009). CSBs' continuity in the aftermath of disaster relies on physical resistance measures, including recovering lifeline infrastructure, repairing business buildings, and removing debris (Finn, Chandrasekhar, and Xiao 2023; Tyler and Sadiq 2019). Additionally, coastal small businesses that rely on favorable locations for profitability are more vulnerable when situated in hazard-prone areas and may have limited preparedness for mitigation (Marshall and Schrank 2020).

Financial availability. The depreciation of capital following hazards can result in the immediate inability of CSBs to sustain their operations, potentially leading to failure. While federal financial support has been widely implemented to aid business continuity after disasters (Zhang, Lindell, and Prater 2009), it is often less accessible for CSBs (Watson 2022). In addition to assisting CSBs in applying for federal funds, communities can explore alternative funding sources, such as partnerships with other firms and large companies, which can offer temporary bridging assistance for CSBs (Gunasekaran, Rai, and Griffin 2011).

Social inclusiveness. Social capacities, including consumer retention and neighborhood bondage, enable business prosperity despite being physically destroyed (Xiao et al. 2018). Building and retaining such connections within communities could facilitate a capacity for rapid recovery of CSBs. However, societal characteristics may conversely exacerbate vulnerability given the dual identity of business owners as homeowners (Helgeson et al. 2022; Marshall et al. 2015), especially for historically underrepresented groups, including minorities, women, and disadvantaged populations.

Information accessibility. Hazard information inclusively encompasses both succinct and accurate warnings prior to incidents and the continuous flow of information for communication during and after events (Runyan 2006; Wang, Hao, and Platt 2021). Access to precise information about hazards can prevent unnecessary loss of CSBs while further assisting them in acknowledging available recovery resources and barriers.

Business operational capacity. The continuity of operation following hazard perturbations for recovery relied on the external business environment and internal self-motivated reactions (McKnight and Linnenluecke 2016). A supportive

Table 2. Characterizing Community Typology.

Typological clusters	Characteristics	Planning capacity	CSB resilience planning demand
1. Capable communities ($N = 9$)	Have thriving economies and communities; medium-sized urbanized populations; high CSBs share of economy; poor community resilience; moderate coastal hazards risk.	Solid planning bases	Relatively high and moderate urgent
2. Risk communities ($N = 23$)	Large populations and are located in metropolitan areas; moderate in community resilience; high risk of coastal hazards.	Divergence base but capable of improvement	High and urgent
3. Steady communities ($N = 13$)	Small or medium urban counties are low in hazard risk, fair in social status, and with the minimum size of CSB shares.	Concrete planning capacity	Low and less urgent
4. Struggling communities ($N = 11$)	Marginal rural counties with small populations are often socially vulnerable and at high risk of disasters	Poor planning capacity	Moderate and urgent

Note: CSB = community-based small business.

business environment facilitates connections between suppliers and consumers and key partnerships establishment for post-hazard operations (Sutton 2010). Specific CSB characteristics, such as size (Tyler and Sadiq 2019), industry sector (Dahles and Susilowati 2015), and property ownership, influence their pre-existing financial capacity to continue operation, resulting in varied vulnerabilities (Howe 2011; Webb, Tierney, and Dahlhamer 2002). Resilient entrepreneurship among business owners also fuels higher risk perceptions that drive businesses to perpetuate actions (Dahles and Susilowati 2015), making them more precautionary toward hazards (Alonso-Dos-Santos and Llanos-Contreras2019).

Case Description and Methods

Local Context and Community Typologies in Gulf Coast Area

The Gulf Coast area is located in the Southern United States, including five states: Alabama, Florida, Louisiana, Mississippi, and Texas. Our data collection and analysis focus on all fifty-six coastal counties (and parishes in Louisiana) across the five states. Multiple climate-sensitive hazards, including coastal flooding, hurricanes, riverine flooding, and tornadoes, are projected to account for 94.1 percent of potential loss within the selected counties (Zuzak et al. 2022). As the Gulf Coast counties exhibit diversity in hazard risk, community resilience foundation, and socioeconomic status quo, they may present different demands for CSB-R and planning capacity (Loh 2012), emphasizing the necessity of context-based planning.

Thus, identifying the typology of communities enables context-based suggestions and sharing of general intelligence to plan in comparable situations (Chang et al. 2018; Laurien et al. 2020). We developed a typology of coastal counties that clusters communities with characteristics that impact local planning capacity and demand for supporting CSB-R (Table 2). Three groups of factors are included: (1) population size and urban-rural classification (ERS 2013, U.S. Census Bureau 2018); (2) small businesses scale and average payroll, which describe counties' economic environment (U.S. Census Bureau 2021a); and (3) projected hazard risk depicted by social vulnerability index, community resilience index (Cutter, Ash, and Emrich 2014), and projected annual hazard loss (Zuzak et al. 2022). The detailed clustering process is explained in Supplemental Appendix B.

Plan Collection

Our empirical study investigated 126 county-level plans across multiple types of plans that have the potential to guide CSB-R. The efforts in different types of plans (Table 3) were evaluated collectively since they coordinated and interacted with one another to achieve resilience and adaptation goals (FEMA 2013). We focused on local planning efforts at the county level for two reasons. First, counties are often the managing entity for hazard mitigation plans since they are more capable of gathering planning resources compared with lower level municipalities. Second, in the Gulf Coast area, where large cities (e.g., Houston, TX) and rural communities are imbalanced in planning capacities, most small towns and rural municipalities have limited attempts to plan for resilience. County-level plan collection can represent the planning efforts of subordinate municipalities (Mattiuzzi 2020), while their completeness ensures that all types of communities along the Gulf Coast are included.

Plan Coding with NLP Method

NLP approaches have been increasingly used in understanding plan contents due to their efficiency in processing large-amount documents with machine-based procedures (Brinkley

Table 3. List of Evaluated Plan Types in Local Plan Collections and Potential Contribution to Community-Based Small Business (CSB) Resilience.

Category	Alternative titles	Relevance to resilience
Emergency Plan	Emergency Operation Plan; Comprehensive Emergency Management Plan; Natural Hazard Plan	Facilitate rapid response, recovery, and mitigate hazards
Adaptation Plan	Post-disaster Redevelopment Plan; Hazard Mitigation Plan; Local Mitigation Strategy; Standard Mitigation Plan; Comprehensive Resiliency Plan	Adapt to the chronic climate risks and address vulnerabilities
Master Plan	Comprehensive Plan; Master Plan; General Plan; Consolidate Plan	Incorporate pre-existing conditions and direct economic development plan

and Stahmer 2021; Cai 2021). Our CSB-R evaluation framework (see the "Literature Review" section) enables the assessment of plan contents using a coding method. The method identifies languages regarding planning policies that may improve CSB-R from the documents. We used a specifically designed NLP method, namely, the keyword-based filter, to assist the coding process in extracting and scoring the plan texts. The keyword-based filter can mitigate potential plan coding issues caused by personal bias among other human-caused coding errors, which are common during the conventional plan evaluation process and jeopardize the accuracy of evaluation outcomes (R. K. Norton 2008). Such application of NLP may expand the scope of plan evaluation research by dealing with large and noisy text masses, with satisfactory performance to capture target contents (Guo et al. 2021).

In the coding process using a keyword-based filter for each objective, we considered effective planning strategies and policy tools to comprise two elements: interaction entities and planning actions. Initially, we manually identified key entities frequently found in sample plans for each aspect of the CSB-R framework. For instance, sentences pertaining to actions for "Building Social Support" (S1) might include entities such as "business development organization, business associations, chamber of commerce, civic association, trade unions." Using NLP methods, we captured commonly co-occurring action expressions from the samples, such as "building relationships, collaboration, incentives, increasing, maintaining, partnering with, providing." We created two synonym corpora for each criterion, utilizing augmentation methods to enhance the expression lists and enumerate relevant expressions. Additionally, we developed a separate corpus specifically for "small businesses."

The keyword-based coding procedure was assisted by manual supervision and adjustment to ensure accuracy. The overall planning efforts to foster small business resilience at the county level were evaluated by computing the average score across the eleven evaluation criteria. The evaluation outcome for each county was the aggregate score of all their plans. We then introduced the *specificity percentage* to measure the level of commitment to CSBs, calculated as the percentage of criteria scored as 2 over the total. Details about the coding procedure with the filter are included in Supplemental Appendix C.

Research Findings Based on Plan Evaluation Results

We analyzed the plan evaluation results to answer the two research questions. First, we benchmarked the commitment of planning policies to CSB-R across Gulf Coast counties by ranking and mapping divergence scores among counties, states, and typologies (RQ1). Second, we identified unaddressed CSB-R planning objectives through criteria-specific evaluation results. To inform improvements regarding the identified shortcomings, we collected actionable policies and practices from the highlighted planning contents (RQ2).

Insufficient and Uneven Local Planning Commitments to CSB-Resilience

Our evaluation results of planning efforts indicate that 73.1 percent of the 56 Gulf Coast counties have invested in community resilience from the criteria in the CSB-R framework. However, there is a lack of dedicated efforts toward CSBs, with only 27.5 percent of resilience-related policies explicitly focusing on them. The evaluation scores among counties vary significantly, as shown in Figure 1, ranging from 5.64 (Pasco County, FL) to 0 (Kenedy, TX; Hancock, MS; Refugio, TX; Willacy, TX; and Jefferson, TX). These variances reflect differences in the completeness of local plan collections, the coverage of resilience objectives, and the level of commitment to CSBs within existing policies. Supplemental Appendix D lists evaluation scores for all the counties.

Our state-level analysis also revealed the inner-state alignment and intra-state heterogeneity in county-level planning efforts across the five states (Figure 1). For example, coastal counties in Florida have generally established more resilience-related plans and address CSB-R planning objectives than counties in the other states. This aligns with the state government's longstanding advocacy for climate adaptation initiatives, such as the 2015 Peril of Flood Act, which mandates the incorporation of climate-related strategies into comprehensive plans. While there have been debates regarding whether these top-down approaches have caused an uneven impact on different localities, Florida has successfully established thriving collections of plans through their implementation (Bunnell and Jepson 2011). In comparison,

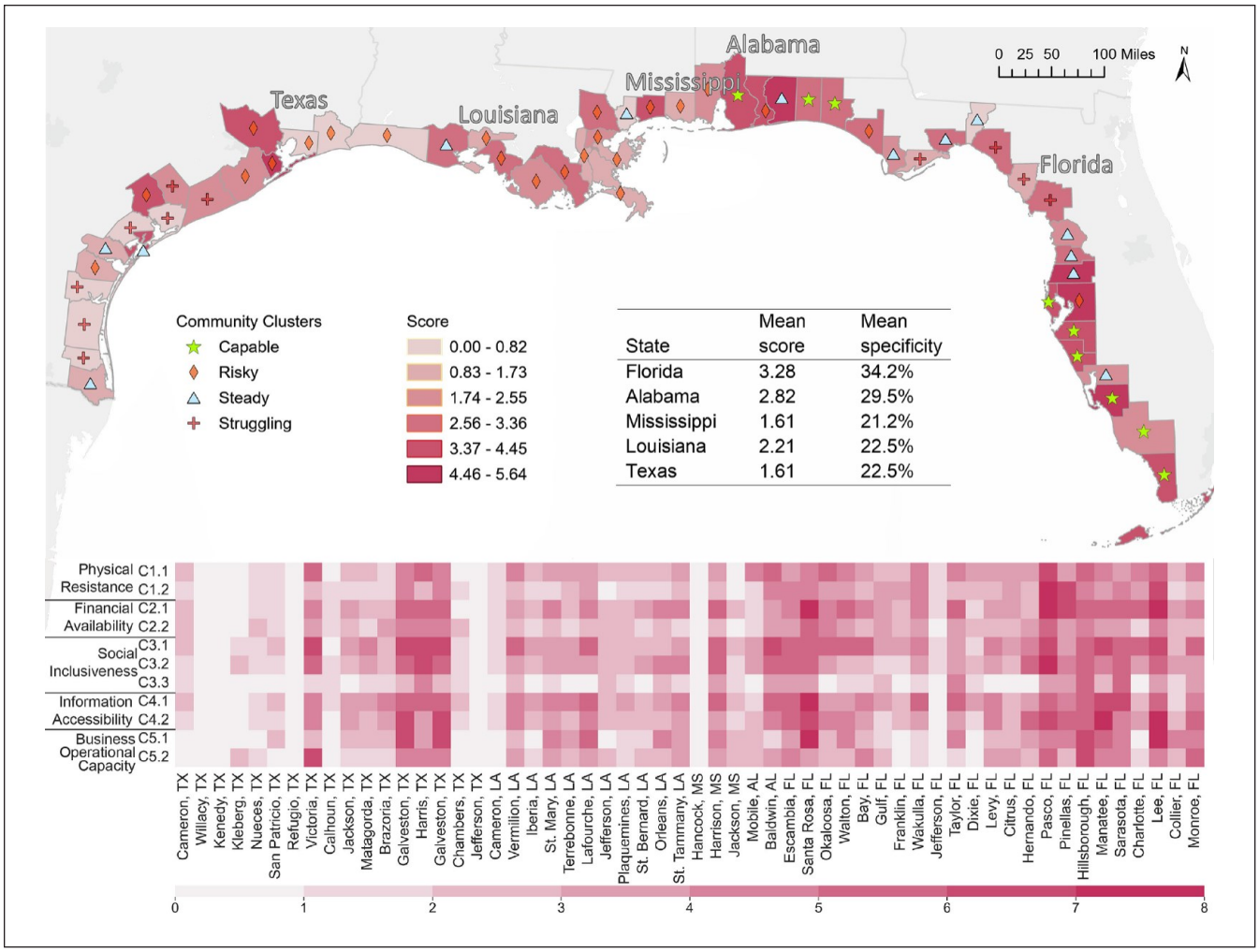

Figure 1. Map of average evaluation score and heatmap of detailed scores by criteria for each county and community.

Texas counties exhibit the lowest consideration for CSB-R within the study area. Most of them lack complete collections of emergency, adaptation, and master plans; thus, they are fragile in community resilience planning foundations. The absence of documented plans might have translated into a weak commitment to CSB-R (Berke et al. 2014). This situation might also mirror a political inclination that has hindered state agencies from engaging in climate change planning or acknowledging its significance (Lieberknecht 2022). Louisiana parishes aligned in their solid and standardized planning efforts for CSB-R. A notable contribution factor is the engagement of academic institutions in conducting local plans, which facilitates their plan quality. Mississippi and Alabama have a small number of coastal counties, with Mississippi counties scoring comparatively lower on average. Only Baldwin, AL, and Harrison, MS, showed above-average efforts among those counties.

Additionally, the comparative analysis across community typologies further uncovers the potential correlation between community contexts and evaluation outcomes. The plan evaluation results of "Capable communities" show that eight counties out of nine have included fair planning efforts to enhance CSB-R. "Steady communities" are assigned moderate evaluation scores, despite being the least urgent group for CSB-R planning. On the contrary, plan evaluation shows polarized outcomes within the "Risky community" group. High-scoring urban counties adjacent to larger-population cities (i.e., Houston and Tampa), such as Hillsborough, FL, Galveston, TX, and Harris, TX, are more resourceful in recovery and resilience planning. Low-scoring counties represent communities with social vulnerability and a high risk of loss caused by hazards, such as Jefferson, TX, calling for more intense planning efforts on CSB-R. Last but not least, insufficient planning efforts for CSB-R are found in "Struggling communities." Their disadvantaged socioeconomic status is often associated with weak planning capacity and increased hazard vulnerability. Taylor and Levy in Florida are the only two counties with acceptable evaluation scores.

Table 4. Average Scores of Eleven Evaluation Objectives.

Resilience dimensions	Objectives	Average score		
		Top 10	Mean	Bottom 10
Physical resistance	P1	3.00	2.61	1.80
	P2	2.70	2.04	1.00
Financial availability	F1	3.20	3.02	1.20
	F2	2.40	2.07	1.10
Social inclusiveness	S1	3.60	3.20	2.30
	S2	2.90	2.77	2.00
	S3	1.30	1.29	0.50
Information accessibility	I1	3.00	3.04	1.60
	I2	2.90	2.70	1.40
Business operational capacity	O1	2.10	2.23	0.90
	O2	2.40	2.09	1.50

Pinpoint CSB-R Planning Objectives Omitted in Local Plans

Our findings suggest that eleven specific CSB-R objectives have attracted uneven local planning efforts. The evaluated scores of three planning objectives have generated the majority of divergence between high- and low-ranked counties (Table 4).

Many CSBs are owned and operated by historically underrepresented groups such as disadvantaged populations, minorities, seniors, and females (U.S. Census Bureau 2021b). However, only 12.61 percent of existing plans in Gulf Coast counties have spared any specific focus considering their socially vulnerable CSBs (S3). Most studied communities also lack guidance in helping CSBs continuity in the aftermath of disturbances since neither incentive to facilitate CSBs' self-motivated recovery and adaptation actions (O1) nor advocating for resilient local business environments (O2) are sufficiently presented in current plans.

Surprisingly, planning efforts aiming at separate objectives from the same CSB-R dimension have received uneven focus. Community resilience planning has long focused on physical aspects (P1); however, CSBs are often omitted when planning for locational risks (P2). Location-specific risks can be ameliorated by integrating climate adaptation strategies in comprehensive plans, as Florida proposed. Zoning ordinances and land-use regulations that prevent development in hazard-prone areas (e.g., Special Flood Hazard Areas) were pervasive in Florida counties. However, arbitrary land-use adaptation planning has not been well coordinated with the paradox that CSBs sometimes rely on beneficial locations. In addition, outcomes in the dimension of financial availability reflect an existing dichotomy in financial support mechanisms for CSBs, which emphasize the need for emergency aid (F1) but overlook alternative financial security programs like pre-hazard insurance (F2). CSBs' over-reliance on financial loans (i.e., SBA loans) is problematic because resources have been disproportionately distributed to disadvantaged businesses (Watson 2022). Despite participating in the National Flood Insurance Program (NFIP) giving credits to counties based on our criteria, a resilient economy requires more redundant financial security options.

Suggest Improvements to Plan for CSB-R

Based on the plan evaluation results, we offer plan improvement suggestions per community typologies and the specific criteria in our CSB-R framework. First, tailored strategies for planning improvement are recommended based on community typologies, considering their disparate planning capacities and demand for CSB-R. "Capable communities" and high-scored "Risk communities" with solid foundations in resilience planning, evidenced by their relatively complete collection of plans, should prioritize overlooked planning objectives related to CSB-R. Additional planning resources can be allocated to designated resilience plans, such as Local Mitigation Strategies while promoting coordination across different types of plans. "Struggling communities" and low-scored "Risky communities" in the early stages of resilience planning are encouraged to collaborate with adjacent communities and seek support from state or regional agencies, academia, and stakeholders. State-level mandatory planning can significantly improve collective local planning efforts. Integrated plans, such as hazard mitigation plans and comprehensive plans, are more effective for these counties than designated plans (e.g., LMS). We suggest that they can efficiently use the shared knowledge of planning practices from counties in comparable situations. By learning from their planning inclinations and goals, counties can develop high-quality plans fitted to local contexts. Counties in the "Steady communities" have a lower risk of hazard-induced loss with a small share of CSBs, and thus may choose to save their community resources for more urgent purposes than supporting CSBs.

Meanwhile, valuable lessons from peer counties of similar typologies regarding practical recovery and adaptation approaches can fuel plan renovations across CSB-R planning objectives. First, adaptation strategies can range from arbitrary zoning ordinances to mild approaches that enable coexistence with risk, such as elevating properties (Pinellas, FL) and prioritizing CSB for restoration (Hillsborough, FL, and Pasco, FL). Local planners should engage CSB owners in hazard and adaptation planning procedures for at-risk locations to balance natural hazard risks and commercial benefits. Second, counties can explore available commercial insurance options and educate business owners to reduce NFIP premium costs, thereby enhancing financial security for CSBs (Hillsborough, FL; Pinellas, FL). Third, planners can advocate for educating CSBs on hazard risk mitigation and climate adaptation strategies, raising the awareness of risks and capability for post-event operation. Also, communities must strive to create CSB-friendly, resilient commercial environments. This

requires supportive regulatory environments that aid existing CSBs with operational continuity while diversifying local business bodies with business retention and expansion programs (Lee, FL). Finally, communities are responsible for rapid assistance and continued connection to socially vulnerable CSBs owned and operated by historically underrepresented groups (Hillsborough, FL). Localities may also consider contracting with these businesses for specific support.

Discussion and Implications

The proposed CSB-R framework was applied to benchmark collective community-level planning efforts, identify vulnerability, and suggest practical improvements. The results uncovered insufficient and disparate support for CSB-R across Gulf Coast counties from different states and contexts.

The newly developed CSB-R evaluation framework bridges the previously disengaged hazard plans and climate adaptation plans for the collective objectives of CSB-R (Lyles, Berke, and Overstreet 2018). To the best of our knowledge, the framework is among the first to benchmark CSB-R in local planning efforts by encompassing the five pillar aspects. It addresses a vacuum in the field by assessing contributions across multiple dimensions and phases, surpassing the focus on specific factors found in previous studies (Tyler and Sadiq 2019; Watson 2022). The evaluation objectives not only synthesize current small business research on hazard recovery but also jointly consider the long-term goal of climate adaptation. We adopt the seven dimensions of the OECD Quality Framework to systematically examine the proposed CSB-R criteria (OECD, European Union, and Joint Research Center—European Commission 2008, 46–49). The strengths of CSB-R include the dimensions of relevance, accuracy, credibility, timeliness, and interpretability. We design the evaluation process to include implementations that facilitate the criteria quality across these dimensions. The accessibility and coherence of our criteria demand further development. In Supplemental Appendix E, we provide detailed explanations and evaluations.

The study pioneers the assessment of "policy focus" in plans from the perspective of CSBs, encompassing 126 plans across 56 Gulf Coast counties. Our consolidated evaluation framework takes into account the cohesive efforts that can promote CSB-R (Berke et al. 2021; Lyles, Berke, and Overstreet 2018) from a collection of various plan types. It thus extends the scope of existing plan evaluation research by incorporating multifaceted resilience tools, going beyond the past focus on land-use tools (Berke et al. 2019). The proposed benchmarks enable comparative evaluation among county-level plans across diverse community contexts (e.g., hazard risks, resilience bases, and socioeconomic attributes). Our evaluation could provide equitable inclusion for underserved communities, such as rural counties, that have often been overlooked due to their absence of standalone adaptation plans (Berke et al. 2019; Shi, Chu, and Debats 2015).

The study shows a pioneering effort that suggests place-tailored improvement strategies for local CSB-R, leveraging plan evaluation outcomes and community contexts. By emphasizing diverse community demands and capacities, our approach advances conventional plan evaluation studies that have applied universal criteria to all evaluation objectives (Stevens 2013). Our NLP-based evaluation method identifies plan weaknesses and compiles pioneering practices targeting CSB-R objectives. This addresses the need for best practice references in hazard and adaptation planning for planning practitioners and researchers (Bierbaum et al. 2013). Our research outcomes facilitate knowledge sharing among communities with similar contexts, allowing them to learn from others' practices on CSB-R objectives. Local planners can assess their community efforts with the proposed framework, identify weaknesses, set reasonable goals for CSB-R based on their community contexts, and make tailored improvements by drawing on best practices from similar communities.

However, this research has certain limitations, which also present opportunities for future work. First, we focus on planning documents as a proxy for assessing local support to CSBs without evaluating their implementation. Future research could track plan implementation following real-world hazards for case studies of specific communities using our CSB-R framework. Our current outcomes have effectively addressed our research objectives and paved the way for this direction of investigation. Second, our supervised keyword-based classifier coded plans based on the presence of CSB-related objectives into a binary-type coding scheme, without regard to the extent to which they were addressed. Future studies could leverage pre-trained large language models to assess gradian details (e.g., the level of implementation guidance) and enhance the automation of classification tasks. Our method, with clearly defines objectives and expands classification criteria, prioritizes coding accuracy over the level of detail. Meanwhile, more advanced technologies capable of analyzing online news or social media posts can provide additional sources to track plan implementation automatically. Finally, the keyword-based classifier fits the corpora of Gulf Coast plans; thus, the direct applications to areas with distinct hazard types require different keywords. Future studies on different locations should keep expanding the objective criteria and corpora to encompass diverse contexts leveraging our developed CSB-R framework. One valuable approach to achieve this is to involve CSB owners and employees in future community engagement, thus incorporating bottom-up perspectives.

Conclusion

Our proposed CSB-R Framework aims to benchmark local commitments in enhancing CSB-R. It allows the comparative evaluation across counties and diagnosis of weak planning objectives. Focusing on Gulf Coast counties, our

evaluation empirically examines the varied and insufficient efforts corresponding to local characteristics and state-level contexts. A typology analysis of community contexts empowers tailored and actionable plan improvement strategies based on their unique planning capacities and demands for CSB-R. When looking at specific CSB-R objectives, we suggest Gulf Coast planners could enhance adaptive location strategies, financial security options, disadvantaged owners, and self-motivated incentive actions for CSBs. Our findings shed light on planning practices by suggesting improvement priorities and adopting pioneering practices among similar communities. While this study focuses on Gulf Coast counties, the CSB-R framework is generalizable to other regions. It benchmarks existing planning efforts and guides future community contributions toward CSB-R. By continuously feeding data in the future, the method can offer a sustainable scoring update based on CSB-R criteria.

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ORCID iD

Yan Wang https://orcid.org/0000-0002-3946-9418

Supplemental Material

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Author Biographies

Ziyi Guo is a doctoral student in the Department of Urban and Regional Planning and the Florida Institute for Built Environment Resilience, University of Florida. Her research interests are urban resilience planning, smart city, and community economic planning.

Yan Wang is an assistant professor in the Department of Urban and Regional Planning and the Florida Institute for Built Environment Resilience, University of Florida. Dr. Wang's research focuses on urban resilience with emphasis on human dynamics and spatial planning. She has adopted a systematic framework that incorporates human, environment, and disruptive events to investigate and model their interactions across time and space from both response and adaptation perspectives.