Applying a Plan Integration for Resilience Scorecard to Practice: Experiences of Nashua, NH, Norfolk, VA, Rockport, TX

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Executive Summary

Planning for land use and development is key to mitigating hazard events and the effects of climate change. Communities adopt multiple plans that directly and indirectly address hazard mitigation; the integration of local plans can significantly affect future community vulnerability to hazards. In partnership with community-based users, we tested and co-developed a *Resilience Scorecard*^{TM} that enables local officials to self-evaluate the degree to which the network of local plans targets areas most prone to hazards, and then assess the coordination of local plans.

We chronicle and evaluate the impacts of the *Resilience Scorecard*^{TM} application process from the local prospective in three communities vulnerable to flooding and climate change. Project objectives are: 1) To determine changes in *local capacity* to proactively plan, including: skill to evaluate plans, level of inter-organizational communication and coordination, and ability to develop integrated policy solutions; and 2) To determine changes in *outcomes* including: level of integration of mitigation actions in local networks of plans; strength of land use and development regulations, public investments for mitigation, and physical and social vulnerability (e.g., housing units relocated from hazard area, number of low-income people exposed to floods, and acres of hazard area conserved as open space).

Pilot 1: Norfolk, VA

Capacity Building

- Norfolk created a team of six members that represent diverse city agencies. Members indicated that the scorecard project was the first time that all key agency staff worked together at the same time in over three decades.
- Elected officials, the planning commission and the general public were informed about scorecard findings and staff recommendations for amending several plans during a public hearing.
- Team members agreed that the scorecard project strengthened their skills to spatially evaluate action policies in plans at the neighborhood scale, and to be unbiased and impartial in the evaluation, and to identify weaknesses, gaps and conflicts among plans.
- Cross agency communication improved and produced benefits, notably increased awareness of the connection between different types of plans that directly or indirectly affect hazard vulnerability. Notably, improved communication occurred between emergency management and urban planning as staff in both agencies were unintentionally excluding each other's plans in their plan making efforts.

Outcomes

1. In response to scorecard findings, significant revisions of the comprehensive plan were made to address major gaps in coordination, including city council approval of 27 policy amendments. Most notably, the comprehensive plan was amended to incorporate key policies and implementation actions in the hazard mitigation plan, and to incorporate major elements of the citywide resilience strategy in Vision 2100.
2. Resilience metrics in the zoning ordinance were added to location criteria for community facilities in the hazard mitigation plan and comprehensive plan. Prior versions of the plans only included conventional criteria based on accessibility of populations to facilities, but standards to steer the location of facilities away from hazard areas were not included.
3. Information generated by the scorecard supported the development of a successful $112 million proposal to the HUD National Disaster Resilience Competition. Results revealed

legacies of unjust mitigation policy attention in two historic African American neighborhoods. Funds are used to invest in resilience projects in these neighborhoods.

4. Official notes from a public hearing initiated by the City Planning Commission indicated the information generated by the scorecard will be used as a fact base for preparation of a new comprehensive plan in 2020.

Potential Obstacles and Limitations

Since Norfolk was the first pilot community to apply the scorecard, the city had more recommendations to improve the process than other cities:

- Plan evaluators from the city initially attempted to evaluate 16 plans that required too much staff time to evaluate. They felt that the most influential plans that affect flood vulnerability should be the focus of attention. To make the process more efficient, plans that were out of date or already integrated in the comprehensive plan were eliminated.
- The Norfolk approach to application of the scorecard required significant reliance on staff with GIS expertise. Staff recommended that future applications should be flexible to meet varying local capacities, such as manual mapping for low capacity communities.
- Plan evaluators felt that in some instances finding the geographic locations targeted by plan policies was too time consuming. Too streamline evaluations, plan evaluators recommend that neighborhood districts can be reduced by combining locations where hazard exposure, development patterns, and socioeconomic conditions are roughly equivalent.
- Not all changes identified by the scorecard results were made as of about one-year after completion of the project. This was partly due to competing demands on staff time as local issues and priorities change, and city staff become preoccupied with other responsibilities.

Pilot 2: Nashua, NH

Capacity Building

- A core team of seven plan evaluators from city government learned about the values and priorities of staff, and learned about the policies and plans of different agencies.
- Application of the scorecard generated an inclusive engagement effort beyond government, including active involvement and training of 40 local leaders representing diverse interest groups to serve as "ambassadors of resilience."
- A place-based narrative for the district hazard zones - the basic geographic unit for scoring plans - was created using crowdsourcing mapping technology. This information offered a venue for public input about needs and preferences for mitigation actions in the districts.
- Nashua strengthened its analytical and collaborative capacity for resilience planning by integrating the *Resilience Scorecard*^{TM} with the National Institute for Science and Technology's *Community Resilience Planning Guide,* and the *FEMA Local Hazard Mitigation Planning Handbook*.
- The scorecard process fostered communication and learning. An example is greater involvement of Office of Emergency Management in development permit reviews. The lead agency charged with reviews gained a better understanding of OEM's expertise and requested that OEM take on a more direct role.

Outcomes

- Core team members consistently observed that the *Resilience Scorecard™* produced a more coordinated and spatially specific network of plans. Prior attempts at plan integration were considered "aimless and undisciplined."
- Information generated by the scorecard was used to amend the 2019 Hazard Mitigation Plan. Seven policies were revised to give greater priority to reducing vulnerability in districts that are highly physically vulnerable and/or highly socially vulnerable.
- Nashua intends to use scorecard results as integral part of the fact base for preparing a new master plan in the years 2020-21, and developing an application for LEED (Leadership in Energy and Environmental Design) certification.
- The Director of OEM estimates that about 10 to 12 additional permits annually would be given more attention and scrutiny by OEM as a result of the scorecard application process.

Potential Obstacles and Limitations

- At the start of the scorecard project, core team plan evaluation members were overly ambitious by selecting over 50 plans adopted by the city since the 1990s. A mid-course correction was made to evaluate only the most influential plans that support economic development, critical infrastructure, climate change, and specific poor neighborhoods.
- A city official expressed concern that support for using scorecard results in the preparation of the new comprehensive plan may begin to dissipate since there was a recent major turnover in city staff that participated on the core team of plan evaluators.

Pilot 3: Rockport, TX

Capacity Building

- The city's commitment to integrating resilience into the comprehensive plan to guide recovery efforts was recognized by receiving a *Silver Achievement Award in Resiliency Planning* from the Texas Chapter of the American Planning Association in November 2019.
- Over 200 residents and elected officials attended 4 public hearings, and 13 members of a comprehensive plan advisory committee were informed about scorecard results.
- Two city staff were trained and learned how to craft the comprehensive plan policies, implementation actions, and use scorecard results to improve coordination with local recovery and mitigation plans.
- Scorecard results enabled staff to identify best practice policies in the existing local network of plans that are to be part of the policy framework of the new comprehensive plan.

Outcomes

- The new comprehensive plan includes 73 policies drawn from best practice policies in the local network of plans that support integration of resilience across all chapters (development, environment, housing, transportation, economy, facilities).
- Icons and textbox graphics are used to visually communicate how the comprehensive plan policies are coordinated with best practice policies from other plans.
- Information generated by the scorecard fostered development of balanced solutions. Policies from the local network of plans were integrated into the comprehensive plan to simultaneously preserve the cultural heritage, promote equity and economic vitality, restore environmental systems, and enhance flood mitigation.

- The implementation chapter in the comprehensive plan specifies actions, timelines, organizational responsibility, and funding necessary to achieve plan goals and objectives. An implementation action matrix was created to display this information. A "plan integration" column is inserted in the matrix that includes 48 references of action proposed by other plans.

Potential Obstacles and Limitations

- Small city's like Rockport with limited capacity for planning for resilience will likely need technical assistance to apply the scorecard. This condition is particularly problematic during a recovery effort from a catastrophic disaster event like Hurricane Harvey.
- At the time of writing this report, plan implementation actions by the city were put on hold due to the coronavirus pandemic. Consensus built through the planning process has a shelf life. If significant time passes between plan adoption and tangible implementation, support for the plan may begin to dissipate as leaders change and constituencies shift, new issues and priorities emerge, and local planners become preoccupied with other responsibilities.

Part 1: Background of the Resilience Scorecard Initiative

The Importance Integration of Resilience in Planning

Disaster events, ranging from catastrophic floods to extreme wildfires, have increased dramatically over the past two decades. The years 2016-2018 experienced historically high levels of losses, with the annual average number of billion-dollar disasters more than doubling the long-term average (NOAA 2019). Meanwhile, "nuisance events" that generate frequent minor impacts are on the rise. In coastal communities, for example, the number of nuisance flood days from sea level rise has risen from an average of 2.1 days per year during 1956–1960 to 11.8 during 2006–2010, and is projected to increase to 26 times per year by 2035 in 170 coastal communities (Union of Concerned Scientists 2017).

In this severe context, practitioners, policymakers, and affected communities have converged around the notion of "community resilience," in recognition that they need to take a more proactive approach to reducing vulnerability, and to an at-risk population growing in number and income inequality (Howell and Elliott 2018). The National Research Council has placed the goal of resilience at the center stage of urban planning by defining community resilience as "the ability to prepare and plan for, absorb, recover from, or more successfully adapt to actual or potential adverse events" (NRC 2012, p. 1).[1]

A major obstacle to building community resilience is that hazard mitigation planning usually occurs in isolation from other decisions dealing with land use and development in hazard areas. Little thought is given to coordination of a local mitigation plan among a community's network of plans that focus on, for example, housing, transportation and climate adaptation. Reasons for poor coordination include increasing specialization in government organizations, reluctance to share information to protect turf, beliefs and ideologies aligned with specialized missions, and organizational performance based on individual goals that ignore collective goals (Peters 2018). As a result, plans often pursue conflicting goals, fail to adequately focus on the most vulnerable areas, and ultimately increase vulnerability (Berke et al. 2020, Hopkins, Kaza and Pallathucheril 2005, Hopkins and Knapp 2016, NRC 2012).

We present results of a local government engagement project in three cities vulnerable to flood events and sea level rise. Our project includes partnerships of university experts and local agency staff to identify conflicts in local network of plans and reveal hidden opportunities for improving coordination and implementation of plans. The project includes the technical application of a *Plan Integration for Resilience Scorecard™* and a local engagement strategy. The scorecard, first developed by Berke et al. (2015), generates critical technical information that community decision makers can use to better coordinate planning for resilience among different types of local plans and implementation practices. The engagement strategy aims to improve involvement in resilience planning among local agencies with responsibilities that affect vulnerability, to enable city staff to learn about each other's agencies' roles and responsibilities, and to improve knowledge of staff about how different types of plans can be integrated to achieve long-term resilience.

We chronicle and evaluate the impacts of *Resilience Scorecard*™ application process from the local prospective. Project objectives are: 1) To determine changes in *local capacity* to

[1] Scientific, civic, and professional practice organizations alike now recognize that importance of urban planning in building integration of resilience across different urban sectors. Examples include the Hazards Planning Program of the American Planning Association 2020; Resilient America Program of the National Academies of Science, Engineering and Medicine 2020; and Planners for Climate Adaptation (P4CA) program of the United Nations.

proactively plan, including changes in: skill to evaluate plans; level of inter-organizational communication and coordination; and ability to use new information to develop integrated mitigation policy solutions; and 2) To determine changes in *outcomes* including change in: integration of mitigation actions across local networks of plans; strength of land use and development regulations; public investments for mitigation; and physical and social vulnerability (e.g., housing units relocated from hazard area, number of low-income people exposed to floods).

Linking the Concept of Plan Integration to Practice

Communities are increasingly adopting different types of plans that affect land use and development patterns, each with its own constituency of interest groups both within and outside government (Hopkins and Knapp 2016). Such broader and more inclusive planning is a positive development, but may also present problems when plans are aimed at pursuing interests of individual groups. For example, a hazard mitigation plan proposes acquisition of homes in a floodplain that experience repeated losses, but a transportation plan locates a road extension in the same area, encouraging growth.

The core capability of the *Resilience Scorecard*^{TM} is to enable comparisons between the degree of integration of local plan policies in support of vulnerability reduction in different geographic areas of a community. The scorecard identifies the level of coordination among plans, as well as conflicts that exacerbate existing, or create new, vulnerabilities in places such as a residential neighborhood, a downtown, and a waterfront. Information generated by the research allows planners and decision-makers to better focus their efforts on areas of greatest need and keep track of their progress toward integration and resilience goals. Applications of the scorecard have been cross-cultural ranging from cities in the United States (Berke et al. 2015, 2019, 2020, Newman et al. 2019), to the Netherlands (Malecha et al. 2018, Yu et al. 2020) and China (Ka et al. 2020).

The new information gives communities the ability to ask crucial policy questions about goals and priorities and how to improve the integration of resilience across multiple local plans. Examples of questions might include: Should policies in comprehensive plan that promote extensive waterfront development better integrate vulnerability reduction? Should policies in all plans be revised to give priority in districts with the highest physical and social vulnerability? Can the land acquisition program of the parks plan be coordinated with the buyout program of the hazard mitigation plan to produce co-benefits that reduce vulnerability and improve amenities? Table 1.1 illustrates a range of potential community benefits supported by application of the scorecard.

Table 1.1: Benefits of the *Plan Integration for Resilience Scorecard*

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1. **Provide a tool to foster collaboration essential for addressing on-the-ground needs.** Each community has a specific set of challenges and opportunities. The results of the evaluation can be used to inform meaningful conversations among planners, emergency management staff and other local officials, and residents about new policy priorities and areas to invest. The process by which communities self-evaluate local plans raises knowledge about the heterogeneous effects of plans, and enhances prospects for co-creating shared solutions.

2. **Uncover conflicts among different plans**. The scorecard reveals inconsistencies between plans and uncovers conflicts can exacerbate existing vulnerabilities or create new vulnerabilities. For example, land use plans that designate a floodplain land acquisition strategy for open space is at odds with transportation

plans that locate roads in the same floodplain, inducing growth. By identifying conflicts communities can revise land use and development regulations and proposed public investments to improve spatial coordination that strengthens mitigation practices.

3. **Identify opportunities to create co-benefits.** The scorecard can expand prospects for seeking new opportunities to produce co-benefits by better aligning plans. Co-benefits have a positive effect on multiple interests rather than having narrowly defined benefits that suit individual interests. A parks plan, for example, includes a land acquisition policy to acquire greenway corridors for walking and biking along waterways can be coordinated with a hazard mitigation plan that designates buyouts for homes along the same flood prone waterways.

4. **Fill gaps in plans.** The scorecard highlights gaps in plans that do account for important areas that have been overlooked in current plans. This is especially important to ensure that critical issues dealing with hazards and climate change have been addressed across plans. Affordable housing plans, for example, that include polices that frequently prioritize redevelopment of poor neighborhoods that are exposed to multiple types of hazards, but fail to include mitigation policies.

5. **Provide communities developing new plans or updating existing plans with a guidance framework to reduce future hazard exposure through smarter and more consistent policies.** The methodical approach can be used to monitor and assess progress of the coordination of networks of plans for hazard vulnerabilities. A community can also evaluate the progress and performance of resilience investments and ensure continuity of decisions.

Source: Malecha et al. (2019)

This project necessitates the expansion of the concept and methods of the *Resilience Scorecard*^{TM} used by researchers to a tool that can be used by local practitioners active in urban planning. The next step is to examine the process by which communities use the scorecard to self-evaluate local plans, how the results influence knowledge about the heterogeneous effects of plans, and whether the process enhances prospects for co-creating shared solutions. Using the scorecard, we piloted application with three cities. The pilot cities applied the scorecard to their own plan-making efforts. We chronicle the process and tracked change in local capacity to coordinate multiple planning efforts, as well as change in outcomes in the form of revisions to plans, and adoption of land use and development regulations and public investments consisted with revised plans. Each city provided feedback on their experience throughout the process.

Engagement Strategy Applied to Planning Practice

The Institute for Sustainable Communities (IfSC) at Texas A&M University obtained funding from the Department of Homeland Security to conduct a four-year project (2016-20) entitled, *Application of the Plan Integration for Resilience Scorecard to Practice*. The authors of this paper were affiliated with IfSC and were the key participants in working with the pilot cities throughout the duration of the project. IfSC has expertise in research on hazard mitigation and climate adaptation planning, as well as in assisting local governments "to facilitate the transformation of communities from high risk/low opportunity to equitable, resilient, and adaptive by mitigating threats to the economy, environment, and culture" (IfSC 2020).

To validate the *Resilience Scorecard*^{TM} and its translation to practice, the IfSC team invited subject matter experts to participate on an advisory board composed of national leaders with significant expertise in hazard and climate adaption planning practice. Members were primarily drawn from the Hazard Mitigation and Disaster Recovery Planning Division of the

American Planning Association. The IfSC team developed a *Plan Integration for Resilience Scorecard Guidebook*™ and software tool to assist local plan evaluators to track scoring. Board members gave critical guidance to IfSC in crafting the guidebook and tool to ensure that the scoring procedures are coherent and applicable to practice. After the scorecard was vetted by experts, IfSC began recruiting flood-vulnerable cities as potential pilot communities to further test the scorecard and guidebook.

IfSC provided technical assistance services to the pilot cities that agreed to apply the *Resilience Scorecard*. IfSC conducted several core activities for each pilot city. A kickoff webinar that involved local leaders and several local agency directors to explain the basic concepts of the scorecard and to identify links to ongoing resilience planning initiatives. A follow-up half-day workshop attended by agency staff focused on the data requirements and procedures to spatially evaluate plans. Attendees were provided with copies of a *Plan Integration for Resilience Scorecard Guidebook*™ and a user-friendly software tool prepared by IfSC that is online and freely available.[2] Finally, IfSC experts acted as facilitators by conducting regular tele-conference meetings with local teams of plan evaluators over a duration of each city's evaluation process (6 to 9 months). IfSC responded to queries from local agency staff, such as assisting the local team by reviewing initial plan evaluations and offering advice on interpretations of how specific policies affect vulnerability.

Throughout this interactive process with the cities, the scorecard tool and guidebook were evaluated and refined. Several small revisions were suggested as well as some amendments of concept definitions. One serious issue involved the plan policy-scoring procedure because staff with diverse types of professional expertise (urban planning, emergency management) could not uniformly understand how to identify and classify different types of policies (e.g., development regulations, public infrastructure investments) that affect hazard vulnerability. This issue was resolved by developing clear definitions of policy categories to help the evaluators classify and score each policy. Overall, local agency staff engaged in applying the scorecard in the pilot cities supported the basic structure of the scoring system.

Pilot City Selection

The three cities selected for this effort are Nashua, New Hampshire; Norfolk, Virginia; and Rockport, Texas. Table 1.2 identifies the selection criteria. In all instances, local agency staff expressed a willingness to partner with IfSC, and they considered the project to be good fit with the timing of ongoing planning efforts. Additional rationale in making the selection is to demonstrate the applicability of the scorecard in diverse contexts. Study cities were selected based on geography and population size. We divided the US into geographic zones consistent with Federal Emergency Management Agency (FEMA) national planning regions. One city was selected from each of three of the six FEMA regions along the Atlantic and Gulf coasts in the US. Variation in geographic location and population characteristics is beneficial from a sampling perspective. Selection of cities from different coastal regions of the United States reflects variation in socio-economic, political, and biophysical characteristics, and thus is more likely to reflect differences in networks of plans and how well they target areas most vulnerable to hazards (Lyles, Berke, and Smith 2014). Further, different population sizes and income offer a preliminary understanding of how cities that vary in resource levels are responding to hazard vulnerability. An additional motivation was to select cities that experience significant

[2] http://mitigationguide.org/scorecard-guidebook/

vulnerability to coastal or riverine floods, and precipitation events and sea levels exacerbated by climate change. Vulnerability is a salient planning issue for the selected cities since they experience high levels of threat from flood hazards.

The selected cities have a range of population sizes: 82,246 (Manchester); 244,076 (Norfolk); and 10,759 (Rockport). Compared to the Norfolk and Rockport, Manchester has the highest income, lowest poverty rate, and least diverse in race. Norfolk is economically dominated by the largest Naval base in the world, and many areas are threatened by significant sea level rise rates at twice the global average. Rockport is highly vulnerable to coastal hazards and was devastated by Hurricane Harvey in 2017. Manchester is subject to riverine flooding and faces prospects for increase of severity from flooding due to climate change, especially in the downtown area.

Table 1.2: Selection Criteria for Pilot Cities

Selection Criteria	Manchester, NH	Norfolk, VA	Rockport, TX
Population characteristics (2018) Size Growth rate (2010-18) Race(white alone, non-Latinex) Median HH income Poverty rate	 86,246 3.2% 73.4% $73.022 9.9%	 244,076 0.5% 43.5% $49,146 19.7%	 10,759 7.3% 64.0% $53,803 26.4%
Location by FEMA planning region	Region I: New England	FEMA Region III: Mid-Atlantic coast	FEMA Region VI: Western Gulf of Mexico coast
Major vulnerability issues	Flooding due convergence of two major rivers; future increase in severity of precipitation events due to climate change; threats to downtown area	Sea level rise at 2X global mean; coastal storm surge; threats to largest Naval base in world, downtown and multiple neighborhoods	Severe damage from Hurricane Harvey-2017; sea level rise
Timing with key ongoing planning efforts related land use and development patterns	Resilient Nashua Initiative; Resilience Dialogues; Downtown Riverfront Development Plan; Climate and Health Adaptation Plan; Hazard Mitigation Plan	Norfolk Resilience Strategy; Vision 2100; plaNorfolk2030	Create new post disaster comprehensive plan; Recovery Planning Assistance Team Report; Aransas Count Long-Term Recovery Plan

Methods for Tracking Change

We derived data to track changes resulting from application of the *Plan Integration for Resilience Scorecard*^{TM} from several sources. We took notes during on-site training sessions, monthly teleconference meetings, and public hearings. As mentioned, these meetings dealt with queries raised by city staff as they completed the phases of the scorecard application process. We supplemented the notes with responses to interviews we conducted with staff who participated in the plan evaluation at the end of the process. Interview questions asked staff to assess their

experience in applying the scorecard and identify actions taken by the city, civic groups, and the private sector resulting from the engagement process and information produced by the scorecard.

To guide our assessment of change, we used a logic model to track the effects of this project for each pilot city. Logic models are frequently used in the public health field to depict the relationship between a project's activities and its intended effects (CDC 2020). We believe that logic models have applicability to monitor and evaluate changes from urban planning initiatives. As shown in Figure 1.1, a logic model is a graphic depiction that presents the relationships among *inputs* (resources, training), *outputs* (change in organizational capacity to plan), and *outcomes* including changes in plans, development standards and public investments, and level of vulnerability (housing units relocated from hazard area, acres of hazard area conserved as open space). Although the boxes of the model are shown in a linear fashion, the relationships among them are expected to be complex and interactive over time.

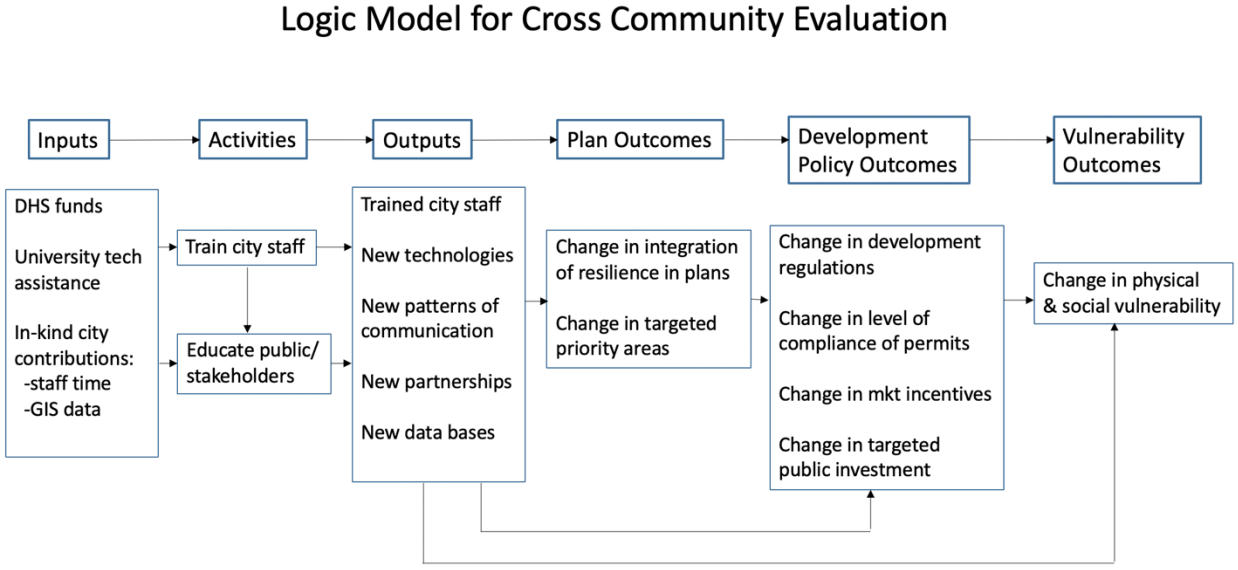

Figure 1.1: Logic Model of Relationships: Inputs, Activities, Outputs and Outcomes

Plan Scoring: A Four-Phase Procedure

The *Resilience Scorecard*^{TM} enables communities to determine coordination, conflict, and gaps in a local network of plans and to use that information to improve integration of mitigation across plans to more explicitly reduce vulnerability. Use of the *Resilience Scorecard*^{TM} requires community actions across four phases.

Phase 1: Form a team. An interdisciplinary team of staff from local government agencies charged with implementation of relevant plans should be established to oversee the scorecard evaluation process to ensure that plan evaluation is not conducted in silos. Core activities of the team are to evaluate plans, communicate across agencies to better understand the contents of plans, and foster consensus in making adjustment based on results of the network of plan evaluation.

Phase 2: Select plans. Plans adopted by local government that influence land use and development in current and future hazard areas should be selected for evaluation. Table 1.3 shows a range of types of plans. Among these plans, the comprehensive plan represents the principal form of general governmental planning and is the primary planning policy instrument

that coordinates land use and development across multiple urban sectors. Hazards mitigation practices can also be integrated into other more specialized planning activities (e.g., parks, housing, transportation). Notably, the hazard mitigation plan is one of the most frequently adopted specialized plans. The Disaster Mitigation Act (DMA) enacted by Congress in 2000 requires all local governments to adopt a mitigation plan approved by FEMA to be eligible for federal pre- and post-disaster mitigation funds. Other specialized plans (e.g., transportation, open space, climate action, hazard mitigation) are sometimes prepared at the regional scale and have direct influence on local land use and development.

Table 1.3: Examples of Types of Plans in a Community Network of Plans

Plan Type	**Purpose**	**Contribution (+/-) to Vulnerability**
Comprehensive/General Plan	Main community planning document	Policies can guide future development into or away from hazard zones.
Hazard Mitigation Plan	Reduce long-term risk to human life and infrastructure	Supports vulnerability reduction and resilience building, often via general policies or specific "action items".
Disaster Recovery Plan	Address disaster recovery-related needs to be activated during recovery	Supports vulnerability reduction and resilience building post-disaster. Coordinates agencies to assist people post-disaster.
Climate Change Adaption Plans	Adjust to actual or expected climate and its effects	Supports flexibility of strategies to address uncertainty of potential loss, and mainstreaming adaptive actions into other sectors of planning
Small Area Plans: Downtown (Redevelopment) Neighborhood District Waterfront Corridor	Address planning issues pertaining to a portion of the community	Targeted policies may increase or decrease vulnerability, depending on purpose and location. Area plans may also contribute to policy district delineation.
Functional or Sector-specific Plans: Transportation (or Transit) Parks / Open Space Economic Development Environmental Management Climate Adaptation/Mitigation Housing (Consolidated/Strategic) Wildlife Management Wildlife Protection	Focus on individual or related functions or sectors in need of specialized planning	Individual plan policies (or objectives, action items, etc.) may increase or decrease vulnerability, and are often distinct from those found in comprehensive or hazard mitigation plans. Applicability to individual policy district(s) may be aided by additional functional or sector-specific maps.

Source: Malecha et al. (2019)

Phase 3: Delineate district hazard zones. The basic unit of analysis for scoring the degree of integration of mitigation practices among plans are district hazard zones. Most community

planning programs divide the community into planning districts based on geographic areas that encompass residential neighborhoods, downtowns, and commercial, industrial, and conservation places. To delineate the district hazard zones, intersect the planning districts with the hazard zones using GIS (Geographic Information Systems).

Phase 4: Spatially evaluate the network of plans. Evaluation of plans includes three step procedure. *First*, local plan evaluators extract applicable policies in each plan that influences land use and development. Classify each policy based on different categories of land use policy instruments (e.g., zoning regulations, land acquisition, public investments programs for infrastructure, market incentives like tax abatement and housing density bonuses) that influence the type, location, and amount of development. *Second*, evaluators score each policy based on the intended vulnerability outcome linked to the policy, that is, whether a policy has no effect on vulnerability (score = 0), increases vulnerability (score = –1) or decreases vulnerability (score = +1). Table 1.4 presents examples of how we apply the scoring method. *Third*, evaluators spatially assign each policy score to one or more district hazard zones, and then sum the scores from all plans by vulnerability outcome for each zone. Higher total scores indicate the use of more policies aimed at decreasing vulnerability, while lower scores indicate that use of more policies that actually increase vulnerability. Figure 1.2 visually illustrates the mapped data outputs of the scoring process.

Table 1.4: Examples of Plan Policy Classification and Scoring Method

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Example 1. A policy in the infrastructure element of a Comprehensive Plan states, "Assure the provision of public and private parking in support of increased development and activity." The rationale is to expand infrastructure capacity to foster physical development of the downtown, which is entirely in the 100- year floodplain and in the projected area to be inundated by sea-level rise by 2100. Thus, for the downtown district this policy linked to *infrastructure capacity* received a score of –1 for vulnerability for the 100-year flood zone and a –1 for the zone covered by additional sea-level rise zone.

Example 2. A policy in the hazard mitigation plan states the need for "acquisition of properties located in the city's repetitive loss areas...including areas passing through areas largely utilized for public housing." The rationale is to reduce vulnerability inside the 100-year flood- plain. The policy of *acquisition* received a score of +1 for social vulnerability for each of the three districts.

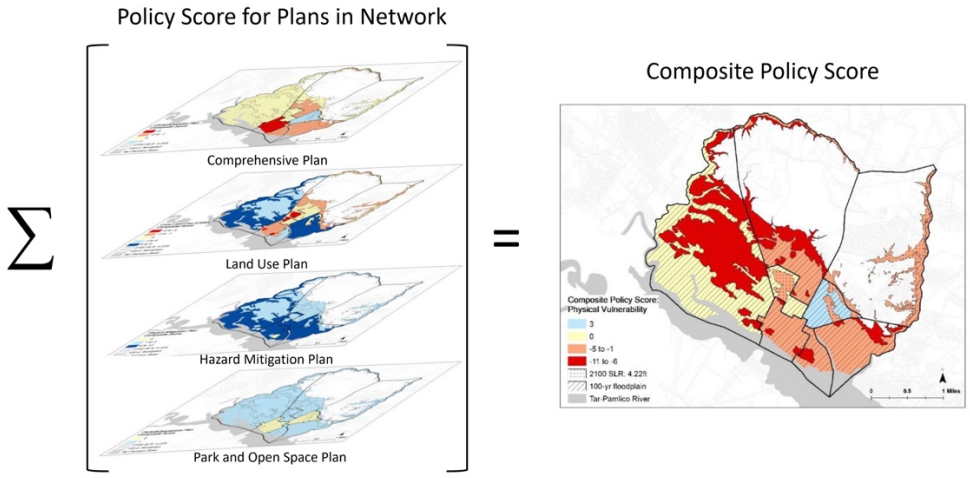

Figure 1.2: Scoring of Networks of Plans by District Hazard Zones

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Part 2: Pilot City Experiences

City of Norfolk, Virginia

The Setting

Norfolk is a good fit to serve as a pilot community with estimated population of 244,707 in 2017. Norfolk is experiencing increasing frequency of floods due to coastal storm surge and sea level rise. Norfolk floods not just from heavy rains or hurricanes. Flooding occurs during blue skies, at high tide, or when the winds come from the right direction. The seas are rising at twice the global average, due to ocean currents and subsidence that involves the loss of coastal lands due to sinking subsurface geology that is not related to rising sea levels caused by climate change. About 16% (8.3 square miles) of the total geographic area (52 square miles) is within the 100-year (1% occurrence probability per year) floodplain boundaries as defined by the Digital Flood Insurance Rate Maps (DFIRM) of the National Flood Insurance Program (NFIP). An additional 32% (16.6 square miles) of the city's area could be exposed to the 100-year floodplain due to sea level rise by 2100 (City of Norfolk 2017a).

Norfolk has taken a longstanding leadership role in community resilience. According to Paula Shea, Chief Planner, inspires to be a "model community on resilience." The city is a participant in the Rockefeller Foundation's 100 Resilient Cities program that resulted in adoption of the Norfolk Resilience City Strategy and the hiring of a city Chief Resilience Officer in 2014. Norfolk hosted the Dutch Dialogues workshop in 2015 to brought together Dutch engineers and city planners with local counterparts to explore creative and innovative solutions to the challenges inherent in living in a coastal city (WPA 2015). The focus of the workshop was to extend beyond the conventional structural approach of building higher barriers, but to determine how to live more naturally with water. These activities culminated into the preparation of a forward-looking Norfolk Vision 2100, which responds to sea level rise and coastal storm hazards, and includes principles to guide the development of a new comprehensive plan during the years 2020-2021.

Forming a Team

The primary goal of establishing the team is to communicate across departments or entities to better understand the contents of the city's network of plans. Thus, Norfolk planners created a team of six members that represent a diverse set of agencies active and influential in the city's resilience program – the planning director, two planning staff within the department of city planning, one emergency manager, their chief resilience officer (from the 100 Resilient Cities initiative), and a GIS analyst. The main points of contact included the Chief Planner, Paula Shea. All members participated in collecting and evaluating Norfolk's network of plans. Core activities included a kickoff webinar, and a 2-day on-site training visit (November 2016), and monthly tele-conference meetings throughout the process (between December 2016 and September 2017) to respond to queries by city's team members.

Selecting Plans

Norfolk has adopted a diverse network of plans that influence on land use and development decisions in areas exposed to coastal flooding and sea level rise. Among the 16 official plans adopted by the City, plan evaluators originally attempted to assess all plans but soon realized that the effort was too time consuming. Local team then identified six plans (five

citywide and one regional) to be included in the study as these plans were considered to have the most significant influence on development decisions in the city (see Table 2.1). Plans excluded from the study did not intersect with the hazard zones, were out of date, or were already integrated in the city's comprehensive plan, which incorporates as chapters several of the stand-alone small area and functional plans. Each of these plans are independently prepared by distinct government agencies and interest groups. The city staff felt that the combined impact of the selected plans has a strong effect on the level of vulnerability to community hazards.

Table 2.1: Selected Norfolk Plans

Comprehensive Plan: Norfolk 2030: The General Plan for the City of Norfolk (2013)
Hazard Mitigation (Regional) Plan: Hampton Roads Hazard Mitigation Plan (2016)
Shoreline Plan: Sand Management Plan Guidance Document (2016)
Resilience Plan: Norfolk Vision 2100 (2016); selected by the 100 Resilience Cities program.
Small Area Plan I: Downtown Arts and Design District Plan Revitalization Strategy (2013)
Small Area Plan II: Military Circle/Military Highway Urban Development Area: A Vision for the Future (2017)

The process of selection required that the team initiate cross agency staff discussions about the presence and influences of different plans. Urban planning staff, for example, were unaware how the hazard mitigation plan reduced vulnerability of built and social environments. The city's emergency management department prepared the city's element in the regional mitigation plan, but communication across emergency management and planning agencies was limited. The Norfolk team thus included the city's element in the regional mitigation plan in the evaluation when it might otherwise have been excluded if city's urban planning staff had not collaborated with emergency management staff.

Delineating District Hazard Zones

The first step in identifying the district hazard zones was to identify the parts of the city subject to flooding. The Norfolk team decided to focus on the 100-year floodplain since it is used in formulating local hazard mitigation policy to administer and enforce NFIP policy goals. The team also prioritized sea level rise given the potentially catastrophic consequences of this hazard. Sea-level rise forecasts were added to inundation surfaces indicated by the 100-year flood elevations on NFIP maps.[3]

Next, the Norfolk team debated about the appropriateness of how to delineate planning districts. The team was concerned about the appearance of bias when presenting the scorecard results to city decision-makers, and thus wanted to use districts that were more 'objective' than the official neighborhoods (which are closely linked to city council districts). In the end, they chose to use the 80 U.S. Census Tracts located entirely or partially in the hazard areas to serve as

[3] We add sea-level rise forecasts to inundation surfaces indicated by the 100-year flood elevations on DFIRM maps, consistent with the method used to guide rebuilding of structures that received FEMA's public assistance funds after Hurricane Katrina (U.S. Army Corps of Engineers [USACE], 2018a). Our aim is to delineate the extent of flooding using the same 1% probability of occurrence as FEMA uses, to which we add the level of sea rise. Recent advances in downscaling the effects of global climate change on sea-level rise have made it possible to delineate areas exposed to sea-level rise (Climate Central, 2014). We use data derived from USACE's sea-level rise calculator, which provides alternative scenarios in 10-year increments up to 2100 for relative local sea-level rise along the U.S. coast (USACE, 2018b). The intermediate-high scenario for the year 2100 from a range of possible sea-level rise scenarios (low, intermediate low, intermediate, inter- mediate high, and high) generated by the USACE sea-level rise calculator for the coastal region that includes Norfolk.

the planning districts. Smaller-scale units of analysis (e.g., Census Block Groups) would offer a more fine-grained analysis of policy coordination, but the time and effort required to spatially evaluate policies in a greater number of districts was beyond available time and staff resources. Even the 80-census tract were considered by plan evaluators to be excess in number and too cumbersome in terms of spatial identification of the locations where each policy has an effect. Plan evaluators indicated that wherever possible tracts could be combined in cases where hazard exposure, development patterns and social and economic conditions are roughly equivalent. Next, GIS was used to intersect the hazard zones with the census tracts to delineate the district hazard zones.

Findings: Spatial Evaluation of the Network of Plans

The Norfolk team followed the three-step procedure for spatially evaluating the plans: extracting policies in plans; scoring each policy based on vulnerability outcomes; and spatially assigning and summing policy scores to district hazard zones. The Norfolk team created and mapped a composite index score for each hazard district zone in the city. Figure 2.1 shows the resulting district hazard zones (and composite plan policy scores from all plans) for the Norfolk *Resilience Scorecard* analysis.

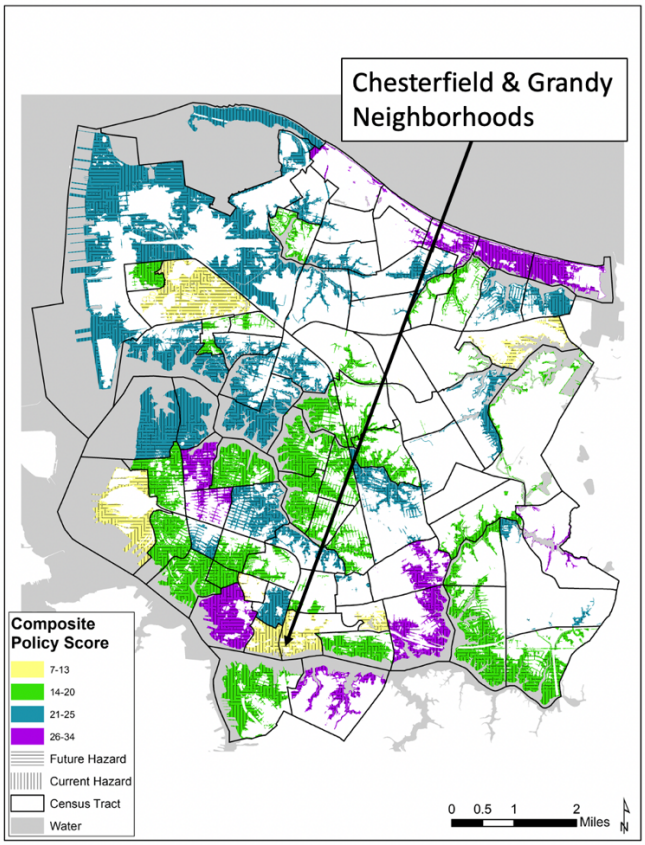

Figure 2.1: Composite Plan Policy Score by District Hazard Zone: City of Norfolk

The Norfolk team was surprised to find some weaknesses and inconsistencies in the city's network plans. Examples include:

- The city's comprehensive plan contained a major gap in hazard mitigation policy as the Norfolk planning staff had unintentionally excluded the hazard mitigation plan in all other prior plan making efforts in the city.
- Plans are unjust in policy attention aimed at socially vulnerable neighborhoods; poor areas of the city received lower composite policy scores, as illustrated by the Chesterfield Heights and Grandy neighborhoods.
- Prominent themes in the Vision 2100 to guide the city's long-term response to sea level rise were not integrated into the current comprehensive plan.
- Location criteria in several plans only focused on accessibility city services and facilities to different population groups but did not factor in location and design criteria for community facilities in flood hazard areas.
- The hazard mitigation plan lacked spatial specificity; notably, it did not specify strategies to mitigate vulnerability to existing development in areas exposed to sea level rise and the 100-year regulatory floodplain.

Results of the evaluation were shared with the city council at a public hearing and with staff across city agencies charged with preparation and implementation of different plans. Local planning staff pointed out that this action proved important for raising awareness about the threats posed by sea level rise and gaining support for better integration of vulnerability reduction policies throughout the city's network of plans.

Tracking Change in Local Capacity and Outcomes

We tracked changes in local government capacity (outputs) to support resilience planning and changes in plans, development regulations/spending, and level of vulnerability (outcomes) in the City of Norfolk as a result of the scorecard application process. Figure 2.2 illustrates these changes.

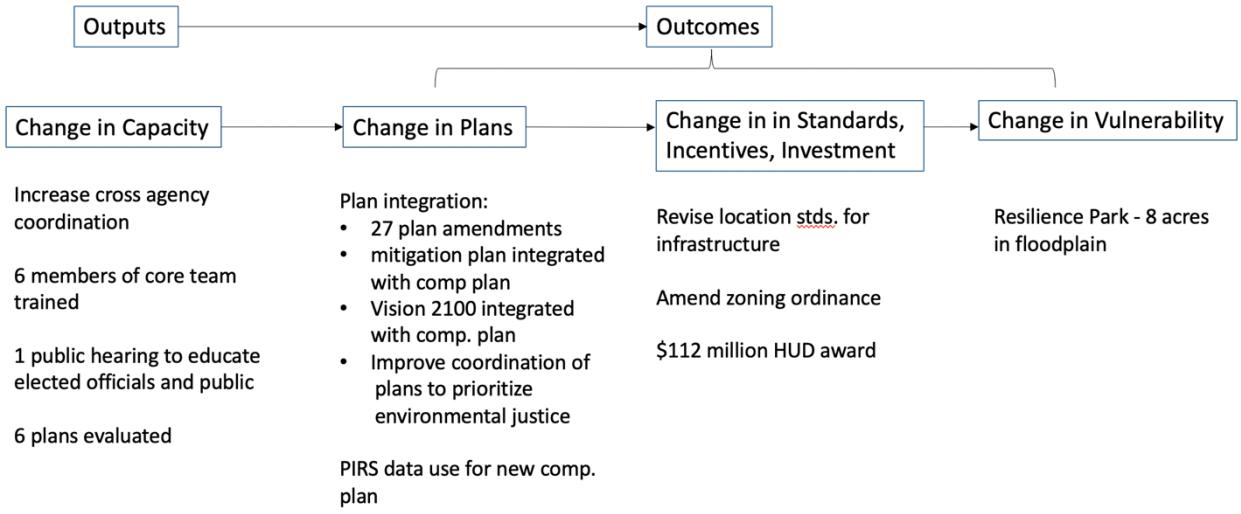

Figure 2.2: Changes Linked to the Scorecard Process in Norfolk

Outputs: Capacity Building

Norfolk's capacity to support resilience improved in serval ways due to the scorecard application process. George Homewood (FAICP, CFM, Norfolk Planning Director) summed up the city's overall experience with the process indicating that the "The Resilience Scorecard was a great tool to allow us to evaluate our existing plans and policies…we undertook a major plan amendment to more fully incorporate our Hazard Mitigation Plan and Vision 2010 as key elements in our comprehensive plan." Comments by city staff team members reveal the benefits of the *Resilience Scorecard* process. One member indicated that the, "process offers an unbiased and impartial look at policies and plans…it helps reveal how we need to spread our energy to other areas of the community." Another stated "We were very intrigued by the spatiality of our policies and hadn't thought about our policies spatially before."

Team members universally agreed that the process strengthened the city's capacity to plan for resilience. Six staff members improved their skills to conduct spatial evaluation of plans and to identify weaknesses, gaps and conflicts among plans, which resulted in a deeper understanding of the network of plans by community staff and decision-makers, increased awareness of the connection between plans and vulnerability to natural hazards. Cross agency communication improved, notably between the emergency management and planning. The new data base provides the motivation and information that staff and decision-makers need to better integrate their network of plans.

Outcomes: Plans, Regulations, and Public Investments

Significant revisions of plans were made to address major gaps and conflicts in coordination, significant revisions of the comprehensive plan, including council approved 27 policy amendments (City of Norfolk, 2017b), were made to address major gaps in coordination. As noted, key policies and implementation actions in the hazard mitigation plan were incorporated into the city's comprehensive plan. The comprehensive plan was also amended to incorporate the Vision 2100 strategy that identifies major elements for a citywide resilience strategy. Figure 2.3 shows the key themes and a mapped illustration of Vision 2100:

- *Yellow low elevation areas* prone to flooding from sea level rise for gradual retreat by applying land acquisitions and limiting expansion of infrastructure;
- *Green high elevation areas* for new urban centers that increase densities, shifting single-use to mixed-use development, expand infrastructure investments; and
- *Red low elevation areas* for major structural flood protection projects to protect significant economic and cultural assets essential to the city's future (downtown, seaport, several historic neighborhoods).
- *Purple high elevation areas* for establishing neighborhoods of the future.

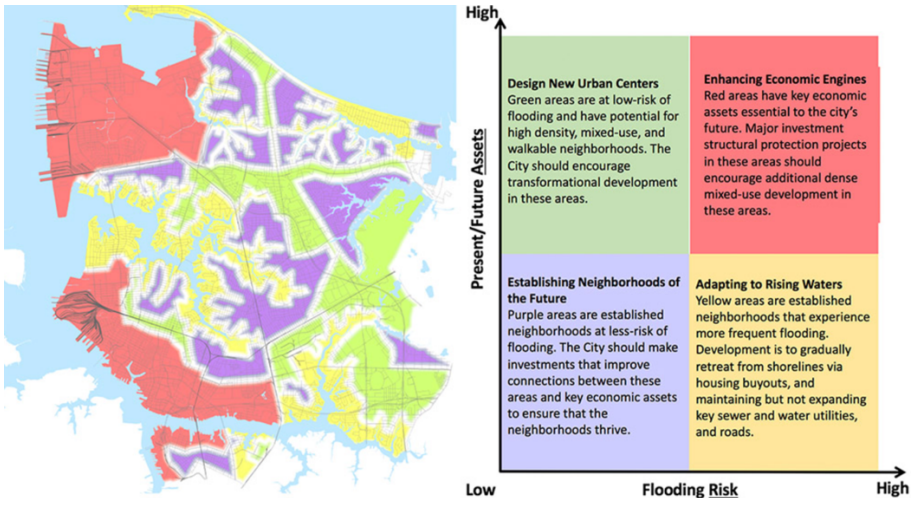

Figure 2.3: Norfolk's Vision 2100 includes land use strategies to address long-term vulnerability to coastal hazards and sea level rise.

Resilience metrics in the zoning ordinance were added to location criteria for community facilities in the hazard mitigation plan and comprehensive plan. Prior versions of the plans only included conventional metrics based on accessibility of populations to community facilities. In addition, information generated by the *Resilience Scorecard*^{TM} helped create a new zoning ordinance to better account for the variations in the "geography of resilience." Official notes from a public hearing initiated by the City Planning Commission indicated the information will be used to update development regulations and building standards, to strengthen stormwater infrastructure requirements, and to serve as a component of the fact base for preparation of a new comprehensive plan in 2020 (City of Norfolk 2017b).

The new data base for plan integration lead to increased public investments targeting flooding and environmental justice problems within the city. The city staff used the data to improve coordination among plan policies to be consistent with Vision 2100 and the hazard mitigation plan, and then to prepare proposals for external funding. As noted, a major need revealed by the scorecard was unjust policy attention aimed at socially vulnerable neighborhoods; that is, poor areas of the city received lower composite policy scores. In 2018, the city competed and won a $112 million award, sponsored by the U.S. Department of Housing and Urban Development's National Disaster Resilience Competition, that targets the historic Chesterfield Heights and Grandy neighborhoods -- poor neighborhoods comprised of a majority percentage of African Americans with 700 houses on the National Historic Register. Figure 2.1 shows that these two neighborhoods had the lowest composite policy scores in vulnerability reduction for the entire city. The city's proposal demonstrated that the award would be used to redress the historic legacies of under-investment and disproportionate impacts from floods by enhancing the city's ability to make public investments, improve quality of life and to stimulate market incentives for local job creation. In reflecting on the award, Paula Shea observed that, "when we go after grants for resilience…a fact base that demonstrates that plans are not at odds makes it clear that we know where we want to go in the future…we have our act together." Projects funded by the award, such as Resilience Park that covers eight acres (see Figure 2.4), must meet multiple goals framed from an equity perspective. Examples of the goals for the new park include more resilient neighborhoods to floods, better educational opportunities about the

role of natural systems, and improve neighborhood-based economic opportunities (City of Norfolk 2018).

Figure 2.4: Norfolk Resilience Park*

*The HUD award includes investments in the park to serve as an education center, and to connect the neighborhoods of Grandy and Chesterfield Heights with 10 acres of open space that integrates a flood berm, a restored tidal creek and wetland, and multiple amenities for community gathering, sports, exercise and play (City of Norfolk 2018).

Future Steps

Norfolk planners indicated several next steps for building city resilience. The city will use the data base and learning outcomes generated by the *Plan Integration for Resilience Scorecard*^{TM} to support resilience initiatives that are woven across urban sectors. The results in Norfolk exemplify how the resilience scorecard framework can be applied at different stages of plan development—from evaluating an existing network of plans, to guiding the development of new plans to coordinate with existing plans, and to changing development ordinances tools to be consistent with revised networks of plans. Future work will focus on all these stages.

Information generated by the scorecard will be used to inform the preparation of a new comprehensive plan starting in the year 2020. They will extend the city's prior experience that has been confined to strengthening resilience from the perspective of stand-alone efforts (e.g., hazard mitigation planning, resilience strategy and Vision 2100).

Norfolk planners learned from the scoring process that they need to place more emphasis on leveraging the uniquely central role that urban planning plays in local government policy making. They see that the information generated by the scorecard supports their key coordinating role in helping communities pose critical questions and devising holistic solutions to rising threats.

Norfolk planners believe that it is critical that the city continues to learn and share its experience with other communities. Planners identified the professional training and educational resources of the American Planning Association as a critical resource. They recommend that APA support educational opportunities for local practitioners that focus on proven best practices for integrating resilience into local planning practices. They also pointed out that the city continue participation in the Dutch Dialogues (WPA 2015) would be an important venue to continue learning and sharing experiences about how to live more naturally with water.

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City of Nashua, New Hampshire

The Setting

Nashua is the second largest city in New Hampshire and home to over 85,000 residents in 2018. It is an inland city situated at the confluence of the Merrimack and Nashua Rivers, and located approximately 45 minutes north of Boston, Massachusetts. Nashua has a significant risk of riverine flooding with the most devastating effects of flooding seen during the 1936 and 1938 flood events causing parts of the city to flood nearly 17 feet. Nashua also experiences flooding from precipitation events that are increasingly overwhelmed due to expansion of impervious cover from urban development and under capacity of stormwater infrastructure. The city has recognized that climate-sensitive hazards linking to flooding poses a future significant threat (City of Nashua 2019a).

Nashua is committed to build community resilience into the City's operations as indicated by several pioneering resilience initiatives. Nashua signed on to the Mayors National Climate Action Agenda in 2017. The city is incorporating resilience and adaptation into multiple planning initiatives, including a Downtown Riverfront Development Plan, a Climate and Health Adaptation Plan, and a Hazard Mitigation Plan. Nashua hired its first Community Resilience Coordinator in 2017 to spearhead citywide resilience efforts, and is partnering with the National Institute of Standards and Technology (NIST) in its first attempt to develop a proactive resilience plan (NIST 2019).

Nashua recognized that more must be done to coordinate its impressive array of diverse resilience initiatives. Priority concerns raised by city staff and leaders from outside government (particularly vulnerable populations and business interests) center on inconsistent prioritization of climate change across city government departments, variable stakeholder engagement, a climate resilience and hazard mitigation portfolio that is more reactive than proactive, and urban planning and emergency management processes that are poorly coordinated (City of Nashua 2018a). The city's Office of Emergency Management (OEM) took up this challenge by leading the development of a successful grant from the National League of Cities in 2018 to support a plan review process that uses the *Plan Integration for Resilience Scorecard*™. Objectives of the process are to: identify inconsistencies and conflicts across plans; prioritize resilience through use of green infrastructure, and climate adaptation and disaster mitigation plan policies; and build community partnerships to improve representation and strengthen engagement (National League of Cities 2018).

Forming a Team and Building a Resilience Coalition

Application of the *Resilience Scorecard™* was part of an ambitious citywide engagement program. A core team of plan evaluators worked in collaboration with an inclusive and diverse coalition of stakeholders called the Resilience Nashua Initiative (RNI). The core plan team included nine staff from municipal agencies (e.g., emergency management, urban planning, public health and community development) responsible for daily operations and planning that guide development and land use in hazard areas. Staff were selected from agencies that could make changes to land use regulations, building standards, and infrastructure investments that influence the safety of development. Justin Kates, Director of Office of Emergency Management, served as the main point of contact on the core team.

The RNI is a coalition of 40 representatives from multiple stakeholder groups, including utilities, businesses, conservation groups, and local government agencies. This coalition was formed with assistance from the National Institute of Science and Technology (NIST) that was supporting the city in risk-informed planning and decision-support for mitigating the impacts of natural hazards.

The broad aims of the RNI are to help the city lay the groundwork for long-term resilience to climate change and hazards by building a network of leaders that support resilience initiatives that extend beyond local government (City of Nashua 2018, p. 6). Justin Kates referred to the network as "ambassadors for resilience," who are looked to as both leaders and respected peers. By performing and endorsing behaviors that support resilience, the ambassadors are viewed as important role models to cultivate buy-in to the resilience agenda from across the city.

The core team of plan evaluators and the RNI undertook joint activities that were supported by Institute for Sustainable Communities at Texas A&M University throughout the plan evaluation process. As noted, this process involves co-developing a shared understanding between city staff, RNI stakeholders, and the university experts about the city's experience in applying the *Resilience Scorecard™*. City staff from the plan evaluation team and university team conducted a 2-day on-site training visit in February 2019, and monthly tele-conference meetings throughout the process (between January 2019 and September 2019) to respond to queries about application of the scorecard.

Selecting Plans

Core team members were ambitious in their desire to learn about the diverse perspectives of the future reflected by the broad range of planning activities in the city. Members decided to evaluate all plans at multiple levels of governance that could influence land use and development in hazard areas. They recognized that evaluating all plans would create a truly comprehensive and integrated data base that could inform critical policy decisions in revising plans and implementation actions at multiple levels, as well as to ensure compliance with federal requirements for hazard mitigation plans. Team members discovered dozens of plans adopted at the state, regional, county, municipal, and small area scales, as well as plans jointly adopted by local governments within the same region that could be influential. The City of Nashua alone had a diverse network of over 50 plans adopted over past 20-years including, for example, climate adaptation, public health, water resilience, flood hazard mitigation, street trees, transportation, economic development, and riverfront development.

Core team staff recognized that including all plans requires time and staff resources that extend beyond the team's capabilities. A decision was made to focus the scorecard on the local network of plans. By concentrating on local plans, team members believe they could more deeply learn about the complexities of planning in Nashua, as well as develop baseline data that could assist in better coordination of local plans and planning activities across local government agencies. The team applied a set of criteria for selecting local plans that were particularly influential on support for economic development, location of infrastructure that provides community facilities, public health, emerging threats from climate change, and focus on neighborhoods (City of Nashua 2018a, pp. 6-10). Many plans were over a decade old and are no longer relevant and influential, but core team members believed that evaluation of such plans yields a deeper understanding of the history success and failures in planning and policy in dealing with social, economic and environmental issues in the city. Local plans that did not

intersect with the hazard zones were not selected. Ultimately, 14 local plans were selected for analysis that operate at both citywide and small area scales (see Table 1). Staff acknowledge the importance of evaluating external plans to generate data needed to strengthen vertical consistency with state and regional plans, and horizontal consistency other local governments, but that the evaluation should be done in the future.

Table 1: Selected Nashua Plans

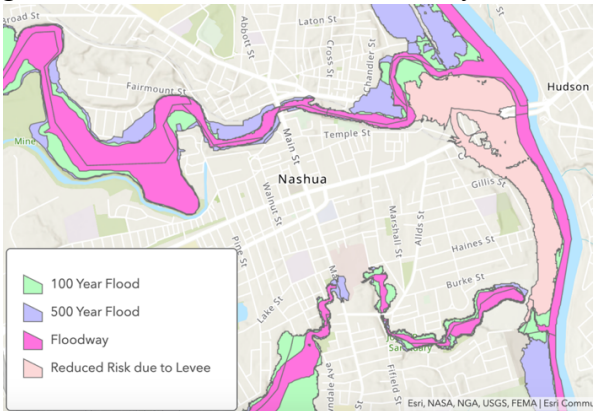
Nashua Master Plan (2000)
Consolidated Plan for CBDG and HOME (2015-2019)
Nashua Downtown Riverfront Development Plan (2017)
Beyond the Crossroads Positioning Nashua To Compete in the Global Economy (2005)
City of Nashua Hazard Mitigation Plan (2013)
Energy Plan for the City of Nashua (2011)
Exit 36 Study Area and Future Conditions (2014)
Nashua Economic Development Plan (2018)
Nashua Sanctuary Stewardship Plan (2003)
Nashua Tree Streets Neighborhood Analysis and Overview (2012)
Nashua Transit System Comprehensive Plan (2012-2025)
Complete Streets in Nashua (2016)
Small Area Plan: Nashua Downtown Master Plan (2003)
Small Area Plan: East Hollis Street Area Plan (2004)

Delineating District Hazard Zones

Nashua's approach to determining district hazard zones combined technical analysis with place-based narratives by residents. The first step in the technical analysis involved identifying geographic areas subject to current and future flooding. Four flood hazard zones were determined. The Nashua team decided to focus on the 100-year floodplain (1% occurrence probability per year) since it is used in formulating local hazard mitigation policy to administer and enforce NFIP (National Flood Insurance Program) land use and building standards. The team also prioritized climate change impacts on future flooding as future rainfall events are likely to be more severe relative to historical trends and that current flood hazard zones are likely to expand. The 500-year floodplain (0.2% occurrence probability per year) indicated on NFIP maps was used as a practical starting point to begin planning for future floods. By using the 500-year floodplains, the staff believed that this could serve as a projected expansion of current flood zones due to more extreme precipitation events linked to climate change and increased impervious cover from future urbanization of watersheds that traverse the city. Staff recognize that the 500-year flood does not account for specific changes in climate, but the intent is to begin to fill a gap in knowledge about current plan policies that influence population growth and development, and ultimately vulnerability of people and development in potential future hazard zones. Two additional flood hazard zones include the NFIP floodway and adjacent areas where all structures are restricted due high velocity flows, and reduced risk areas that are protected by levees.

The Nashua team then debated about the appropriateness of how to delineate district hazard zones. They chose to use the 43 U.S. Census Block Groups located entirely or partially in the hazard areas (see Figure 2.5). This small-scale unit of analysis would offer a fine-grained analysis of policy coordination across plans. GIS was then used to intersect the hazard zones with the block groups to define the district hazard zones.

Figure 2.5: District Hazard Zones, City of Nashua



Next, core team staff wanted to compliment the technical analysis used to determine district hazard zones with a place-based narrative of each zone. Place-based information on hazards can be particularly effective in building public awareness and action about hazards by shaping mitigation policy responsive to the needs and goals defined by local people. The narrative for each zone was created using crowdsourcing mapping technology that appears on the city's website, known as coURBANIZE. The coURBANIZE platform was utilized for the Resilient Nashua Initiative and proved useful in providing important information for the *Resilience Scorecard*™ plan review project (City of Nashua 2019b). A staff member on the core team observed that "This tool was innovative as it allowed community members who may not have been able to participate in public meetings to provide comments and input into all sectors of Nashua planning." The website enabled community residents to provide feedback on hazards they have experienced as well as community resources and facilities that are important to them. Figure 2.6 illustrates the riverfront area in downtown Nashua.

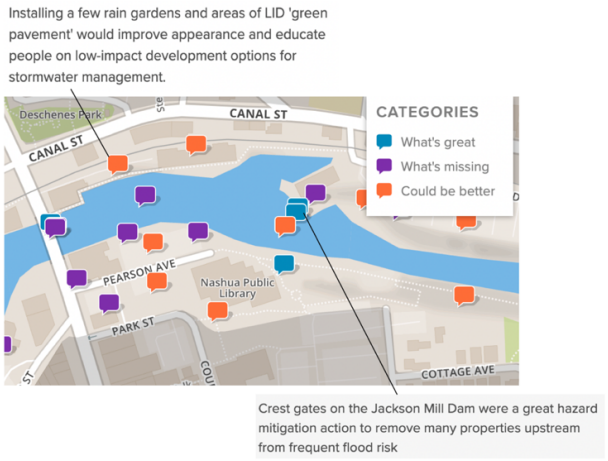


Figure 2.6. Downtown Nashua: Participatory Mapping using coURBANIZE and Comments
Source: City of Nashua (2019b)

Findings: Spatial Evaluation of the Network of Plans

The Nashua team spatially evaluated plans based on the 3-step procedure: extracting policies in plans; scoring each policy based on vulnerability outcomes; and spatially assigning

and summing policy scores to district hazard zones. The Nashua team created composite index score for each district hazard zone in the city (see Figure 2.7). Key findings revealed several strengths, gaps and inconsistencies in the city's network plans:

- A significant number of policies are included across all plans are aimed at reducing vulnerability, but many of these policies are reactive to addressing mitigation after a disaster event, rather than proactive policies aimed at reducing vulnerability before disaster events.
- The hazard mitigation plan primarily includes vague policies that lack spatial specificity in high vulnerability locations exposed to the 100-year and 500-year regulatory floodplains. Vulnerable areas include poor neighborhoods, historic districts, and areas with high potential for economic development.
- Multiple polices in the city's network of plans are inconsistent and in conflict. A notable example is the historic Millyard site located in the floodplain along the Nashua River. The Nashua Economic Development Plan includes land use and pubic investment policies that prioritize restoration and a high density, mixed use development project for this site (see Figure 2.7). Yet, the mitigation plan includes specific policies aimed at strengthening building standards and limiting increased density on the most exposed parts of the site.

At the time of writing this report, GIS maps illustrating the distribution of policy scores had not been completed. Maps are to be completed and used as part of the fact base for preparing a new comprehensive plan during the year 2020.

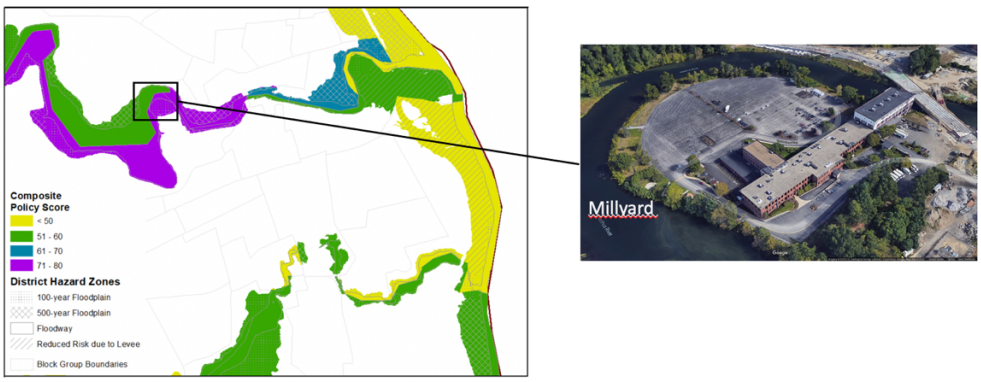


Figure 2.7: Nashua, NH: Composite Plan Policy Score by District Hazard Zone (left); Millyard Development District (right).

Tracking Change: Building Capacity and Producing Outcomes

Application of the *Resilience Scorecard*^{TM} produced multiple direct and indirect benefits. The plan review process supported local capacity building and outcomes to meet several of the city's highest resilience priorities, including: cross-departmental coordination on resilience; accessing and developing locally-relevant data to improve knowledge; and finding ways to plan for and design climate-resilient urban systems (see Figure 2.8).

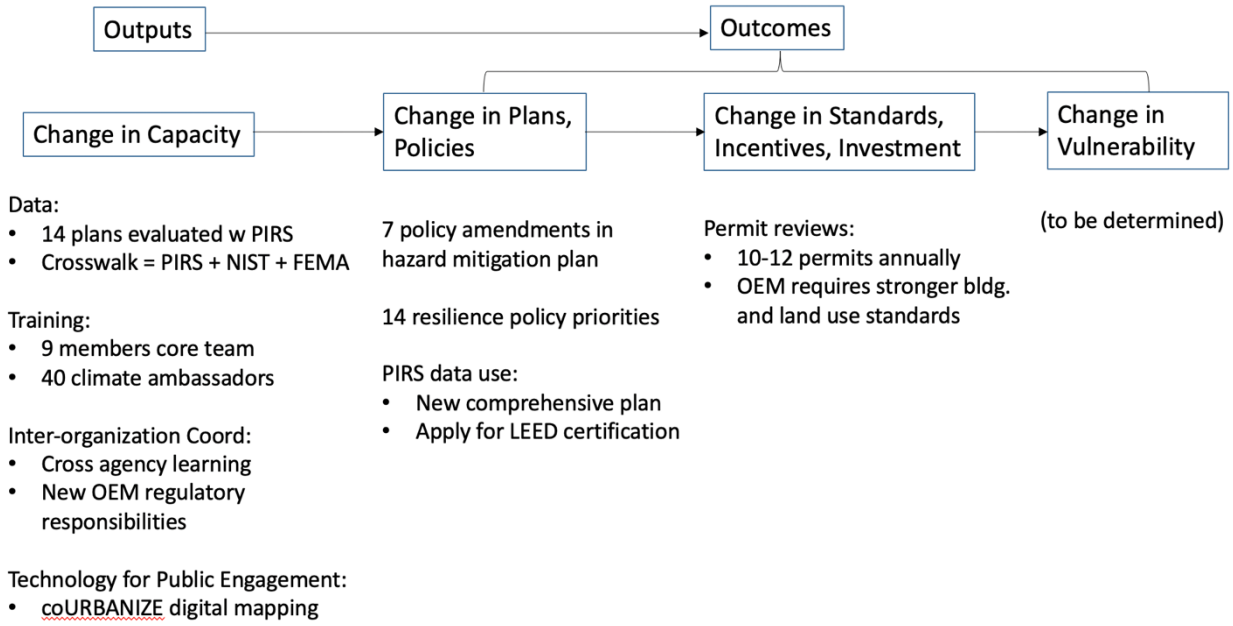


Figure 2.8: Changes Linked to the Scorecard Process in Nashua

Outputs: Building Change in Capacity

Learning about the depth and breadth of local planning initiatives is a critical output of the *Resilience Scorecard*^{TM} plan review process. As noted, the city has historically been active and committed to planning across a broad range of sectors from economic development and environmental conservation to climate adaptation and public health. However, these initiatives have frequently taken place in silos and have not been successful in institutionalizing resilience into city operations.

The scoring process enabled core team plan evaluators to learn about policies and plans of different agencies, and about the values and priorities of staff, as well as administrative rules and operations of diverse agencies. The general sentiment of learning is reflected by a comment by a team member, observing that "…using the scorecard was huge to help us understand what we had, what was out there." Another member noted that "The process required me to actually go through plans, understanding the history of planning…what exists and what doesn't." Working and learning together clearly increased capacity to identify congruencies, gaps and conflicts among the plans. As noted, information generated by the scorecard revealed a clear conflict between policies in the Nashua Economic Development Plan and policies in the Nashua Hazard Mitigation Plan focused on the riverfront Millyard district. This finding made it important to engage OEM and the Office of Economic Development throughout the process. As a result, consensus was reached between both agencies in revising policies for utilities and building codes in the local hazard mitigation plan to more explicitly focus on reducing vulnerability in Millyard (see Table A-1), and to give specific attention to vulnerability reduction in economic development initiatives in updating the new comprehensive plan during the year 2020.

Application of the *Resilience Scorecard*^{TM} generated a broader and more inclusive engagement effort beyond government. This included public engagement by residents in evaluating floodplain land uses and making suggestions for improvements through use of a

participatory mapping technology, and leveraging 40 local leaders of interest groups to be the "ambassadors of resilience" based on resilience educational/visioning workshops. These initiatives helped the community to understand risks and lay the groundwork for strengthening support for long-term resilience to climate change and hazards.

Nashua strengthened its analytical and collaborative capacity for planning by developing a unique integration of multiple tools the city applied throughout the Nashua Resilient Initiative. Figure 2.9 illustrates a crosswalk developed by Justin Kates, Director of Nashua's OEM, that aligns tasks included in the *Resilience Scorecard*^{TM} with resilience and mitigation planning tools and guidelines developed by federal agencies, including: the *FEMA Local Hazard Mitigation Planning Handbook* used by communities to guide preparation of local mitigation plans to meet 44 CFR 201 requirements; and the *NIST Community Resilience Planning Guide for Buildings and Infrastructure Systems* that sets forth a multi-step process to assist communities in identifying critical structures and to set goals for maintaining essential services like education, food, shelter, and businesses.

By integrating these *Resilience Scorecard*^{TM} with the planning tools, the crosswalk is an important contribution to creating a more comprehensive approach to community resilience planning than separately applying of each tool. Nahshua's approach takes advantage of the synergies among the tools, prevents confusion among planners and improves efficiency by minimizing duplication of tasks.

FEMA Local Mitigation Planning Handbook	NIST Community Resilience Planning Guide	TAMU Plan Integration for Resilience Scorecard Guidebook
Resources		Planning Districts
Task 2 - Build the Planning Team	Step 1 - Form a Collaborative Planning Team	Leadership and Forming Your Team
Task 3 - Create an Outreach Strategy		
Task 4 - Review Community Capabilities		Generate Lists of Policies, & Policy Task 3 - Validate and
Task 5 - Conduct a Risk Assessment	Determine Goals and Objectives	Combine Planning Districts and Hazard Zones to Form 'District-
Task 6 - Develop a Mitigation Strategy	4 - Plan Development	Change plans and development policy tools
Task 7 - Keep the Plan Current	Step 6 - Plan Implementation and Maintenance	
Task 8 - Review and Adopt the Plan	Step 5 - Plan Preparation, Review, and Approval	
Community	Step 6 - Plan Implementation and Maintenance	knowledge of planners and stakeholders

Figure 2.9: Crosswalk Resilient Nashua Inigtiative
Source: Kates (2019b)

Another positive output linked to the *Resilience Scorecard*^{TM} plan review process is a stronger role for OEM in mitigation policy implementation. Prior to the process, OEM staff had limited, if any, input to permit reviews. Because the process fostered learning and greater interaction among core plan review team staff about diverse agency plans and priorities for the community, the lead local agency for permitting (Community Development) recognized the unique expertise of OEM related to resilience, and thus requested that OEM take a more direct role in the city's permit review committee. Greater involvement provides opportunities for OEM staff to scrutinize proposed developments to incorporate vulnerability reduction practices that are prioritized by OEM.

Outcomes: Changes in Plans and Regulations

Multiple positive outcomes were produced as a result Nashua's improved capacity to integrate resilience into the city's planning and implementation efforts. Core plan review team members consistently observed that the *Resilience Scorecard*^{TM} produced a more disciplined and spatially specific approach to improving plans. A member summed the general sentiment of team by stating that "the PIRS review helped us to more carefully think through the spatial

impacts of policy scores across plans in different parts of the city. Prior attempts were aimless and undisciplined."

As noted, a notable example of the more focused approach is the update of the city's 2019 Hazard Mitigation Plan (City of Nashua 2019). The update exemplifies how the new information generated by the *Resilience Scorecard*^{TM} was used to revise vague policies that did not spatially target physically vulnerable and socially vulnerable locations. The revisions focused on district hazard zones that have negative policy scores and are highly vulnerable to floods -- Table A-1 in the appendix includes a complete list of the revised policies. Examples of revised policies include:

- voluntary land and property acquisition to remove structures in a flood-prone poor neighborhood near the downtown;
- green infrastructure investments to support stream restoration to ensure adequate drainage and diversion of stormwater in the downtown commercial areas; and
- proposed zoning amendments to limit or prevent new development on developable parcels adjacent to the Merrimack River (City of Nashua 2019, sec. 4.2, pp. 306-320).

The city will use information generated by the *Resilience Scorecard*^{TM} as integral part of the fact base for preparing a new master plan in the year 2020, and developing an application for LEED (Leadership in Energy and Environmental Design) certification. A major theme of the next master plan will be to build the city's resilience to hazards and climate change. To ensure that resilience will be a critical component of the master plan, the city included language requiring use of the information in a request for proposals by consultants to assist the city in preparing the plan. The request indicates that "the update of the hazard mitigation plan in 2019…and other community planning efforts [including the *Resilience Scorecard*^{TM}] are an essential resource to start building the new 2020 Master Plan" (City of Nashua 2019c, p. 6). In addition, Nashua is using the *Resilience Scorecard*^{TM} data base to be a LEED certified city. By receiving a LEED certification, a city receives international recognition for implementation of integrated planning for natural system resilience, energy, water, and other factors that contribute to quality of life. A key LEED credit category that aligns with the scorecard requires that cities develop "Integrative Processes" in the development of plans, development designs and sustainability strategies (LEED 2020).

Another outcome are the actual changes in permit review requirements, especially for proposed floodplain land use activities. As noted, OEM has a stronger role in providing input into development proposals during the permit review process. OEM staff estimated that compared to years prior to use of the scorecard, about 10 to 12 additional permits annually would be given more attention and scrutiny by OEM. We examined a recent set of permit reviews to identify examples of input by OEM (City of Nashua 2018b):

- require the design and upgrading of buildings to extend beyond basic damage reduction, but also to have the ability to maintain operations or quickly recover after disasters to reduce demands during recovery and speed the overall recovery process.
- point out that since Nashua participates in the Community Rating System (CRS), proposed developments are eligible for a CRS rating discount; and
- educate permit applicants by providing technical information on best practice examples of flood mitigation measures.

Next Steps

Justin Kates, Director or OEM, maintained that Nashua's future efforts to build resilience are threefold. First, future resilience planning initiatives must be integrated into a master (or comprehensive) planning effort, rather than be confined to stand-alone plans. Comprehensive planning offers a major opportunity to integrate information generated by the *Resilience Scorecard*^{TM} into policies and implementation practices across urban sectors. Prior experience in Nashua emphasized siloed, stand-alone plans has had limited implementation successes (City of Nashua 2019d). For example, OEM has historically been responsible for the completion of the hazard mitigation plan, but has limited authority and resources to carry forward the hazard mitigation and adaptation recommendations into implementation (City of Nashua 2019d). Thus, Kates believes that future resilience initiatives should be embedded into the comprehensive plan since this plan has the most legal standing and likely to generate the broader support relative to stand-alone planning.

Second, Nashua wants to improve monitoring plan performance in achieving resilience based on locally defined goals. Results from the *Resilience Scorecard*^{TM} require that emphasis should be placed on implementation and monitoring at the granular scale where integrated planning has considerable potential to impact neighborhood vulnerability. Change that is detected at the small scale is more directly felt by neighborhood residents compared to the conventional tracking of change at the citywide and regional scales.

Third, Nashua will strive to maintain engagement with national initiatives to share its experiences, and learn about readily available resources and proven best practices implemented elsewhere (City of Nashua 2018a). Participation in national conversations about local experiences like the Resilience Dialogues supported by the American Society of Adaptation Professionals, facilitates a local dialogue with subject matter experts external to the city in order to explore alternative ways to reduce vulnerability from climate change (Resilience Dialogues 2019). Nashua planners believe that the external review and feedback initiated by the Resilience Dialogues process can be extremely helpful to provide realistic alternatives to the city's resilience planning initiatives.

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Table A-1: Spatially Specific Policies in the 2019 Hazard Mitigation Plan Changed Based on Resilience Scorecard Plan Review

- *Infrastructure*. Improve drainage capacity of problem flood areas, particularly Wethersfield/Westwood, Shelly Drive and Browning Ave, Victor Ave at Emmett St, Westchester Dr, Wilmington Rd at New Searles Rd, Pemberton Rd at Belfast St, Park Ave/Lawndale Ave area, Courtland St/Hall Ave area; C, D, E Sts, Marshall St (Bowers to East Hollis), and Spaulding Ave., p. 308.
- *Land and Property Acquisition*. Remove structures from flood-prone areas to minimize future flood losses by acquiring and demolishing structures from voluntary property owners and preserving lands subject to repetitive flooding, particularly southern portions of 300 Main Street Marketplace, p. 312
- *Natural system protection*. Stream restoration to ensure adequate drainage and diversion of stormwater, particularly on Salmon Brook near Main Street. P. 312
- *Natural System Protection*. Prevent erosion with proper bank stabilization, sloping or grading techniques, planting vegetation on slopes, terracing hillsides, or installing riprap boulders or geotextile fabric, particularly on Nashua and Merrimack Rivers. P. 316.
- *Infrastructure*. Raise utilities or other mechanical devices above expected flood levels, particularly in areas likely to be redeveloped soon in the Millyard. P. 320.
- *Building code*. Wet floodproof basements residential and non-residential structures, which may be preferable to attempting to keep water out completely because it allows for controlled flooding to balance exterior and interior wall forces and discourages structural collapse, particularly in areas likely to be redeveloped soon in the Millyard, p. 320.
- *Zoning*. Identify best approach to prevent new development or to require flood-resilient site & building design in developable parcels adjacent to the Merrimack River, p.320.

City of Rockport, Texas

The Setting

The City of Rockport is the county seat of Aransas County and a notable tourist destination in the Texas Coastal Bend Region along the Gulf of Mexico. Residents and businesses are highly exposed to coastal storms as the majority of the city's geographic area (16.8 square-miles) is only seven feet above sea level, with 17% in 100-year floodplain and additional 10% in the extending from the 100-year to 500-year floodplain (Aransas County 2017). In August 25, 2017, Hurricane Harvey made landfall just to the south of the city as a Category 4 storm that inundated 45% of the city's land area. Rockport suffered major damage from wind and storm surge. Over 90% of homes experienced some level of damage and 30% of homes were destroyed entirely (City of Rockport 2020). The pre-Harvey population of 10,759 has declined by nearly 20% largely due to a displacement of low-income households. Affordable rental units sustained significant losses, but these units are less profitable to rebuild (City of Rockport 2020).

Community leaders were determined that rebuilding presented a "window of opportunity" that could transform the city to be safer, smarter, and more resilient. One local government official observed that recovery of the city was about "bouncing forward," rather than merely "bouncing back." Rockport initially engaged in the Aransas County Long-Term Recovery Plan to be eligible for federal recovery funds to start the arduous process on rebuilding of housing and the economy (Aransas County 2018). Soon after the disaster, the city invited a Recovery Planning Assistance Team (RPAT) from the American Planning Association to identify actions that can help the achieve the twin goals of an economically revitalized and disaster resilient downtown (RPAT 2020). Participation by Rockport in these activities forged a commitment to taking an integrated communitywide approach to recovery.

The next step was to incorporate the *Resilience Scorecard™* into the comprehensive planning and implementation process as a means to guide rebuilding and enhance resilience. Rockport planners considered the comprehensive plan to be the best vehicle to build in resilience across multiple sectors of planning for recovery. Among all types of local plans (e.g., climate change, hazard mitigation, transportation, housing), the comprehensive plan represents the principal form of local governmental planning and the primary planning policy instrument that coordinates land use and development across multiple urban sectors. Figure 3.1 illustrates the sequence of the planning process and role of *Resilience Scorecard™* used in Rockport.

Organizing a Core Team of Plan Evaluators for PIRS™

Application of the *Resilience Scorecard™* was guided by two key local agency staff who were associated with the comprehensive planning process. Amanda Torres, chief planner and certified floodplain manager, served as the main point of contact. Michael Donoho, Torres' supervisor, and Director of Building, Development and Public Works, was informed throughout the plan evaluation process and provided input in guiding development of the policy recommendations for the comprehensive plan.

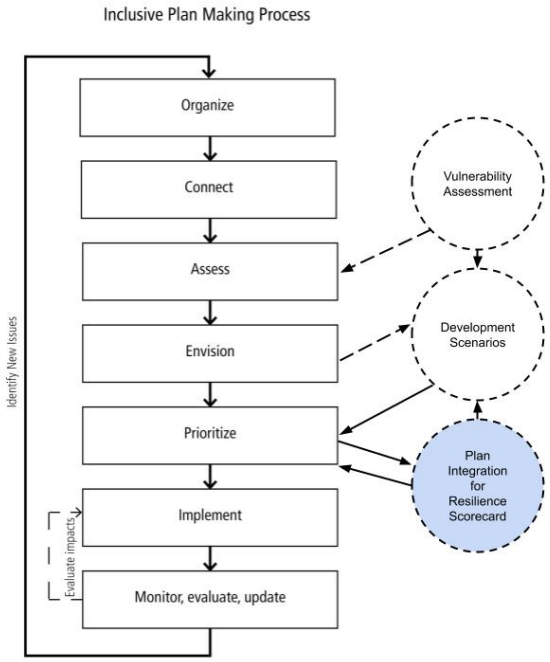


Figure 3.1: Expanding the Inclusive Plan-Making Model for New Plans (Masterson et al 2014)*

* The *Resilience Scorecard*^{TM} can be used in the development of new plans. As communities begin prioritizing goals, objectives, actions, and policies, the *Resilience Scorecard*^{TM} can be used to understand the range of policies across the network of plans, identifying opportunities to fold other plan's policies into the new plan, and pinpoint additional policy opportunities to be embedded into the new plan.

Because Rockport 's government has limited capacity and the city had to direct attention to the massive recovery effort, the staff needed significant technical assistance throughout the scorecard process. To facilitate application of the scorecard, Rockport requested and received additional funding from a local non-profit organization, The Harte Research Institute for Gulf of Mexico Studies. The additional support was used to employ a part-time planning expert from the Texas Sea Grant Program to lead in the evaluation of the network of plans. Torres participated on regular tele-conference meetings with the Texas Sea Grant planner and university experts between January 2019 and September 2019 to be informed about results generated by the scorecard and to seek advice on improving policy coordination of other plans with the comprehensive plan.

Selection of Plans

Rockport's team considered four plans and a zoning ordinance to be crucial in guiding land use and development decisions during the aftermath of Harvey (see table 3.1). A small area master plan and a zoning overlay code focused on restoration and preservation the city's historic downtown area. The county hazard mitigation plan emphasized mitigation practices funded by FEMA in the event of a federal disaster declaration, and the floodplain management plan prioritized improving policies to increase credits received under the National Flood Insurance Program's Community Rating System for household flood reduction premiums. The floodplain management plan was adopted a few months before the Hurricane Harvey disaster. Finally, the city participated in the development of the county long-term recovery plan that had an important

role in guiding rebuilding after Hurricane Harvey by enabling the city (and county) to be eligible for federal and state disaster recovery funds. As the comprehensive plan development process entered its final stage, an additional evaluation was conducted on the draft version of the plan using the *Resilience Scorecard™*. The evaluation focused on how well the plan policies are coordinated with the selected plans and overlay zoning code.

Table 3.1: Selected Rockport Plans

A Vision for Rockport: A Master Plan for the Heritage District and Downtown Rockport (2006)
Rockport Heritage District Zoning Overlay Code (2014)
Aransas County Long Term Recovery Plan and Report (2018)
Aransas County Multi-Jurisdictional Hazard Mitigation Action Plan (2017)
Aransas County Multi-Jurisdictional Floodplain Management Plan (2017)

Delineating District Hazard Zones

The Harvey inundation area was used as the primary hazard zone for scoring plans. This area incurred widespread damages, and resonated emotionally with residents. Local residents thought of this devastated area as a worst-case future scenario that should be prioritized in the preparation of the comprehensive plan. The 100-year (1% annual chance) and 500-year floodplain (0.2% annual chance) also served as the hazard zones in formulating mitigation policy since these zones should be plan policies should be consistent with land use and building standards of the National Flood Insurance Program. But the NFIP boundaries were considered too abstract to serve as the primary basis for guiding planning and application of the scorecard.

Rockport decided to use Census block groups as the preferred planning district since the city did not formally delimit neighborhoods. The city's extra-territorial jurisdiction (ETJ) was included in the study area, given recent annexations and the potential for more in the near future (certainly within the 20-year time horizon of the comprehensive plan). District hazard zones were delineated by intersecting the hazard zones with 17 Census block groups that cover zones in the city and the ETJ.

Spatially Evaluating the Network of Plans

The scores generated by the *Resilience Scorecard*™ reveal several strengths, gaps and inconsistencies in Rockport's network of plans. Figure 3.2 illustrates the spatial distribution of composite plan policy scores by district hazard zone.

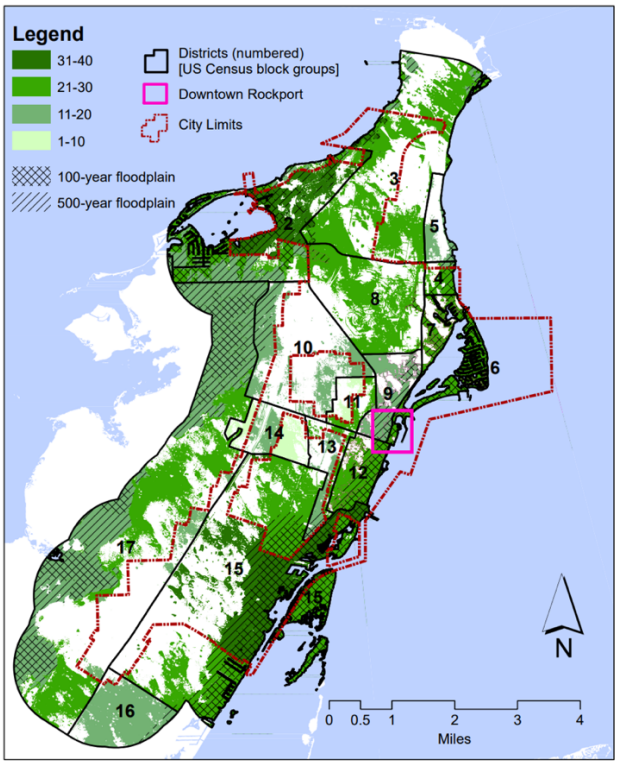


Figure 3.2: Composite Plan Policy Scores for All Plans by District Hazard Zone*
*Shaded areas outside of 100-year and 500-year floodplain indicate inundation by Hurricane Harvey

The analysis revealed several key findings. First, all district-hazard zones received positive composite scores, indicating that Rockport's network of plans support vulnerability reduction in three hazard zones (100-year, 500-year, Harvey inundation). As expected, the plans that specifically focus on mitigation -- hazard mitigation plan and floodplain management plan -- consistently received highest scores among all plans. The Master Plan for the Heritage District and Downtown Rockport had the lowest scores as the priority is to preserve historic structures, as well as support tourism and economic development.

Second, Districts 2 and 15 received the highest positive policy scores (see darkest green shades on Figure 3.2). Environmental protection policies received strong support as significant critical wildlife habitats and wetlands are present in both districts. District 2 is targeted by policies that support floodproofing of residential properties, acquisition of wetland areas, residential buyouts, and investment in stormwater drainage infrastructure. District 15 is targeted by policies aimed at reducing coastal erosion to preserve wildlife habitats, and bulkheads structures to protect economic assets of a marina.

Third, District 14 received the lowest policy scores. It is located inland of the downtown and was inundated by Hurricane Harvey. It does not contain 100-year and 500-year flood zones under the National Flood Insurance Program and is primarily a low-density development. As a result, it is subject to limited mitigation policy attention aimed at maintaining or improving drainage infrastructure for runoff generated by rainfall events, and city- and countywide policies for acquiring parklands and environmentally sensitive areas. Examples of policies that support increasing vulnerability include moderate density single family residential development and mixed-use development.

Fourth, hazard zones in District 9 that overlaps or is adjacent to the downtown has several conflicting policies from different plans. The district received the second lowest category of scores (see areas outlined in pink color on Figure 3.2). Examples of policies that increase vulnerability include:

- "Develop waterfront property along Water Street for condominium units, ground floor retail and restaurants..." in Master Plan for the Heritage District and Downtown Rockport (City of Rockport 2006, p. 3-9).
- "Secure funding for Heritage District & Downtown utility improvements, housing and economic development [to] help create a 'Developer-Ready' zone" in Aransas County Long Term Recovery Plan (Aransas County 2018, p. 49).

In contrast, examples of policies in the floodplain management plan that reduce vulnerability in the same location include:

- "Review and update zoning regulations to reduce population density in areas [including downtown] vulnerable to hazards" in Aransas County Multi-Jurisdictional Hazard Mitigation Action Plan (Aransas County 2017, p. 17-44)
- "Investigate grant opportunities for property buyouts, open space preservation, or other flood mitigation measures" in Aransas County Multi-Jurisdictional Floodplain Management Plan (Aransas County 2017, p. 65)

Tracking Change in Local Capacity and Outcomes

We tracked changes in Rockport's capacity (outputs) to support resilience planning, and the integration of resilience into the formation of the new comprehensive plan (outcomes) in the City of Rockport as a result of the scorecard application process. At the time of writing this report, plan implementation actions by the city were put on hold due to the coronavirus pandemic. Figure 3.3 illustrates the changes in capacity and outcomes influenced by the *Resilience Scorecard*™ plan evaluation process as of April 2020.

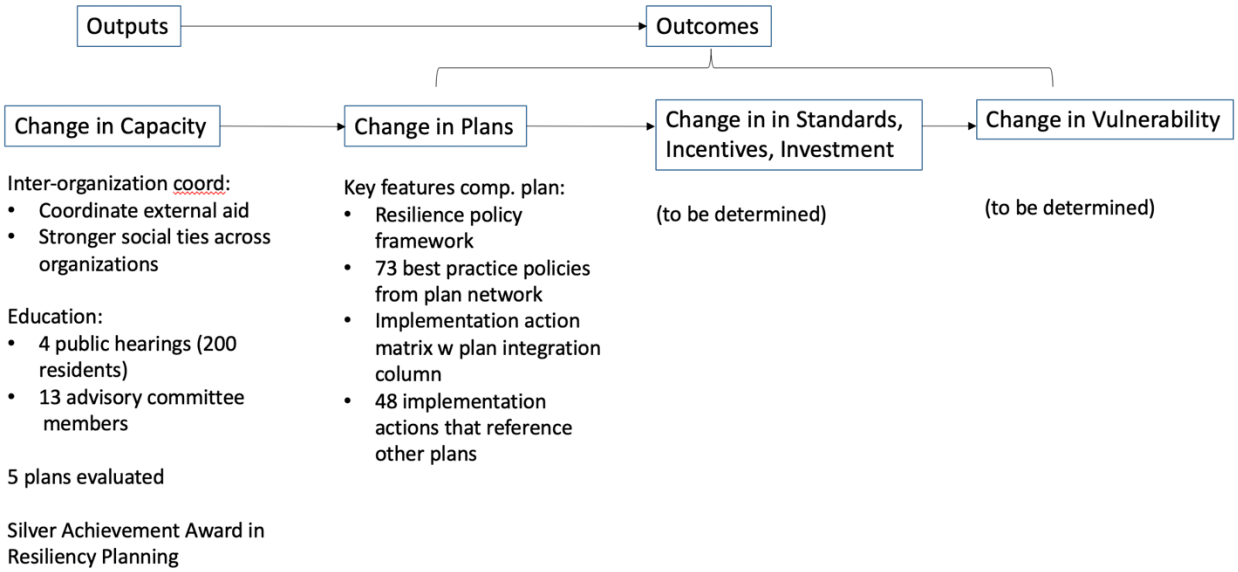


Figure 3.3: Outputs and Outcomes

Outputs: Change in Capacity

According to Torres, the *Resilience Scorecard™* served as a "filter to see how all the individual plans aligned" and enabled the city to "internalize resilience" across multiple sectors of disaster recovery. Similar to many local disaster recovery experiences (Olshansky and Johnson 2010), Rockport had to meet sometimes narrowly conceived requirements to qualify for different federal and state assistance programs ranging from affordable housing and public infrastructure restoration to property buyouts and structural flood protection works. The new information generated by the scorecard helped the city confront the dual demands of meeting local needs, as well as comply requirements for external disaster recovery funding. The city's commitment to resilience planning and recovery efforts was recognized by receiving a Silver Achievement Award in Resiliency Planning from the Texas Chapter of the American Planning Association in November 2019.

Although city staff did not directly evaluate local plans, the staff closely tracked the scorecard process throughout the comprehensive planning process. Results produced by the scorecard were disseminated through a range of plan making activities. Over 200 residents attended four public meetings associated with the new plan, and a 13-member advisory committee consisting of 9 residents that represent different stakeholder groups and 4 local government staff were regularly informed about purpose of the scorecard and gave feedback to findings.

Torres observed that the scorecard results increased the capacity of local officials to foster the development of an overarching policy framework that integrated resilience across all chapters (development, environment, housing, transportation, economy, facilities) of the new comprehensive plan. She maintained that the integrated policy framework serves to educate elected officials, agency staff, interest groups, and the general public about how diverse sectors of the community (tourism, heritage, hazard mitigation, environment) can work together to foster resilience. It also serves to guide city staff and elected officials in day-to-day decision-making by helping them stay on track toward achieving the long-range vision of resilience articulated in the plan.

The scorecard produced information that enabled staff to address two critical sets of issues. One set focused identifying best practice policies in the existing local network of plans that should be part of the policy framework of the new comprehensive plan. The other set focused on identifying specific policies and resources devoted to implementation of city's network of plans that could be leveraged in the implementation phase of the comprehensive plan. The county mitigation plan and county long-term recovery plan were prepared so that Rockport and Aransas County are eligible for federal recovery funds that flow through these plans. It was critical that the comprehensive plan policies and implementation actions be coordinated with the mitigation and recovery plans to achieve shared communitywide goals and priorities.

The connection to the county hazard mitigation plan and long-term recovery plan was important to the City in terms of motivating commitment to carry out comprehensive plan. One resident, after reading through the comprehensive plan said, "I was involved with the Long-term Recovery Plan and I see it discussed here. Everything we worked on in that is not lost and is built on." Another active participant on the recovery plan representing the county government noted that "after the countless hours we put in…I am thankful to see that our work matters."

Outcomes: Innovations Integrated into the Comprehensive Plan

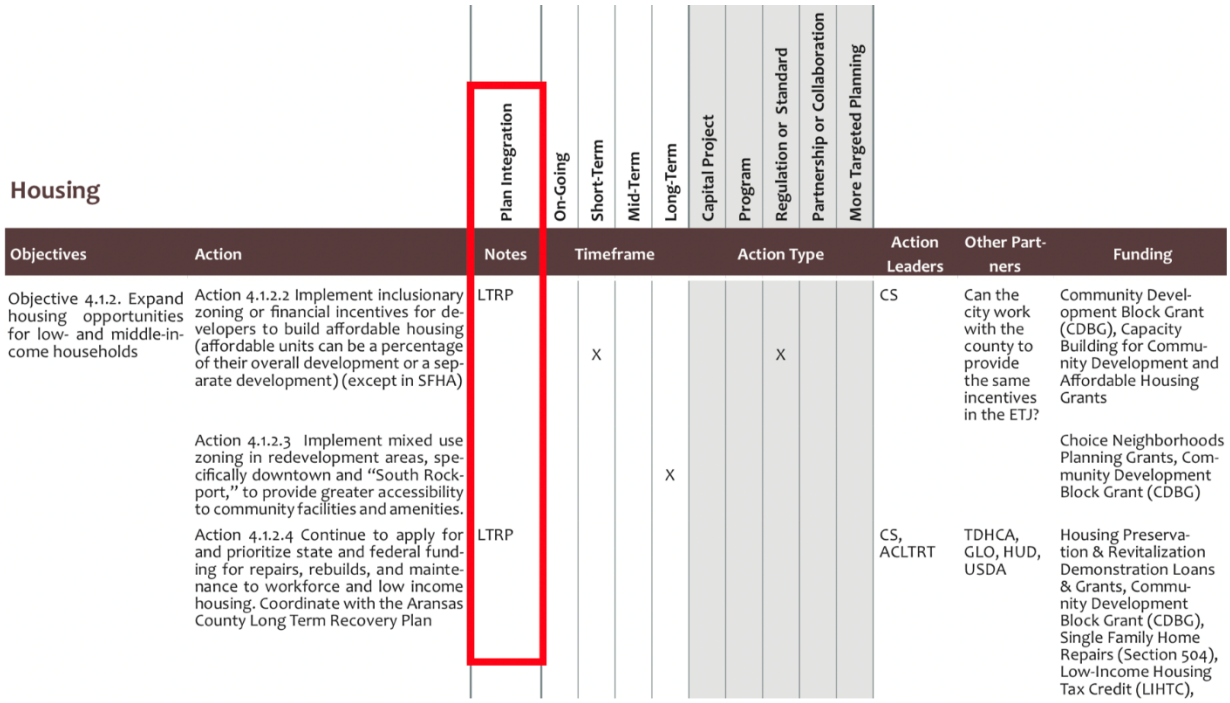
Several innovate measures within the comprehensive plan are included that demonstrate the benefits of the *Resilience Scorecard*^{TM}. A key measure involved integration of 73 policies into the comprehensive plan that were drawn from best practice policies included the local network of plans. The comprehensive plan document includes graphic illustrations using both icons to visually communicate and textboxes to describe how each policy coordinated with best practice policies from other plans. For example, Figure 3.4 illustrates a comprehensive plan policy drawn from the county multi-jurisdiction hazard mitigation plan (MHMP) that supports conservation easements and mitigation banking to protect wetlands that provide flood mitigation functions.

Figure 3.4: A page in the in the Rockport Comprehensive Plan illustrating a textbox of a Best Practice Wetland Mitigation Policy from the Aransas County Multi-jurisdiction Hazard Mitigation Plan (MHMP) (City of Rockport 2020, p. 125).

The practice of integrating policies from the network of plans into the comprehensive plan validates the work devoted the city's recovery. One resident described the importance of having a plan that encompasses the entire city. While there had been two city-wide comprehensive plans and a downtown plan in the past, the new one "includes more factors" that were identified by the entire community, which helped to expand the scope of the project as compared to the original plan. Several residents noted that it was a benefit to have a replacement plan for the one developed years earlier and were pleased that the new plan is "well-integrated" and offers balance solutions because of PIRS™.

Information generated by the scorecard fostered development of balanced solutions that meet multiple stakeholder values. Policies from the local network of plans were integrated into the comprehensive plan to simultaneously preserve the cultural heritage, promote equity and economic vitality, restore environmental systems, and enhance flood mitigation of the historic downtown. For example, policies from two plans integrated into the comprehensive plan attempt to achieve such balance. First, the Recovery Planning Assistance Team's plan calls for establishing a downtown tax incremental finance district to generate revenue to retrofit stormwater drainage to protect historic structures from flooding, and to invest in infrastructure improvements that support new development and attract tourists. It also includes a policy to use of FEMA post-disaster mitigation funds to create a living shoreline along the downtown waterfront to limit shoreline erosion and to improve amenities that bolster the tourist economy. Second, the County Long-term Recovery Plan includes policies to implement inclusionary zoning and financial incentives in the downtown district for developers to build affordable housing and to expand a market for businesses.

Consistent with recommendations for creating high quality implementation elements of comprehensive plans (Godschalk and Rouse 2015), the implementation chapter in the Rockport comprehensive plan specifies objectives, actions, and the timeline, organizational responsibility, and funding necessary for carrying out each action to achieve each objective. An implementation action matrix was created to display this information. A key feature in the matrix is "plan integration" column that includes references to other plans in the network associated with a given action. Information generated by the *Resilience Scorecard*™ was used to create the column that includes 48 references to other plans. Figure 3.5 shows an example of how actions aimed at expanding affordable housing after Hurricane Harvey are complimented by the long-term recovery plan (LTRP). By including the "plan integration" column, local officials are informed about resources and commitments from organizations in other planning domains that can be leveraged to improve prospects for successful implementation of the comprehensive plan. In so doing, the implementation matrix is designed to reinforce the overall theme of promoting policy alignment across the local network of plans. The implementation matrix is also used by city staff and city council to monitor progress. By including this column, it reminds staff and officials the consensus and greater impact of the policy ensuring future implementation.



Housing

Objectives	Action	Notes	Plan Integration	On-Going	Short-Term	Mid-Term	Long-Term	Capital Project	Program	Regulation or Standard	Partnership or Collaboration	More Targeted Planning	Action Leaders	Other Partners	Funding
Objective 4.1.2. Expand housing opportunities for low- and middle-income households	Action 4.1.2.2 Implement inclusionary zoning or financial incentives for developers to build affordable housing (affordable units can be a percentage of their overall development or a separate development) (except in SFHA)	LTRP			X					X			CS	Can the city work with the county to provide the same incentives in the ETJ?	Community Development Block Grant (CDBG), Capacity Building for Community Development and Affordable Housing Grants
	Action 4.1.2.3 Implement mixed use zoning in redevelopment areas, specifically downtown and "South Rockport," to provide greater accessibility to community facilities and amenities.						X								Choice Neighborhoods Planning Grants, Community Development Block Grant (CDBG)
	Action 4.1.2.4 Continue to apply for and prioritize state and federal funding for repairs, rebuilds, and maintenance to workforce and low income housing. Coordinate with the Aransas County Long Term Recovery Plan	LTRP											CS, ACLTRT	TDHCA, GLO, HUD, USDA	Housing Preservation & Revitalization Demonstration Loans & Grants, Community Development Block Grant (CDBG), Single Family Home Repairs (Section 504), Low-Income Housing Tax Credit (LIHTC),

Figure 3.5: Implementation Action Matrix and a Plan Integration Column

Next Steps

Amanda Torres observed that future efforts are aimed at implementing the comprehensive plan to build a stronger, more resilient Rockport. First, an immediate next step will involve development of a work plan to carry out the actions identified in the implement action matrix. Most actions will involve coordinating disaster recovery efforts across different sectors.

Second, the city's planning staff will be developing a parks and recreation plan consistent with the policy framework outlined in the comprehensive plan. This will involve identification of open space locations in floodplain hazard areas that are privately owned and likely to be developed. The locations most also be accessible to residents for recreational activities. The aim of the new park plan will be to guide use of parking funding in the most critical areas most exposed to coastal storm floods and sea level rise and increase community amenities.

Third, the city will initiate a project with the Nature Conservancy that ties parks and recreation planning with conservation and flood insurance. The Nature Conservancy has developed tools to help communities link conservation and restoration with the National Flood Insurance Program's Community Rating System. The aim is to create projects that generate CRS credits that reduce household flood insurance premiums, protect natural environment, and reduce risk to coastal storm floods and sea level rise.

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