

**Phil Berke, TAMU
DHS COASTAL RESILIENCE CENTER
RESEARCH PROJECT
YEAR 4 PROGRESS REPORT
July 1, 2018 – June 30, 2019**

Project Title:

Application of the Plan Integration for Resilience Scorecard (PIRS) to Practice

Principal Investigator Name/Institution:

Philip Berke, PI / TAMU

Other Partners/Institutions:

Jaimie Masterson, Investigator

Short Project Description (“elevator speech”):

We develop the *Plan Integration for Resilience Scorecard* (PIRS) to assist local practitioners assess the degree to which networks of plans are coordinated in risk mitigation and target geographic areas most prone to hazards. Our research tested PIRS in six coastal communities and found that plans are not fully consistent and do not always address the areas in a community most vulnerable to floods or sea level risks; moreover, some plans actually increase physical and social vulnerability to hazards. For this project, our primary objectives are: to document experiences of communities that have applied PIRS (City of Norfolk, VA and City of Nashua, NH); and to initiate new partnerships in applying PIRS with the City of Rockport, TX and the Port of Corpus Christi Authority. Results from the documentation will be used to refine the PIRS guidebook, training materials and plan scoring tool to ensure that they meet needs and requirements of different types of communities that vary in capacity to anticipate and plan for future risks. The documentation will be based on a participatory action research methodology. A top priority throughout the project is to continue our ongoing collaboration with federal agencies (FEMA, NIST), state agencies (New York Rising, Texas Sea Grant), and professional practice organizations, especially the American Planning Association, to demonstrate how PIRS can best support their local resilience planning programs.

1. Introduction and project overview:

Communities adopt multiple interdependent plans that significantly affect future community vulnerability to hazards. The plans are almost always independently prepared by distinct government agencies and interest groups. It is not surprising that the plans are often in conflict and can actually increase physical and social vulnerability to hazards. We develop a resilience scorecard that allows local planners, emergency managers and other officials to assess the degree to which the network of local plans integrate mitigation and recognize and respond to the physical and social vulnerabilities of geographic areas most prone to hazards. The information generated by the Resilience Scorecard is used to create strategies to resolve conflicts across plans and missed opportunities to improve community resilience.

A notable success story in applying the Resilience Scorecard to practice occurred in the City of Norfolk, VA. The city's planning department used scorecard results to help develop a fact base for a proposal to the National Disaster Resilience Competition that targeted a poor and underserved neighborhood that received low scores based on the scorecard evaluation. In 2018, the city received a \$112 million award to invest in a resilience project in the Ohio Creek watershed (figure 1), known as Chesterfield Heights area. Design work will be measured against several goals, such as improving amenities in the form of a park, enhancing economic development, and strengthening infrastructure and the built environment in vulnerable neighborhoods.



Figure 1: Norfolk Resilience Park as part of Ohio Creek Watershed Initiative

Another success story occurred in the City of Nashua, NH. The emergency manager, Justin Kates, led an effort that used both the Resilience Scorecard and the NIST Resiliency Planning Guidebook to create a comprehensive and integrated resilience planning framework for the city (figures 2 and 3). In collaboration with the Texas A&M and NIST teams, Kates created a crosswalk that demonstrates how to apply the Resilience Scorecard and Planning Guidebook to develop an Integrative Framework for Community Resilience (Nashua city staff indicate that the finalized version of the crosswalk will be complete in August 2019).



Figure 2: Nashua community members discussing the scoring and geographic placement of a policy as part of a *Plan Integration for Resilience Scorecard* activity.



Figure 3: Nashua city staff (Emergency Manager, Justin Kates, far left; Community Resilience Coordinator, Anna McGinty, far right; and City Planner, second from right) and Texas A&M team members (Jaimie Masterson, second from left; Matt Malecha, center, facing away; Siyu Yu, not pictured) discuss the process of policy evaluation described in the *Plan Integration for Resilience Scorecard Guidebook*, Nashua City Hall.

2. **Results:**

See comments above (Section 1: Introduction and project overview) about two examples of applications that took place in Norfolk and Nashua.

- Two published peer reviewed papers (see attachments).
- Revised second version of the guidebook for local practitioners based on our work with two demonstration cities, *Plan Integration for Resilience Guidebook 2.0* [mitigationguide.org, go to link Scorecard Guidebook]
- Completed a report on lessons learned and outcomes 18-months after the Norfolk demonstration effort was completed (see attachment).
- Initiated three additional pilot projects in Texas.
 - A community-based organization (Charity Productions) is partnering with poor minority neighborhoods in Houston in applying the scorecard. The objective is to track how well county, city and neighborhood plans

- (stormwater, housing, recovery, transportation, mitigation) to meet neighborhood needs after Hurricane Harvey.
- The Port of Corpus Christi Authority is collaborating with communities that experience growth related to port expansion in applying the resilience scorecard in order to better coordinate plans to reduce hazard vulnerability.
 - Rockport is applying the scorecard to guide preparation of the city's new comprehensive plan to assure alignment of multiple post-Harvey recovery initiatives in the city with the vision and strategies included in the plan.
 - Conducted a series of trainings:
 - Masterson, Jaimie and Justin Kates, emergency manager for City of Nashua, NH. May 23, 2019. Conducted a two-hour intensive workshop at the 2019 National Conference of Association of State Floodplain Managers (ASFPM). Twelve participants from public and private sector were in attendance.
 - Masterson, Jaimie and Philp Berke. December 11, 2018. Conducted introductory webinar for state and local practitioners, New York Rising.
 - Berke, Phil and Jaimie Masterson. February 8, 2019. NYS Pilot Scoping call. Discussed the opportunity of using PIRS in preparation for hazard mitigation plans and the state resilience initiative, New York Rising.
 - Masterson, Jaimie. October 15, 2019. State Chapter Conference of Texas Chapter of American Planning Association (TXAPA) Plenary. Moderated the opening plenary on Hurricane Harvey recovery and discussed the value of planning and plan integration with the PIRS tool.
 - Masterson, Jaimie and Matt Malecha. February 1, 2019. Texas Sea Grant Program. Conducted a second 2-hour workshop with planning extension agents on PIRS.
 - Malecha, Matthew and Jaimie Masterson. 11/29/2018. Texas Sea Grant / Community Resilience Collaborative. 'Train-the-trainers' session with Sea Grant Planning Specialist and administrative staff.
 - Malecha, Matthew and Siyu Yu. 06/18/2019. City of Rockport, TX. Plan Integration for Resilience Scorecard *for Disaster Recovery*. Training and discussion of preliminary scorecard results and future analysis.
 - Malecha, Matthew and Siyu Yu. 06/19/2019. Port of Corpus Christi, Corpus Christi Bay region, TX. Plan Integration for Resilience Scorecard *for Disaster Recovery*. Preliminary training and discussion of scorecard evaluation parameters in a new context (Port of Corpus Christi and neighboring jurisdictions).

Research Findings

Two sets of findings are revealed by two papers published in peer reviewed journals.

Findings from Berke et al. 2019

We examined the relationship between policies in local networks of plans with level of social vulnerability in neighborhoods of six cities along the Atlantic and Gulf coasts. The policies are designed to stimulate redevelopment in primarily poor and minority neighborhoods that are exposed to flood and sea level rise hazards. Findings reveal a "development paradox": policy scores in plans intended to stimulate development in socially vulnerable neighborhoods could

increase risk, which, in turn, escalates the potential for greater losses that could wipe out progress in development by failing to give attention to reducing risk.

This dynamic raised by the paradox is not new, nor is it unique to the communities included in this study. Planning efforts for major neighborhood improvement projects are often overtly designed to achieve wider development objectives in impoverished areas in high hazard locations, and this pattern is shaping urban areas in many parts of the world. Yet, development policy responses to achieve risk reduction and human development goals are undertaken independently and have been piecemeal or, at worst, conflicting.

Findings from Newman, et al. 2019

This paper offers a novel Geodesign procedure for creating master plans at the site scale that support neighborhood resilience. The procedure integrates a proactive plan evaluation using the Resilience Scorecard with landscape performance indicators. The Resilience Scorecard is used to evaluate the degree to which local networks of plans are coordinated (or in conflict) in support of neighborhood resilience. Landscape performance indicators are used to measure the projected impact of alternative design strategies that could be integrated into the plans. The indicators measure differences in outcomes of alternative strategies, including future stormwater runoff, groundwater replenishment, carbon sequestration, and energy use, as well as costs and economic benefits. In collaboration with neighborhood residents, design strategies were created that best support neighborhood resilience. Projections of impacts based on landscape performance indicators of each alternative were used as a guide to develop a resilient master plan for League City, Texas.

Products

- Revision of PIRS Guidebook 2.0 for local practitioners, updated software tool
- 2 published peer reviewed articles
- Lessons learned report on Norfolk's experience in applying the Resilience Scorecard (see attachment)
- 2 PhD dissertations completed at Texas A&M
- Developed training materials for local practitioners and tested with Texas Sea Grant and at ASFPM workshop.

3. End users:

- Charity Productions: In spring 2019, we initiated a partnership with this community-based organization (CBO) to apply the scorecard in three poor minority neighborhoods in Houston that experienced significant damages from Hurricane Harvey. This CBO represents neighborhoods internal to the city with little or no formal power, but with intimate knowledge about how their neighborhoods are affected by hazards and the appropriateness of risk mitigation policy interventions that reflect the needs of socially vulnerable groups.
- Texas Sea Grant, Texas A&M: We trained four coastal planning specialists employed by Sea Grant. They are currently working in collaboration with our group in three Texas communities, including Rockport, Corpus Christi and Houston.

- National Institute for Science and Technology (NIST): We are partnering with NIST in assisting staff of the City of Nashua, NH in attempting to integrate the Resilience Scorecard and NIST Resilience Planning Guide.
- FEMA: End user at FEMA has assisted NIST and the Texas A&M group in facilitating potential work with NY Rising. While the project has not been initiated to date, we have had numerous contacts with FEMA and especially appreciate their efforts.
- Port of Corpus Christi Authority, TX: We initiated a new project with the port staff in May 2019, expected completion date about February 2020.
- Nashua, NH: Over the past year we have been in continual contact and regularly provide technical assistance to city staff in applying the Resilience Scorecard. Nashua is expected to complete application of the scorecard in September 2019.
- City of Norfolk, VA: We completed our project with Norfolk, VA in Spring 2018, and have been collaborating with city staff in to prepare the lessons learned report (see attachment).
- Rockport, TX: We initiated a new project with the Rockport staff in January 2019, expected completion date about September 2019. Rockport is devastated by Hurricane Harvey.
- Association of State Floodplain Managers: Jaimie Masterson collaborated with Justin Kates of Nashua, NH (leads city team in applying the scorecard) is giving a training session on how to apply the Resilience scorecard at the 43rd. ASFPM National Conference, Cleveland, Ohio, May 2019.

4. Transition:

- We have had numerous discussions with senior staff at the American Planning Association. We focused on how we might co-develop communication, outreach and training programs. We hope to translate the scorecard to practice in working with APA through utilization of its extensive resources and outreach to 44,000 members.
- Completed demonstration project in Norfolk, VA and produced a lesson learned report (see attachment).
- Continued working with emergency management, GIS, resilience office staff in Nashua, NH in applying the Resilience Scorecard.
- Initiated three new community demonstration projects in Texas: poor minority neighborhoods in Houston, Port Corpus Christi Authority, and Rockport.
- Revised *Plan Integration for Resilience Guidebook 2*.

5. Project Impact:

- Raise Awareness/Knowledge. Risk mitigation practitioners in local governments and civic-based organization are using the scorecard to identify when and where local plans are in conflict and whether they focus on the local areas most vulnerable to specific hazards. With the information gathered using the scorecard, the officials inform the public and decision makers about conflicts and missed opportunities to improve local hazard mitigation planning.
- Changes Made by Local Governments. The demonstration communities (Norfolk and Nashua) indicate that the information produced by the scorecard influenced

changes and innovations in plans, development regulations and infrastructure investments. The changes include a range of impacts:

- steer new development and public infrastructure investments away from hazard areas;
- protect ecosystem (e.g., wetlands) that support hazard mitigation;
- avoid reproducing many pre-existing physical and social vulnerabilities during disaster recovery; and
- provide a fact base that supports change in development policies that create inequality and increase the uneven impacts of hazards on poor minority populations.

6. Unanticipated Problems:

NY Rising has not progressed as initially anticipated during discussions with FEMA and NIST. With NIST staff we conducted a webinar training for local officials in NY state, and had multiple conversations with state agency staff (Emergency Management and Department of State). We are appreciative of FEMA staff who worked to enable initiation of projects in two counties. We remain in contact with NY Rising staff and hope a project will evolve.

7. Student Involvement and Awards:

- Two doctoral students were supported: Siyu Yu and Matt Malecha, Urban & Regional Science, Texas A&M.
- A Landscape Architecture studio class (about 15 students) taught by Dr. Galen Newman applied the scorecard in Houston.

No minority students were involved. **However**, we did training and actively engaged poor minority neighborhoods. Specifically, in May 2019, we trained an early career African American planning practitioner based in Houston [Steven Washington of Texas Sea Grant; <http://texasseagrant.org/staff/steven-c.-washington/>]. He will be participating on a collaborative partnership to apply the scorecard in three poor minority neighborhoods in Houston that experienced significant damages from Hurricane Harvey during 2019-20. The partnership includes a highly regarded community-based organization -- Charity Productions, plus Mr. Washington and the Texas A&M team. The aim is to apply the scorecard to track how well county, city and neighborhood recovery plans (stormwater, housing, transportation, mitigation) are meeting neighborhood needs after Hurricane Harvey.

Degrees:

- You Jung Kim. 2019. PhD in Urban & Regional Science, Texas A&M
- Siyu Yu. 2019. PhD in Urban & Regional Science, Texas A&M

Awards:

2018 "TX-ASLA Award of Excellence," American Society of Landscape Architects, Texas Chapter (TX-ASLA). "*Resilience through Regeneration.*" Planning and Analysis Category, Graduate. Student Team: Xu qi Song & Rui Zhu

8. Interactions with education projects:

None

9. Publications:

Two New Publications Year-4:

Newman, Galen, Malecha, Matt, Yu, Si, Qipao, Z., Horney, Jen, Lee, Daemyung, Kim, Young., Lee, R.J., & **Berke, Philip**. 2019. Integrating a Resilience Scorecard and Landscape Performance Tools into a Geodesign Process. *Landscape Research*. DOI: 10.1080/01426397.2019.1569219

Berke, Philip, Siyu Yu, Matt Malecha, John Cooper. 2019. Plans that Disrupt Development: Equity Policies and Social Vulnerability in Six Coastal Cities. *Journal of Planning Education and Research*. (forthcoming).

Publications Prior to Year-4

Berke, P., Lee, J., **Newman, G.**, Combs, T. Kolosna, C., Salvesen, D. 2015. Evaluation of Networks of Plans and Vulnerability to Hazards and Climate Change: A Resilience Scorecard, *Journal of the American Planning Association* 81(4): 287-302. DOI: [1080/01944363.2015.1093954](https://doi.org/10.1080/01944363.2015.1093954)

Berke P., Malecha M., Yu S., Lee J., **Masterson J.** (2018). Plan Integration Scorecard for Resilience: Evaluating Networks of Plans in Six US Coastal Cities, *Journal of Environmental Planning and Management*, DOI:[10.1080/09640568.2018.1453354](https://doi.org/10.1080/09640568.2018.1453354).

Malecha, M., Brand, A., & **Berke, P.** (2018). Spatially evaluating a network of plans and flood vulnerability using a Plan Integration for Resilience Scorecard: A case study in Feijenoord District, Rotterdam, the Netherlands. *Land Use Policy*, 78, 147-157. DOI: [10.1016/j.landusepol.2018.08.011](https://doi.org/10.1016/j.landusepol.2018.08.011)

Masterson, J., Berke, P., Malecha, M., Yu, S., Lee, J., & Thapa, J. (2017) Plan integration for resilience scorecard: How to spatially evaluate networks of plans to reduce hazard vulnerability. College Station, Texas: Institute for Sustainable Communities, College of Architecture, Texas A&M. http://mitigationguide.org/wpcontent/uploads/2013/01/Scorecard_3Oct2017.pdf

Student theses and dissertations completed up through Year 4.

Su Yu. *The Influence of Plan Integration on Community Vulnerability and Ecological Resilience to Natural Hazards*. 2019. Landscape architecture and Urban Planning, Primary Advisor: Phil Berke

You Jung Kim. *Advancing Scenario Planning to Prepare for Uncertain Climate Change: Future Urban Growth Prediction and Flood Vulnerability*. 2019. Landscape architecture and Urban Planning, Primary Advisor: Dr. Galen Newman, Committee Member, Phil Berke

10. Year 4 Research Activities and Milestone Achievements:

Year 4 Research Activities and Milestones: Status as of 6/30/2019

Reporting Period 7/1/2018 – 6/30/2019			
Research Activity	Proposed Completion Date	% Complete	Explanation of why activity/milestone was not completed
Document the process in which PIRS is applied to the communities that combine the NIST resilience planning guide and the PIRS guidelines, and that are planning for post-disaster recovery. The process includes recording the results of local official evaluations of plans, actual changes in plans as a result of the self-evaluations, and actual changes in local development ordinances and infrastructure spending priorities.	5/15/2019	50%	Documentation of the process was completed for Norfolk, but not Nashua. Nashua fell behind schedule since GIS staff person left. Nashua plans to complete GIS mapping of scorecard results by August 2019. Documentation for Nashua should be complete by October 2019.
Conduct analysis of field notes of local officials' reactions to using the PIRS and documentation of outcomes due to PIRS.	5/30/2019	60%	Interviews completed in Norfolk, and initiated in Nashua. We plan to complete Nashua by November 2019.
Complete analysis of consistency between networks of plans and land use regulations in reducing vulnerability in Tampa, Florida.	5/30/2019	90%	All research has been completed. We are now writing the report with expected completion date August 2019.
Research Milestone			
Produce a 3-page research summary that concisely describes findings from applying PIRS for each community to a professional audience. Each research summary will include illustrations and concise explanations of each community's experiences, lessons learned and outcomes from the PIRS application process. The PI (Berke) has	6/30/2019	50%	Summary report based on documentation of changes and interviews is

found that research summaries are effective for conveying the results of research to mitigation practitioners and policy makers.			completed for Norfolk, and will be completed for Nashua by December 2019. We could not complete summery report for Nashua because city is behind schedule due to loss of GIS staff person.
Submit a paper for peer review that focuses on developing a user-friendly evaluation procedure to determine the degree to which land use regulatory ordinances (i.e., zoning) are consistent with networks of plans.	6/30/2019	20%	Need to complete research summaries for more demonstration communities.

11. Year 4 **Transition** Activities and Milestone Achievements

Year 4 Transition Activities and Milestones: Status as of 6/30/2019

Reporting Period 7/1/2018 – 6/30/2019			
Transition Activity	Proposed Completion Date	% Complete	Explanation of why activity/milestone was not completed
Continue working with Nashua, NH to apply the PIRS tool and integrate PIRS with NIST resilience planning guide.	3/30/2019	80%	We have worked extensively with Nashua for past year, and now waiting for the city to complete its application of the scorecard.
Continue working with New York Rising to undertake a community demonstrate project to show how PIRS could be applied in State of NY.	6/30/2019	0%	As noted, to date we have not initiated a project with a community in NY state.
Partner with 1-2 communities recovering in Texas from Hurricane Harvey to apply PIRS with recovery planning.	8/30/2019	100%	We have partnered with 3 communities in Texas.
Conduct at least two training webinars; one for FEMA, one or more for each of the following professional organizations NADO, ASFPM, APA. In addition, State Sea Grant or a state agency (planning, emergency management).	6/30/2019	100%	We have completed 3 training seminars for the Association of State Floodplain Managers, Texas Sea Grant, State of New York Rising and FEMA Region 2. Plus, one at State Chapter

			Conference of Texas Chapter of American Planning Association, 3 for local governments, and the Port of Corpus Christi.
Transition Milestone			
Update PIRS guidebook and related training materials. Updates will be based on applications of the guidebook working in partnership with a range of communities with different levels of capacity to plan for resilience. Investigators will document the strengths and weaknesses of each element in the guidebook based on end-user comprehension of concepts, recommendations on how best to organize local staff into work teams (mapping, policy, engagement), and capacity to undertake technical analyses (e.g., GIS mapping of hazards and evaluation of plans and basic vulnerability data). Knowledge gained in working with different types of communities (e.g., low and high capacity) in pre-disaster and post-disaster recovery settings will be used to improve the guidebook in ways that encourage use of PIRS by local officials (planners, emergency managers, county and city managers, and others). The focus will be making revisions that enable local officials: 1) to better comprehend how resilience planning concepts can be translated to practice; 2) to draw on experience of other communities in assigning tasks and organizing staff in applying the scorecard; 3) to more clearly identify readily available sources of mapped hazards, vulnerability, and plan policy data; 4) to facilitate use of the plan evaluation spreadsheet software scoring tool; and 5) to better understand how to use information generated by real world applications of PIRS to create solutions for improving integration of resilience across multiple sectors of urban planning, and land use and development regulations and investments.	6/30/2019	100%	
Update website that will house PIRS (mitigationguide.org). The investigators will work with engagement staff at the Institute for Sustainable Communities (PI Berke is Director) who are trained in website development to incorporate the updates of the guidebook and training materials that supplement use of the guidebook. Knowledge generated by application of PIRS with partner communities during year-4 will provide the basis for creating the updates. The updated website will significantly facilitate use by end-users by incorporating more information about real world applications of the guidebook and plan evaluation tool.	6/30/2019	100%	
Present the most up-to-date version of PIRS and local experiences in applying PIRS at one national conference linked to associations that represent professional practice that deal with mitigation (e.g., APA conference, ICMA conference, ASFM conference, National Hurricane Center Conference) or at a workshop organized by FEMA.	6/30/2019	100%	

12. Tables:

Table 1: Research Project Product Delivery

Product Name	Product Type (e.g., software, guidance document, knowledge product)	Delivery Date	Recipient or End User(s)
Plan Integration for Resilience Guidebook 2.0 (2 nd edition)	Guidebook and associated spreadsheet software	6/30/2019	Practitioners from the fields of urban planning, landscape architecture, urban design, emergency management, and community resilience, community-based civic groups active in mitigation and disaster recovery.
Application of Plan Integration for Resilience Scorecard: Lessons Learned from the City of Norfolk, VA	Lessons learned research summary report: Norfolk	4/30/2019	Practitioners from the fields of urban planning, landscape architecture, urban design, emergency management, and community resilience, community-based civic groups active in mitigation and disaster recovery.
Training Course	Draft for two-hour training course materials based on ASFPM workshop: ppt slides, Guidebook, case study to support in-class assignment involving review of plans.	5/23/2019	Practitioners from the fields of urban planning, landscape architecture, urban design, emergency management, and community resilience, community-based civic groups active in mitigation and disaster recovery.

TABLE 2: BERKE PERFORMANCE METRICS

Metric	Year 1 (1/1/16 – 6/30/16)	Year 2 (7/1/16 – 6/30/17)	Year 3 (7/1/17- 6/30/18)	Year 4 (7/1/17- 6/30/18)
HS-related internships (number)	0	0	0	0
Undergraduates provided tuition/fee support (number)	0	0	0	0
Undergraduate students provided stipends (number)	0	0	0	0
Graduate students provided tuition/fee support (number)	2	2	2	2
Graduate students provided stipends (number)	3	3	3	0
Undergraduates who received HS-related degrees (number)	0	0	0	0
Graduate students who received HS-related degrees (number)	0		0	2
Graduates who obtained HS-related employment (number)	0		0	1
SUMREX program students hosted (number)	0	0	0	0
Lectures/presentations/seminars at Center partners (number)	0	3		8
DHS MSI Summer Research Teams hosted (number)	0	0		0
Journal articles submitted (number)	0	2	2	2
Journal articles published (number)	0	0	2	2
Conference presentations made (number)	3	5	2	4
Other presentations, interviews, etc. (number), webinars	1	6	2	1
Patent applications filed (number)	0	0	0	0
Patents awarded (number)	0	0	0	0
Trademarks/copyrights filed (number)	0	0	0	0
Requests for assistance/advice from DHS agencies (number) (FEMA, NIST)	0	1	2	2
Requests for assistance/advice from other agencies or governments (number)	0	9	3	8
Dollar amount of external funding	\$200,000	\$250,000	\$2,490,000	0
Total milestones for reporting period (number)	2	2		5
Accomplished fully (number)	2	1	4	3
Accomplished partially (number)		1	1	2
Not accomplished (number)	0	0	0	0