**BERKE- TAMU**
**DHS COASTAL RESILIENCE CENTER**
**RESEARCH PROJECT**
**YEAR 3 PERFORMANCE REPORT**
**AND**
**FINAL PROJECT REPORT**

Project Title: Local Planning Networks and Neighborhood Vulnerability Indicators

Principal Investigator Name/Institution: Philip Berke, Texas A&M

Co-Principal Investigators and Other Partners/Institutions:

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Project Start and End Dates: 1/1/2016 – 6/30-2018

Short Project Description ("elevator speech"):

A primary objective is to develop a tool and user guidelines to assist local planners and emergency managers to integrate hazard mitigation into planning in all relevant sectors of urban development. Failure to coordinate networks of plans can significantly compound the growing risks to disaster events. Development and validation of the tool requires testing in communities to assess how well networks of local plans (land use, hazard mitigation, economic development, transportation) integrate mitigation practices that govern development in hazard areas.

Summary Abstract:

We apply a *Plan Integration for Resilience Scorecard* (PIRS) in six US coastal cities. Our research objectives are twofold: (1) to evaluate the degree to which hazards mitigation is integrated throughout network of plans in different geographic areas exposed to hazards; and (2) to evaluate the degree to which the network of plans recognizes and targets areas where the built environment is vulnerable to hazards. We find that plan integration scores vary widely across the cities, and that some plans actually increase vulnerability in hazard zones. Policies also frequently support mitigation in areas with low vulnerability, rather than in areas with high vulnerability.

We engaged three additional communities to translate PIRS to planning practice. In partnering with local officials, we adapted PIRS to fit mitigation planning practice through the lens of local practitioners. Our aim is to improve the capability of local partners to self-evaluate their own networks of plans. We found that PIRS generates information to improve hazard planning by allowing planners to identify conflicts between plans, assess whether plans target areas that are most vulnerable, and better inform decision makers about opportunities to mainstream mitigation into multiple sectors of planning.

We developed a *PIRS Guidebook* for practitioners, and training materials (scoring tool, video of lectures, ppt slides) to guide local application of PIRS that are publicly available [see, mitigationguide.org]. We gave five webinars to national and state audiences, eight presentations at national conferences, and generated three funded proposals that showcase PIRS (two from NSF at $2.2 million and one from the Texas One Gulf Program at $90,000).

**REPORT NARRATIVE:**

1. Research Need:

Fragmentation and poor integration among the diverse range of sectors of planning has led to siloes in which mitigation planning is isolated from other planning. Hazard mitigation specialists have long been concerned about the implications of lack of integration of mitigation across local planning sectors, which can significantly compound future risks. Failure to coordinate integration of multiple planning activities that govern land use in hazard areas has become a national policy concern. This was acknowledged by the Federal Emergency Management Agency director Craig Fugate's call in 2010 for more integration of hazard mitigation efforts into all types of local planning and more cooperation between emergency managers and planners (Fugate 2010). Although Fugate's observation was made nearly a decade ago, recent DHS funded research substantiates its relevance (Berke et al. 2012, Lyles and Berke 2014).

Berke, P. R., Smith, G., & Lyles, W. (2012). Planning for resiliency: evaluation of state hazard mitigation plans under the Disaster Mitigation Act. Natural Hazards Review, 13, 139–150.

Fugate, W. C. (2010). "Integrating Hazards into Local Planning," Foreword to Hazard Mitigation: Integrating Best Practices into Planning, James Schwab, editor, Planning Advisory Service Report 560, American Planning Association, Chicago, IL, 2010: iii-iv).

Lyles, W., Berke, P., and Smith, G. (2014). "A Comparison of Local Hazard Mitigation Plans in Six States, USA." Landscape and Urban Planning 122: 89–99. https://doi.org/10.1016/j.landurb plan.2013.11.010.

2. Project History:

We reviewed the literature in hazard mitigation planning to identify how mitigation can be supported thorough different types of local planning activities (economic development, land use, capital improvement programs, environment) that influence land use and development patterns in hazard areas. We then developed a conceptual framework to guide development of a *Plan Integration for Resilience Scorecard* (PIRS). The scorecard includes two sets of geospatial indicators to measure the level of: 1) integration of hazard mitigation policies in a local network of plans in different geographic areas; and 2) social and physical vulnerability in different geographic areas. Next, we systematically applied PIRS in six demonstration coastal communities to evaluate the level of integration that local plans support mitigation, and the degree to which the network of plans prioritize vulnerability reduction in different geographic areas. Finally, we engaged three additional communities to translate PIRS to planning practice. We developed training materials to guide local application of PIRS.

3. Results:

*Research*. Two core sets of findings are derived to date from our research. For *physical vulnerability* to the built environment, we find that plan integration scores vary widely across cities, and that some plans actually increase vulnerability in hazard zones. Policies also frequently support mitigation in areas with low vulnerability, rather than in areas with high vulnerability. For *social vulnerability*, we find that local plans are not fully integrated and do not always address the areas where marginalized populations are most vulnerable; moreover, some plans actually actively increase vulnerability in neighborhoods with the most marginalized populations.

*Community engagement*. We created a Plan Integration for Resilience Scorecard (PIRS) derived from research in six communities (see, mitigationguide.org). The research-driven scorecard was converted into a user-friendly tool that enables local officials to self-evaluate their community's network of plans. We produced a *Plan Integration for Resilience Scorecard Guidebook* that provides end users the opportunity to identify when and where their community plans are in conflict, as well as how well they target different geographic areas of the community that are most vulnerable. The new knowledge generated by application of PIRS allows local officials to engage the whole community regarding 'missed opportunities' to strengthen local hazard mitigation planning, and to improve the integration, consistency, and responsiveness of their networks of plans. We completed a collaborative effort with local officials in Norfolk, VA and we are currently working with Nashua, NH and League City, TX. Norfolk actually revised its plans as a result of application of PIRS.

*Webinars*.

- Model Forest Policy Program, September 2016
- Planning Information Exchange (PIE) of the Association of Floodplain Managers and the American Planning Association, October 2017
- FEMA PrepTalk, January 2018
- FEMA-Community Planning and Capacity Building (CPCB), June 2018
- Louisiana Sea Grant Program, July 2018

*Targeted Outreach.*

- American Planning Association- Hazard Mitigation and Disaster Recovery Division Newsletter, 2016
- National Planning Conference, Hazard Mitigation and Disaster Recovery Division Meeting, Phoenix, April 2016
- National Hurricane Conference, New Orleans, March 2017
- National Planning Conference, New York City, May 2017
- Association of State Floodplain Mangers Regional Conference, New Jersey, June 2017
- Natural Hazards Workshop, Broomfield, July 2017
- Texas Sea Grant Program, College Station, February 2018
- National Hurricane Conference, Orlando, April 2018

*Leveraging for additional funded projects*.

- Berke received funding for two NSF proposals (NSF RAPID, $200,000 2017-18, and NSF CRISP $2 million 2019-23) in which PIRS has a central role.
- Berke leveraged another NSF project ($200,000 2016-2020) under the Partnerships for International Research & Education (NSF-PIRE) that supported three doctoral students to apply the PIRS in three different cities in the Netherlands.
- Berke received funding ($90,000 2018-19) from the Texas One Gulf program to apply PIRS to communities recovering from Hurricane Harvey.

4. End Users and Transition Partners:

We are engaging end-users through creation of a National Advisory Committee, direct contact with FEMA officials, and involvement of local government staff in the demonstration communities.

We have recruited and convened a National Advisory Committee to strengthen partnerships and collaborations with the practice community and to ensure the applicability of the scorecard for mitigation practitioners. Members include key leaders in the practice community:

-Chad Berginnis, Director, Association of State Floodplain Managers
- Nat'l Coordinator for Community Recovery Planning & Branch Chief for Community Planning and Capacity Building of the Interagency Coord. Div.,FEMA
-Jennifer Ellison, Community Development Coordinator, City of Urbandale, Iowa
-Allison Hardin, Urban Planner, City of Myrtle Beach, SC
-Barry Hokanson, Director, Hazard Mitigation and Disaster Recovery Division of the American Planning Association & Mitigation Planner, PLN Associates
-Darrin Punchard, Mitigation Planner, Hawksley Consulting
-Gavin Smith, Exec. Director, Coastal Resilience Center, University North Carolina

The Committee met about every 4-months via teleconference with project investigators during a two-year period. Committee members offered guidance in the development of the PIRS tool, assisted with dissemination of project results, and provided oversight and strategic advice to the research and translational activities. The Committee also served to enhance communication between the project researchers and the practice community.

FEMA is the primary end user for this project. Our primary point of contact at FEMA has been Matt Campbell who also serves on our National Advisory Committee. We also kept in regular communication with our OUP Program Manager (Eleanore Hajian) about progress of this study through emails, conference calls, and preparation of a brief research summary report.

Finally, our engagement efforts focused on local officials in multiple cities. It is the local community where all aspects of planning come together. We engage local agency staff charged with responsibilities for planning. Local officials that have been engaged include, for example, emergency management, resilience officers, land use planning, economic

development, and environmental conservation. These end users are typically charged with preparing, updating and reviewing the diversity of local plans that influence land use and development in hazardous areas.

By the end of the project period in June 2018, we have initiated multiple potential engagement projects in communities. We completed a successful 12-month engagement effort with Norfolk, VA. We initiated work in Nashua, NH in Spring 2018 in partnership with NIST (Steven Cauffman, lead contact) focused on integrating PIRS with the NIST *Community Resilience Planning Guide* in Nashua, NH. We plan to continue this collaboration with NIST in several additional communities over the next two-years with DHS support. We also are doing long-term engagement work with League City, TX where we are applying PIRS in a Hurricane Harvey disaster recovery planning effort.

5. Project Impact:

*Summary of Impacts*
As noted, we developed the PIRS tool to enable local officials to self-evaluate their local networks of plans. We also prepared a guidebook for training local officials on PIRS. Application of PIRS has had multiple impacts: raised knowledge and capacity of local officials to better support mitigation; provided a fact base that has been used to revise plan policies to improve integration of plans; improved land use regulatory practices and standards to be consistent with plan revisions and to better integrate mitigation into urban development projects.

We completed a collaborative effort with local officials in Norfolk, VA in applying PIRS. Norfolk actually revised its plans as a result of application of PIRS and has revised its development ordinances to be consistent with the network of plans. In collaboration with NIST, we are currently working with Nashua, NH in combining efforts to jointly apply PIRS with the NIST *Community Resilience Planning Guide*. We also are working with League City, Texas, in applying PIRS in assisting them preparing post-Harvey recovery plans, and to extend PIRS to include an evaluation component that assess the degree of integration of local networks of plans with land use regulations in different geographic areas.

*Detailed review of impacts:*
In our work in applying the scorecard in the three demonstration communities we tracked four types of impacts likely to occur at different stages of the plan review and implementation process:

Impact #1: Changes in knowledge by urban planners, emergency managers and stakeholders about roles of alternative plans and how they can be better integrated to increase support for mitigation, reduce duplication of effort, and more efficiently use limited resources.

Impact #2: Revision and better integration of vulnerability reduction into a community's general plan, hazard mitigation plan, and other local plans.

Impact #3: Revision of a range of development policy tools that influence land use and development in hazard areas to be consistent with the revisions of plans. Examples of policies include development regulations (e.g., zoning and subdivision ordinances), incentives (density bonuses, property tax breaks), land acquisition strategies, and design and location of capital improvement projects (transportation, water, sewer).

Impact #4: Changes in vulnerability outcomes that limit or prevent new development (and population) in hazard areas, or reduce vulnerability of existing development (and population) in hazard areas in different geographic areas.

Impact #1 (change in knowledge of planners and stakeholders) begins soon after (1-3 months) a community starts to apply the scorecard. This impact indicates that plan review is not just about the scores. Based on our work with the demonstration communities to date, we are finding that a valuable contribution resulting from application of the scorecard is a collaborative process that yields information about how specific policies that influence public and private land use and investments within a plan and the network of plans. Application of the scorecard provides a deeper understanding and comprehensive assessment of how multiple plans, that may not directly address hazard mitigation, are conclusively linked to mitigation and disaster loss.

For example, the City of Nashua saw the scorecard as so valuable they developed an interactive web-mapping tool to score plans. Stakeholders are able to log in to the mapping website to understand the integration of their network of plans. Additionally, Nashua planners felt some policies were unclear. Going forward, the city will use the scorecard process to update their hazard mitigation plan and draft a new comprehensive plan, with clearer policies that incorporate hazard exposures. This knowledge, along with Resilience Dialogues recommendations and HAZUS analysis are being fully integrated into the new hazard mitigation plan updates.

Examples of comments by local officials in the demonstration communities indicate the high value they place in gaining a better understanding of their networks of plans through application of the scorecard:

- "We wanted to see the effect of all our policies on flood resilience because we had never taken such a comprehensive look our policies before. It was also an opportunity to see how different plans stacked up, particularly because we had not previously evaluated the hazard mitigation plan side by side with other community plans." –City of Norfolk;
- "We were very intrigued by the spatiality of our policies and hadn't thought about our policies spatially before. This was important to us because our Vision2100 document specifically designates areas of flood protection and retreat." –City of Norfolk;
- "We utilized this to update our comprehensive plan and zoning ordinances" –League City;
- "It is important for practice that you are tracing back to the policy." –League City
    - "The Resilience Scorecard was a great tool to allow us to evaluate our existing plans and policies against the backdrop of resilience. Perhaps most revealing were not

inconsistencies in our plans, but that we had not fully incorporated all our policies and actions aimed at resilience into our most important policy document, our comprehensive plan. Following our participation in scoring Norfolk's plan, we undertook a major plan amendment to more fully incorporate our Hazard Mitigation Plan as a key element in our comprehensive plan. As we kick off the drafting of our next comprehensive plan later this year, we plan to revisit our scores from the Resilience Scorecard to better guide future development and investments that will maximize our opportunities to transform Norfolk into a resilient waterfront community." – George Homewood, FAICP, CFM, Planning Director

Examples of comments from the 40-member stakeholder meeting during an interactive activity we conducted in June, describe the "Aha" moments various departments and agencies had in Nashua:

- "This policy recommends increasing development in the floodplain. Clearly we want to encourage development in the Mill Yard District, but not in floodplain." –City of Nashua stakeholder
- "Many of the policies are too vague and need to be more targeted." (the scorecard reveals weak policies that could more specifically speak to hazards, vulnerability, and actionable policy tools) –City of Nashua stakeholder
- "We are required to create a consolidated housing plan for HUD. We see that vulnerable groups are identical to the SoVI census tract that are most vulnerable and the plan scorecard results." –City of Nashua stakeholder
- "We need to update our masterplan to address hazards." –City of Nashua stakeholder
- "Drainage capacity can only be done to a certain extent. We need to address open space in floodprone areas and regulations on development at the same time." –City of Nashua stakeholder
- "We need to look at areas not developed. The city needs to decide about how to develop the parcels in the floodplain." –City of Nashua stakeholder

Impact #2 (change in plans) and Impact #3 (change in regulatory and investment policies) will likely occur in the mid-term (3-12 months) after completion of our engagement efforts in the demonstration communities this summer 2018. We will document these changes up to the summer 2018, and continue to track changes if funding for this project is extended. To date, change in plans and policies have included amendments to several components of planning documents of the City of Norfolk. Staff planners indicate that applying the scorecard produced several benefits: a) the most comprehensive examination (but not time consuming) of the level of integration among different plans they had ever undertaken; b) allowed them to evaluate the degree to which policies from multiple plans decrease (or actually increased) vulnerability in different geographic areas of the city; and c) the new information supported deeper and more inclusive conversations about different stakeholder interests regarding the impacts of specific policies.

Action by the City of Norfolk was recently taken based largely on results of the scorecard evaluation process. On June 22, 2017 the planning staff presented a document to the Norfolk

Planning Commission Public Hearing that details policy amendments across various plans. Following are examples of needed actions under two broad headings that are included in the public hearing document (see attached Planning Commission Public Hearing document):

- The scorecard tool revealed weaknesses and inconsistencies throughout plans. Examples of improving plan integration include:
  a. Pg. 1: Land use, transportation, and facility location elements in the comprehensive plan (plaNorfolk 20130) need to be amended to incorporate resilience plan proposals (Vision 2100).
  b. Pg. 2: Amend comprehensive plan (plaNorfolk 20130) to incorporate specific design criteria for public facilities in the resilience plan (Vision 2100).
  c. Pg. 4: Revise land sales and acquisition policies in the affordable housing plan to be consistent with resilience plan (Vision 2100).
  d. Pg. 4: Update zoning regulations to be consistent with resilience plan land use strategies that vary across different geographic areas (red, yellow, green and purple districts, see pp. 10-11).
  e. Pg. 5: Location criteria for community facilities within the comprehensive plan did not account for resilience policies and metrics discussed in the resilience plan.
  f. Pg. 5: Incorporate resilience policies in Vison 2100 into the capital improvement projects to determine major roadway improvements, rail, ferries, etc. (p. 5)
  g. Pg. 5: Use Vision 2100 as a guide when reviewing development proposals and budgets for capital improvements.

- Norfolk planning staff indicates they had not previously reviewed or evaluated the hazard mitigation plan. They have not consulted the hazard mitigation plan in the preparation of all other plans adopted by the city. They indicate that the scorecard provided a methodological tool to guide integration of the mitigation plan across other plans, and to make the mitigation plan better. Examples of integration of the mitigation plan identified on the attached Planning Commission Public Hearing document include:
  h. Pg. 2: Amend the comprehensive plan (plaNorfolk 20130) to incorporate actions in the hazard mitigation plan (Hampton Roads Mitigation Plan).
  i. Pg. 5: Integrate the mitigation plan and resilience plan (Vision 2100) guides to evaluate options to future development proposals.
  j. Pg. 7: Hazard mitigation plan contains policy actions that should more clearly specify "appropriate strategies to mitigate the impact of flooding to existing flood-prone structures." The resilience plan could be used to improve the mitigation plan, for example, since the resilience plan includes flood maps of locations of such structures, which can provide the basis for formulating more spatially specific policies in the mitigation plan.
- Norfolk planning staff indicates they had not considered the policies impacts in socially vulnerable areas. For instance the scorecard:
  k. Revealed the quantity of policies in more socially vulnerable districts. The city stated they see now they should include additional policies for socially vulnerable planning districts.

l. Revealed socially vulnerable districts in upland areas are the same locations they are incentivizing for sea level rise retreat. Planners had conversations about the "new gentrification" that might occur displacing socially vulnerable populations by wealthier residents that are seeking homes outside of hazard zones.

Impact #4 (change in vulnerability outcomes) will likely be evident in the long-term (>2 years), but we will track any change outcomes during the duration of this study.

6. Student involvement and awards:

Three doctoral students (Matt Malecha, Malini Roy, Siyu Yu) at Texas A&M are employed on this project. They are all applying and extending PIRS in various forms for their dissertation research. Each has conducted international field research in applying PIRS in three cities in the Netherlands under a NSF funded project. Two of the students have completed all course, exams and are working on their dissertations with expected date of graduation May 2019.

- Matt Malecha:

International Research Fellowship, National Science Foundation Partnerships for International Research & Education (NSF-PIRE), 2016. Research focused on application of PIRS in Rotterdam, Netherlands.

*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*, 57th Association of Collegiate Schools of Planning (ACSP) Annual Conference, October 12-15, Denver, Colorado

*Resiliency through Plan Integration*, Avoiding Disasters Conference: How to Reduce Impacts from the Next Big Storm, April 26-27, Rice University, Houston, Texas

- Malini Roy:

Roy, Malini. NSF-PIRE Research Seminar Presentation. "Planning for Future Flood Scenarios: Adapting Plan Integration for Resilience Scorecard in Dordrecht, Netherlands," May 25, 2018, Vrije Universiteit Amsterdam, Netherlands.

International Research Fellowship, National Science Foundation Partnerships for International Research & Education (NSF-PIRE), 2016. Research focused of application of PIRS in Dordrecht, Netherlands.

- Siyu Yu:

Jesus Hinojosa Endowed Urban Planning Scholarship, Texas A&M University, 2018. Scholarship based on application of PIRS Nijmegen, Netherlands.

International Research Fellowship, National Science Foundation Partnerships for International Research & Education (NSF-PIRE), 2017. Research focused on application of PIRS Nijmegen, Netherlands.

Urban and Regional Science Doctoral Departmental Scholarship, Texas A&M University, 2014-2017.

College of Architecture Research Colloquium Lecture Series, Texas A&M University on Dec

8th, 2017."Making Room for the River: Applying a Plan Integration for Resilience Scorecard to a Network of Plans in Nijmegen, Netherlands"

Publications with students as lead- or co-authors:

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.

**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.201

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.

7. Interactions with education projects:

Berke. P. *Mitigation Planning for Resilient Cities. Coastal Resilience Center ReTalk Webinar*, March 8, 2018. Johnson C Smith University, Charlotte, NC

8. Publications:

Berke, P., Malecha, M., Yu, S. and Masterson, J. 2018. Plan integration for resilience scorecard: Evaluating networks of plans in six US coastal cities. *Journal of Environmental Planning and Management* (online): https://doi.org/10.1080/09640568.2018.1453354.

Malecha, M.L., Brand, A.D., & Berke, P.R. 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.

Two papers under review, and two papers are currently in preparation related to application of PIRS.

9. Tables:

**Table 1: Documenting CRC Research Project Product Delivery**

| **Product Name** | **Product Type** (e.g., software, guidance document) | **Delivery Date** | **Recipient or End User** |
|---|---|---|---|
| *Plan Integration for Resilience Scorecard Guidebook* | Guidance document | 2017 | FEMA staff that focus on hazard mitigation. State and local officials directly active in hazard mitigation, or indirectly though planning activities that govern development and land use in hazard areas. Professional practice associations like Assoc. of State Floodplain Managers, Am Planning Assoc. Hazard Mitigation and Disaster Recovery Division, Natural Hazard Mitigation Assoc., Nat'l Emergency Man. Assoc. |
| Berke, P., Malecha, M., Yu, S. and Masterson, J. 2018. Plan integration for resilience scorecard: Evaluating networks of plans in six US coastal cities. *Journal of Environmental Planning and Management* (online): https://doi.org/10.1080/09640568.2018.1453354. | Peer reviewed outlet | | researchers |

| | | | |
|---|---|---|---|
| Malecha, M.L., Brand, A.D., & Berke, P.R. 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. | Peer reviewed outlet | | researchers |

**Table 2A: Documenting External Funding**

| Title | PI | Total Amount | Source |
|---|---|---|---|
| Inter-organizational Dynamics in Human Systems that Govern Interdependent Infrastructure Systems under Urban Flooding | **Berke, co-PI** | **$200,000** | **NSF RAPID** |
| Anatomy of Coupled Human-Infrastructure Systems Resilience to Urban Flooding: Integrated Assessment of Social, Institutional Planning, and Physical Networks | **Berke, Co-PI** | **$2 million** | **NSF CRISP** |
| Coastal Flood Risk Reduction Program: Integrated, Multi-scale Approaches for Understanding How to Reduce Vulnerability to Damaging Events | **Berke** | **$200,000** | **NSF PIRE** |
| Application of PIRS During Post-disaster | **Berke** | **$90,000** | Texas One Gulf program |

| | | | |
|---|---|---|---|
| Recovery after Hurricane Harvey | | | |

**Table 2B: Documenting Leveraged Support**

| Description | Estimated Total Value |
|---|---|
| **Indirect** | **$10,000** |
| | |

## Table 3: Performance Metrics:

### BERKE PERFORMANCE METRICS

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

10. Year 3 Research Activity and Milestone Achievement.

**Research Activities and Milestones: Final Status as of 2018**
**Reporting Period 7/1/2017 – 6/30/2018**

| **Research Activities** | Proposed Completion Date | % Completed | Explanation of why activity/ milestone was not reached |
|---|---|---|---|
| Complete evaluations of networks of plans and community hazard vulnerability in 6 additional local governments. | 5/30/17 | 100 | |
| Complete data analysis to determine how well a network of plans support mitigation, and how well they are spatially correlated with variation of social and physical vulnerability. | 6/30/17 | 100 | |
| Complete assessment of impacts of local government application of the plan integration tool based on one or more sources of information: 1) anecdotes that represent end user assessments of proposed changes that will be taken; 2) actual policy changes in plans, regulations, and public investment strategies; and, 3)if possible, measurable changes in vulnerability | 5/18/18 | 100 | |
| | | | |
| **Research Milestones** | | | |
| Submit a manuscript for publication to a refereed journal. | 10/30/17 | 100 | |
| Compile a report that documents impacts of application of the plan | 6/30/18 | 100 | |

| | | | |
|---|---|---|---|
| integration tool that are accomplished by the end of the project | | | |

11. Year 3 Transition Activity and Milestone Status:

**Transition Activities and Milestones: Final Status as of 2018**
**Reporting Period 7/1/2017 – 6/30/2018**

| **Transition Activities** | Proposed completion date | % completed | Explanation of why activity / milestone was not reached |
|---|---|---|---|
| Further test the plan integration for resilience scorecard in 6 additional communities that agree to have their plans assessed; and inform communities of results. | 6/30/17 | 95 | All plans are examined in the 6 communities. We have not informed them of the results. We decided that it would best only inform community officials in those communities where we had significant engagement and developed trust (Norfolk has been informed and Nashua will be informed once we complete our engagement work there about 9/30/18. |
| Complete preparations for a workshop with hazard mitigation practitioners to review tool in partnership with the Hazard Mitigation and Disaster Recovery Planning Division of the American Planning Association. | 7/30/2017 | 100 | |
| | | | |
| **Transition Milestones** | | | |
| Conduct workshop with hazard mitigation practitioners to review tool in partnership with | 7/30/17 | 100 | |

| | | | |
|---|---|---|---|
| the Hazard Mitigation and Disaster Recovery Planning Division at the American Planning Association Conference, and review tool at the Hazards Workshop in Broomfield, CO. | | | |
| Place final plan integration assessment tool on website [mitigationguide.org] with examples that demonstrate application of the tool. | 6/30/18 | 100 | |