

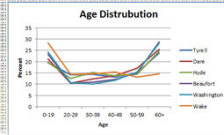
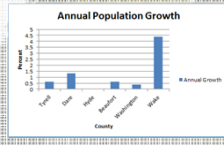
# Rural Coastal Community Resilience: Developing and Testing a Framework for Evaluating Climate Change Vulnerabilities and Adaptive Capacities in Eastern North Carolina

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## Introduction

Climate change and sea level rise (SLR) will threaten coastal cities, rural communities, ecosystems, and agricultural systems globally (Lane et al., 2013). Resilience research addresses climate readiness and adaptation to changing environmental conditions (Adger, 2005). The majority of coastal resilience work conducted concerns tourism destinations and larger urban centers along the coast (Tang, 2008). Rural communities have largely been left out of the adaptation dialogue despite experiencing the same physical climate change impacts (Davies et al., 2009). To build adaptive capacity for climate change, this research explores the theories of resilience and vulnerability in socio-ecological systems (Folke, 2006). Here we present the rural coastal community resilience framework to specifically address the Albemarle Pamlico Peninsula.

### The Albemarle Pamlico Peninsula



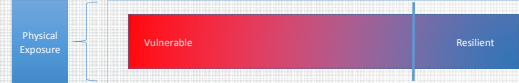
### Risk in Rural Low Lying Coastal Areas

- Salt water intrusion
- Sea level rise
- Flooding

### Dominant Local Industries

- Agriculture
- Commercial fishing
- Timber production
- Ecotourism

## Focus Groups

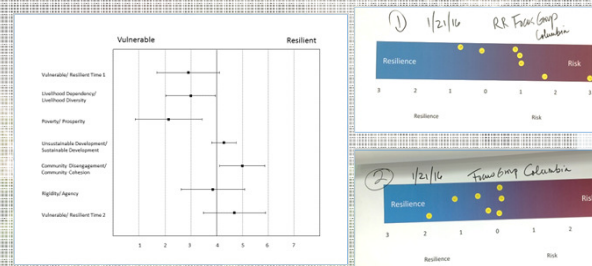


- 3 venues
- Pre and post survey
- Introduction to sea level rise and saltwater intrusion
- Resilience vote
- Indicator voting
- Final resilience vote
- Recorded and transcribed



## Nominal Group Process

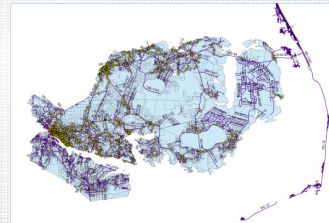
### Focus Group Voting



## Residential Survey

### "Drop-off/ Pick up"

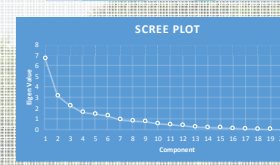
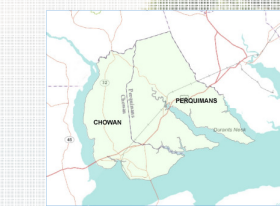
- 1000 addresses
- Introduction letter
- Online version
- In person contact survey drop-off
- Pick up survey
- Or mail back survey
- February through April



## Pilot Results

### Intercept survey in analogous location

- 50 responses
- Exploratory factor analysis
- Principal component analysis



| Item  | 1      | 2      | 3      | 4      | 5      |
|---|--------|--------|--------|--------|--------|
| D. There are job opportunities for younger generations in my community.   | 0.02   | 0.362  | 0.61   | -0.148 | 0.137  |
| E. There are new businesses coming to the region.   | 0.287  | 0.594  | 0.285  | -0.176 | 0.323  |
| G. Local businesses can find qualified local people to employ in the region.  | 0.106  | 0.174  | 0.159  | -0.327 | 0.79   |
| H. It is expensive for youth to return after college in my community.   | 0.117  | 0.008  | 0.67   | -0.306 | 0.52   |
| I. My community is a healthy place to live.   | 0.676  | 0.143  | 0.509  | -0.195 | 0.134  |
| C. My community has access to the social services we need (schools, youth programs, senior programs).                       | 0.011  | 0.257  | 0.413  | 0.046  | -0.156 |
| B. My community has adequate resources to plan for the future (federal programs, tax base, tourism income, federal grants). | 0.313  | 0.675  | 0.273  | -0.054 | 0.06   |
| F. My community's local infrastructure is in good condition (roads, bridges and street lighting).                           | 0.489  | 0.457  | 0.466  | -0.068 | 0.2    |
| J. My community gets help from the government after natural disasters, hurricanes.  | 0.696  | 0.293  | 0.072  | -0.004 | -0.181 |
| A. I have faith in the future for the foreseeable future in my community.   | 0.688  | 0.256  | 0.01   | -0.065 | 0.037  |
| K. People feel like they belong in my community.  | 0.855  | 0.278  | 0.207  | 0.071  | 0.205  |
| L. People help each other when needed in my community.  | 0.877  | -0.041 | 0.035  | 0.035  | -0.139 |
| D. People trust each other in my community.   | 0.728  | 0.217  | 0.122  | 0.218  | -0.162 |
| F. I trust people in my community.  | 0.871  | 0.136  | 0.035  | 0.114  | 0.209  |
| F. Flood insurance is affordable in the region.   | 0.121  | 0.155  | 0.789  | 0.071  | 0.68   |
| M. Private education options are affordable in the region.  | 0.245  | 0.609  | 0.435  | 0.187  | 0.009  |
| N. Local public schools are of high quality in the region.  | 0.114  | 0.603  | 0.643  | -0.146 | -0.105 |
| O. I am active in the local government in my community.   | 0.139  | 0.795  | 0.062  | 0.066  | -0.047 |
| P. People are active in the local government in my community.   | 0.157  | 0.699  | 0.206  | -0.106 | -0.868 |
| Q. My voice gets heard by the local government.   | -0.078 | 0.215  | 0.749  | -0.109 | -0.29  |
| R. My voice gets heard by the local government.   | 0.313  | 0.641  | 0.599  | -0.045 | 0.084  |
| S. The local government shows leadership.   | 0.265  | 0.659  | 0.339  | -0.32  | 0.086  |
| T. People in my community trust local government decisions.   | 0.234  | 0.864  | 0.171  | -0.045 | -0.045 |
| U. I trust local government decisions.  | 0.234  | 0.715  | 0.342  | -0.013 | -0.035 |
| V. Government regulations that affect me are easy to understand.  | 0.361  | 0.365  | 0.697  | -0.028 | -0.201 |
| W. Wetlands are important for commercial fishing in the region.   | 0.407  | 0.014  | 0.056  | 0.663  | -0.137 |
| X. Planting vegetation on shorelines reduces erosion in the region.   | -0.128 | 0.122  | -0.18  | 0.823  | -0.189 |
| Y. Wetlands protect my community from storm surge flooding.   | 0.048  | -0.078 | -0.093 | 0.919  | -0.122 |
| Z. Creating new river beds protects against storm surge flooding in the region.   | -0.061 | -0.25  | 0.024  | 0.836  | 0.414  |

## Rural Coastal Community Resilience Framework

| Risk Indicator                   | Definition  | Resilience Indicator           | Definition  |
|----------------------------------|---|--------------------------------|---|
| <b>Vulnerable</b>                | Your community's assets (infrastructure, population, businesses, land, natural resources) are likely to be negatively impacted from hazardous events and over extended periods of time.           | <b>Resilient</b>               | Your community is well prepared for hazardous events, and can recover from hazardous events in a timely and efficient manner.   |
| <b>Livelihood Dependency</b>     | Your community relies on a single resource or industry to generate most jobs.   | <b>Livelihood Diversity</b>    | Your community has many different industries that provide jobs for its residents.   |
| <b>Inequality</b>                | Your community has groups of individuals (subpopulations) who are more at risk to natural hazards, experience economic strain, or are leaving the area to seek jobs elsewhere (rural flight).     | <b>Prosperity</b>              | Your community is successful in terms of its employment rates, job opportunities, and tax base, and has affordable education, health care, and housing.   |
| <b>Unsustainable Development</b> | Your community does not have land use policies, has policies that do not promote well-being or natural resource conservation, or allows development to occur anywhere, including high risk areas. | <b>Sustainable Development</b> | Your community has land use policies that promote well-being, such as conserving wetlands for clean water and storm surge protection or providing natural areas for recreational and spiritual enjoyment. |
| <b>Community Disengagement</b>   | Your community is experiencing reduced participation in local government, churches, schools, and community social events.   | <b>Community Cohesion</b>      | Your community values people from different backgrounds, is quick to lend a helping hand, and has a shared vision for the future.   |
| <b>Rigidity</b>                  | Your community lacks trust in its leaders or has regulations that limit the ability of the community to change or adapt to new situations.  | <b>Agency</b>                  | Your community has leaders with the power or ability to manage problems or situations and effectively plan for the future.  |

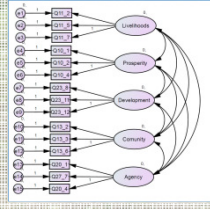
## Local Perceptions

### Pre and Post Survey

| Questionnaire Item*  | Pre-survey Mean (SD) | Post-Survey Mean (SD) | Test Statistic | p-value | Cohen's D |
|--|----------------------|-----------------------|----------------|---------|-----------|
| <b>is a threat to my community</b>   |                      |                       |                |         |           |
| Sea level rise   | 3.31 (1.32)          | 4.00 (1.08)           | t(12)= 2.92    | .013    | .81       |
| Flooding   | 3.75 (.97)           | 4.31 (.65)            | t(11)= 1.87    | .089    | .54       |
| Salt water intrusion   | 3.08 (.79)           | 3.67 (1.16)           | t(11)= 2.55    | .027    | .73       |
| <b>My community is vulnerable to</b>   |                      |                       |                |         |           |
| Sea level rise   | 4.08 (.86)           | 4.08 (.86)            | t(12)= 0       | 1       | 0         |
| Flooding   | 4.31 (.63)           | 4.31 (.63)            | t(12)= 0       | 1       | 0         |
| Salt water intrusion   | 3.92 (.76)           | 3.92 (.76)            | t(12)= 0       | 1       | 0         |
| <b>My community is prepared for</b>  |                      |                       |                |         |           |
| Sea level rise   | 2.25 (1.06)          | 2.33 (.78)            | t(11)= .56     | .586    | .16       |
| Flooding   | 2.75 (1.22)          | 2.43 (.89)            | t(11)= 1.6     | .137    | .46       |
| Salt water intrusion   | 2.42 (.67)           | 2.67 (1.16)           | t(11)= .9      | .389    | .26       |
| <b>My community has access to the resources need to plan for climate change impacts.</b> |                      |                       |                |         |           |
| Sea level rise   | 2.83 (1.03)          | 2.25 (.87)            | t(11)= 1.9     | .089    | .54       |
| <b>My community would benefit from adaptation planning workshops.</b>                    |                      |                       |                |         |           |
| Sea level rise   | 4.31 (.75)           | 4.31 (.63)            | t(12)= 0       | 1       | 0         |

## Next Steps

After completion of the residential survey, we will utilize SPSS AMOS 24 to develop a structural equation model that explores key factors for resilience on the Albemarle Pamlico Peninsula. There will also be three more focus groups targeting low socio-economic status communities to ensure that the framework is applicable to diverse perspectives. The goal is to provide insight into resilience strengths for coastal planners. Further, the framework may identify which communities will be most vulnerable and take the longest to recover from coastal hazards.



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