Coastal Resiliency of O&G Infrastructure

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Civil and Military Marine Transportation Infrastructure
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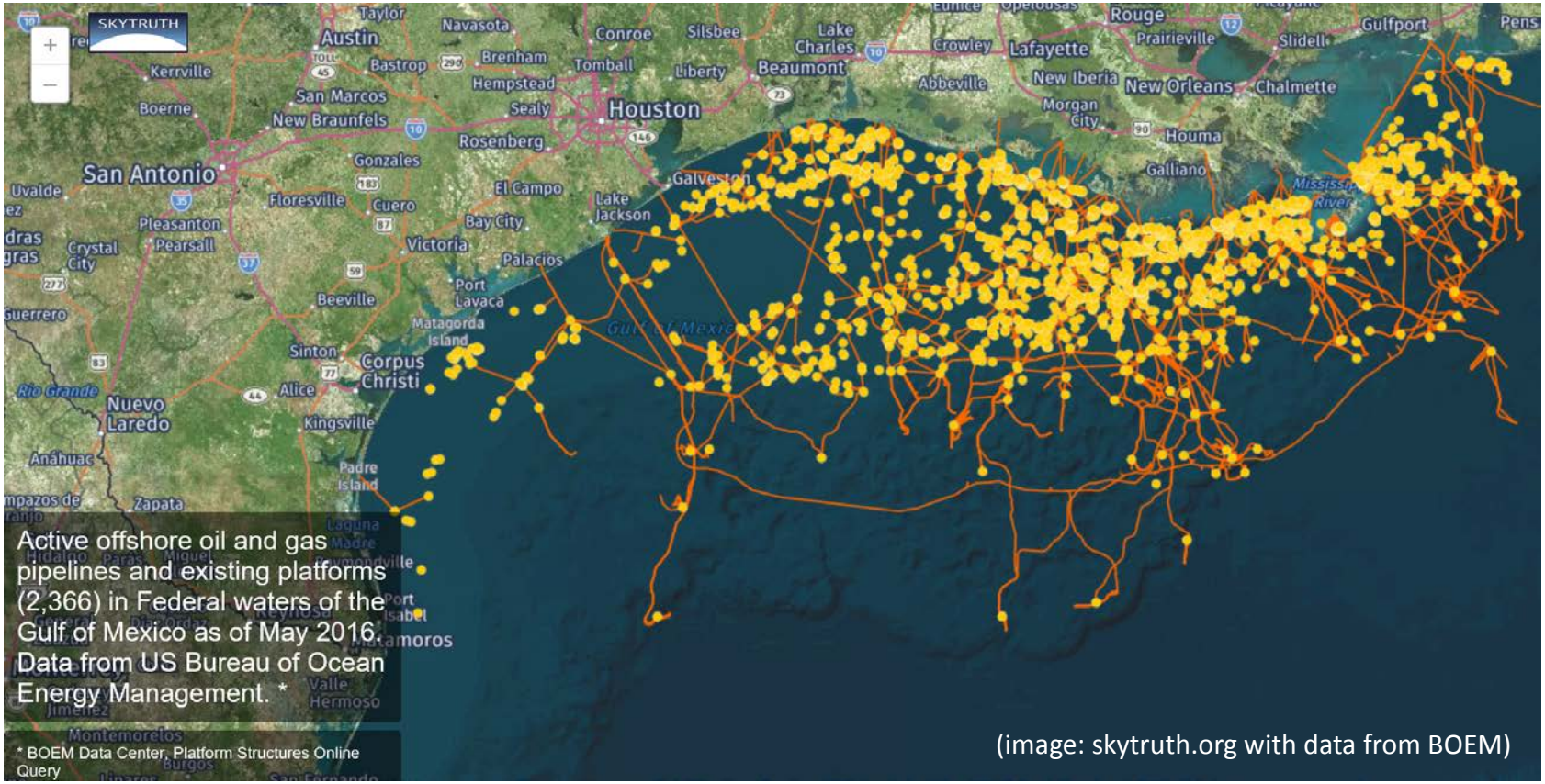
Exposed O&G Infrastructure

- Offshore: platforms and pipelines



Exposed O&G Infrastructure

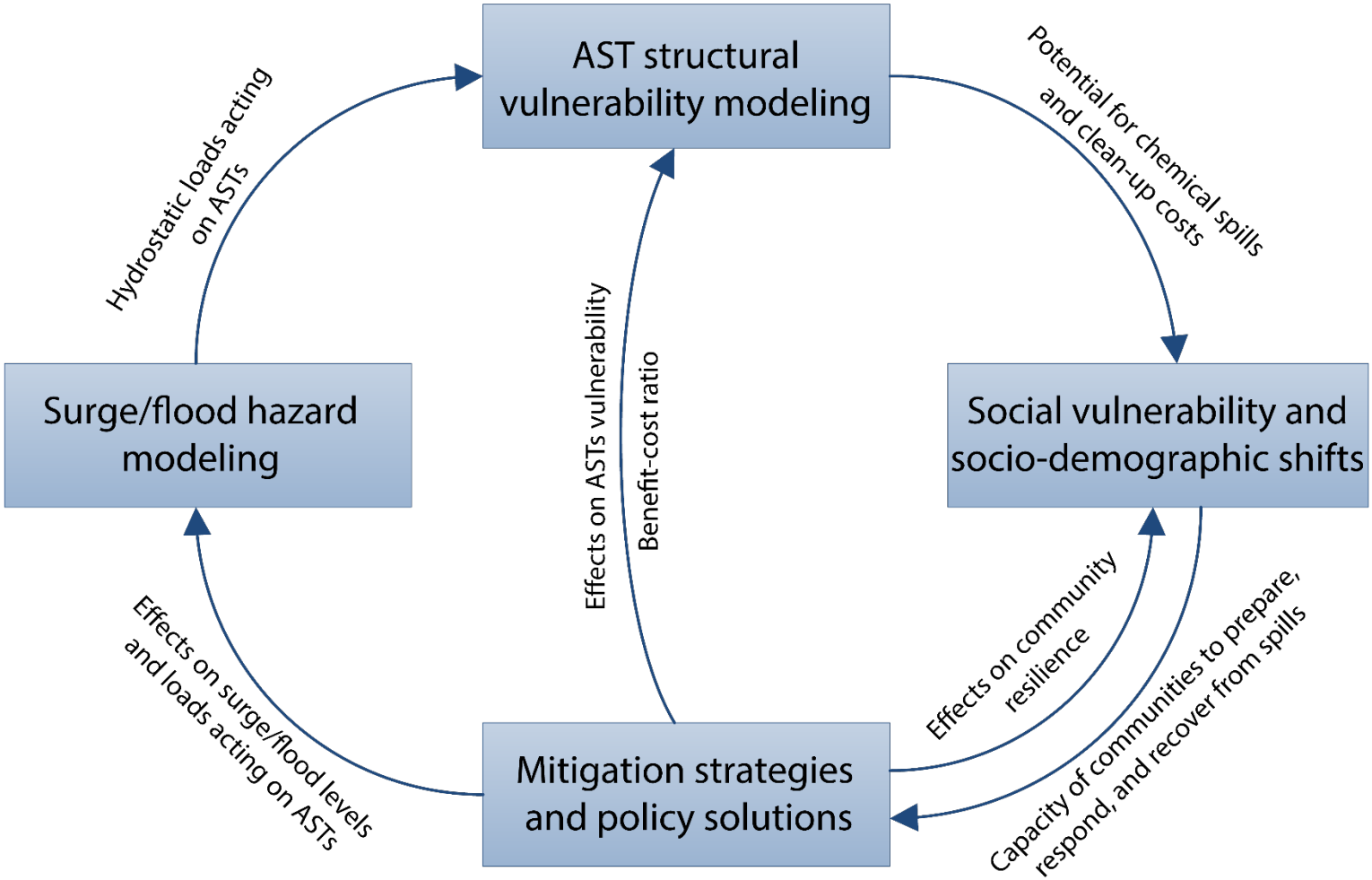
- Onshore: terminals, refineries, tanks, pipelines

Past Hurricane Performance of ASTs

The Challenges

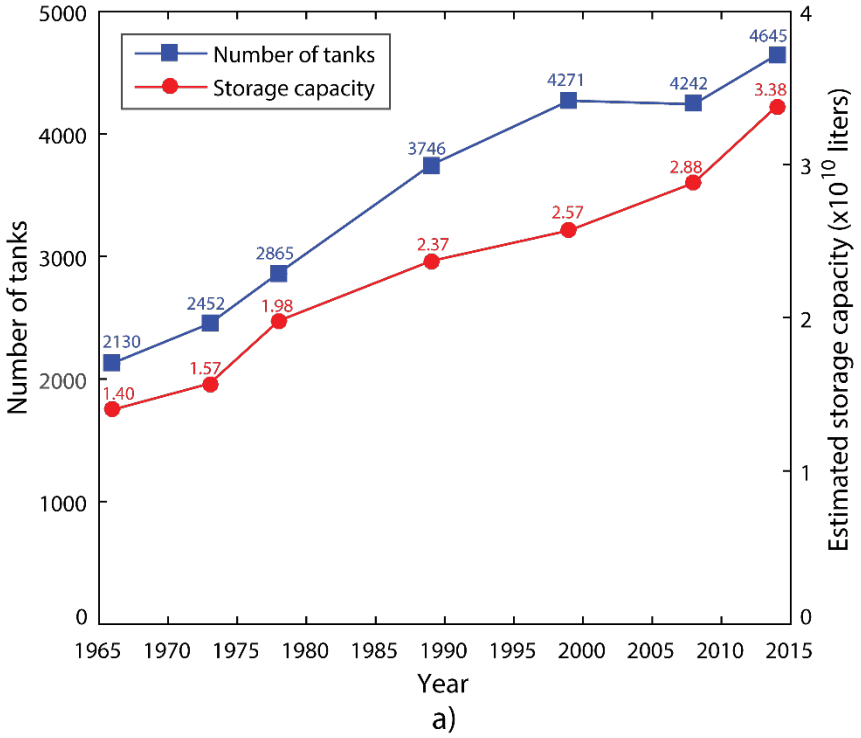
- Risk and resilience models are lacking for this critical O&G infrastructure
- Need tools to evaluate mitigation and adaptation strategies
- Integrated frameworks required to understand broader implications (e.g. environmental and social systems)

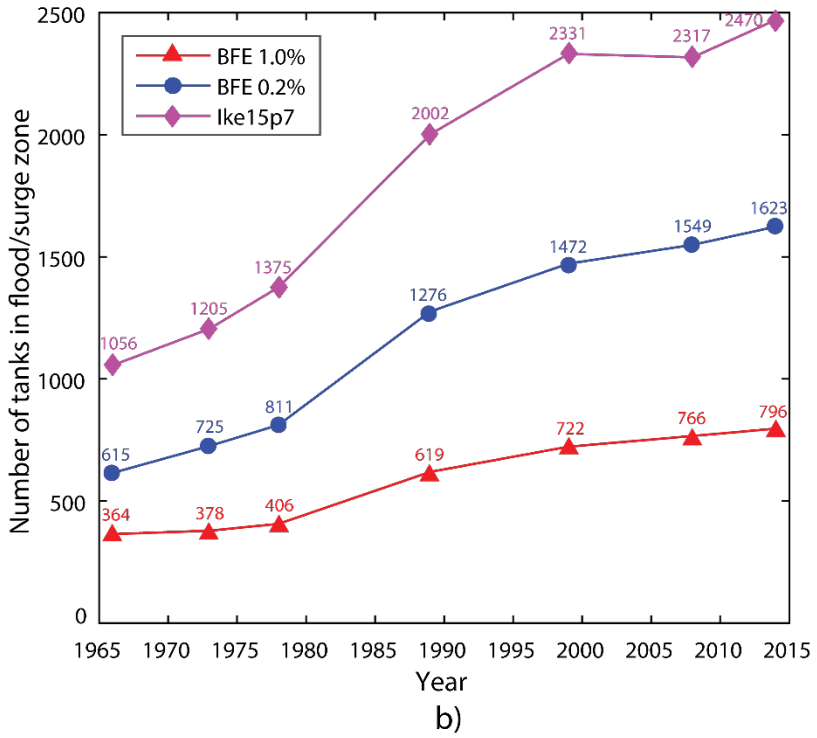
Research Framework



Houston Ship Channel: Evolution of Inventory

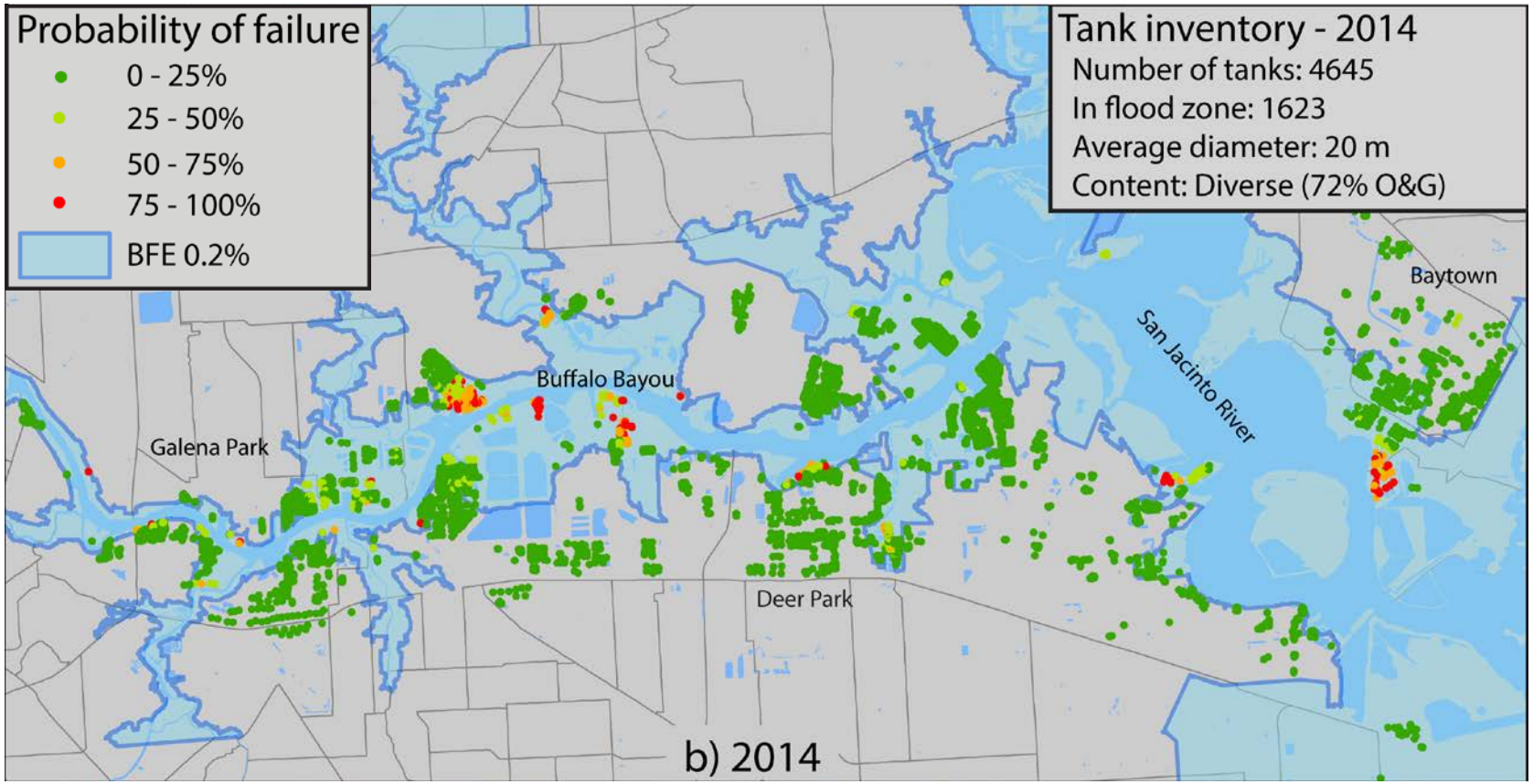
- AST Evolution from 1966 to 2014:





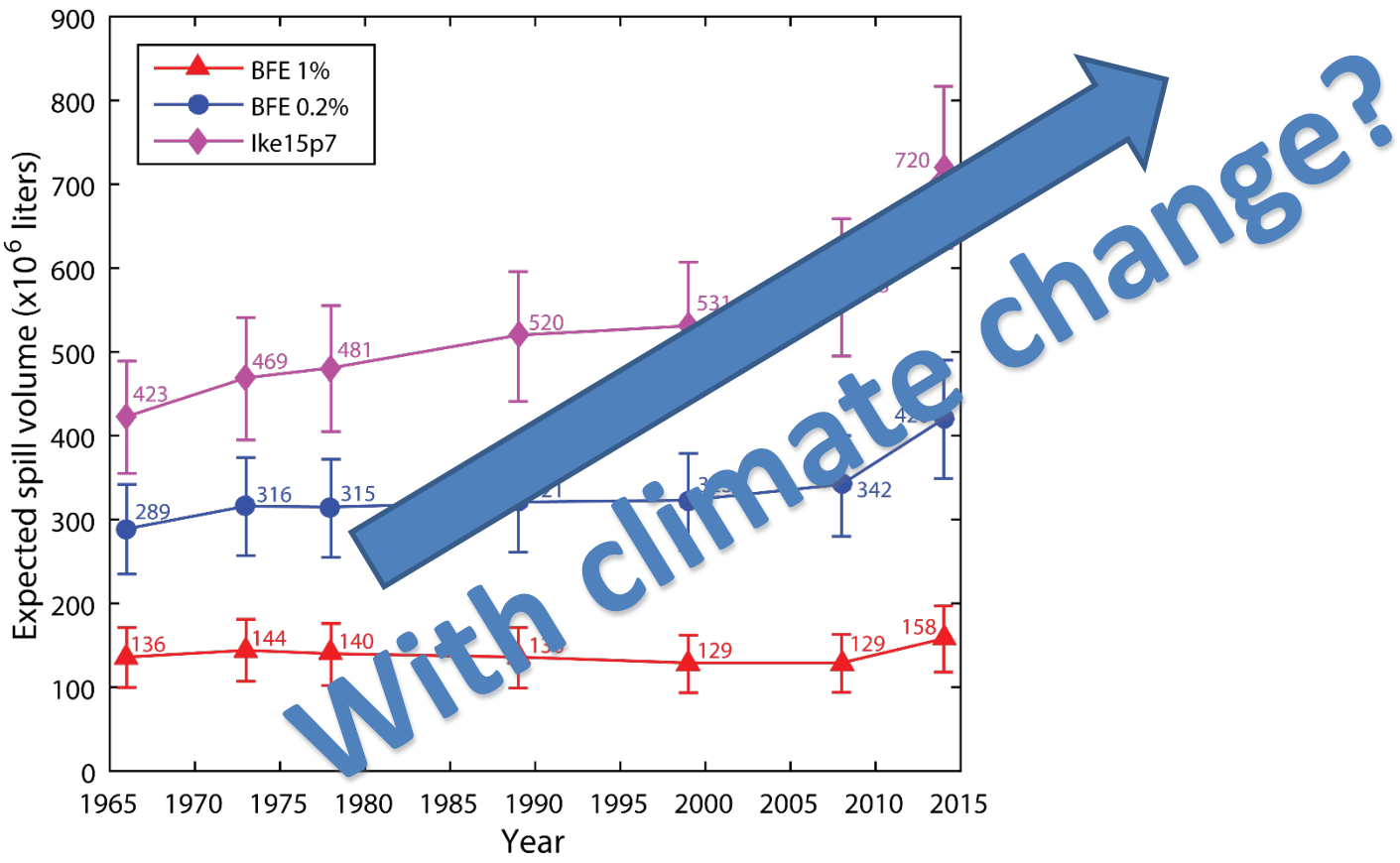
Structural Vulnerability Assessment

- Probability of failure of AST portfolio using fragility models



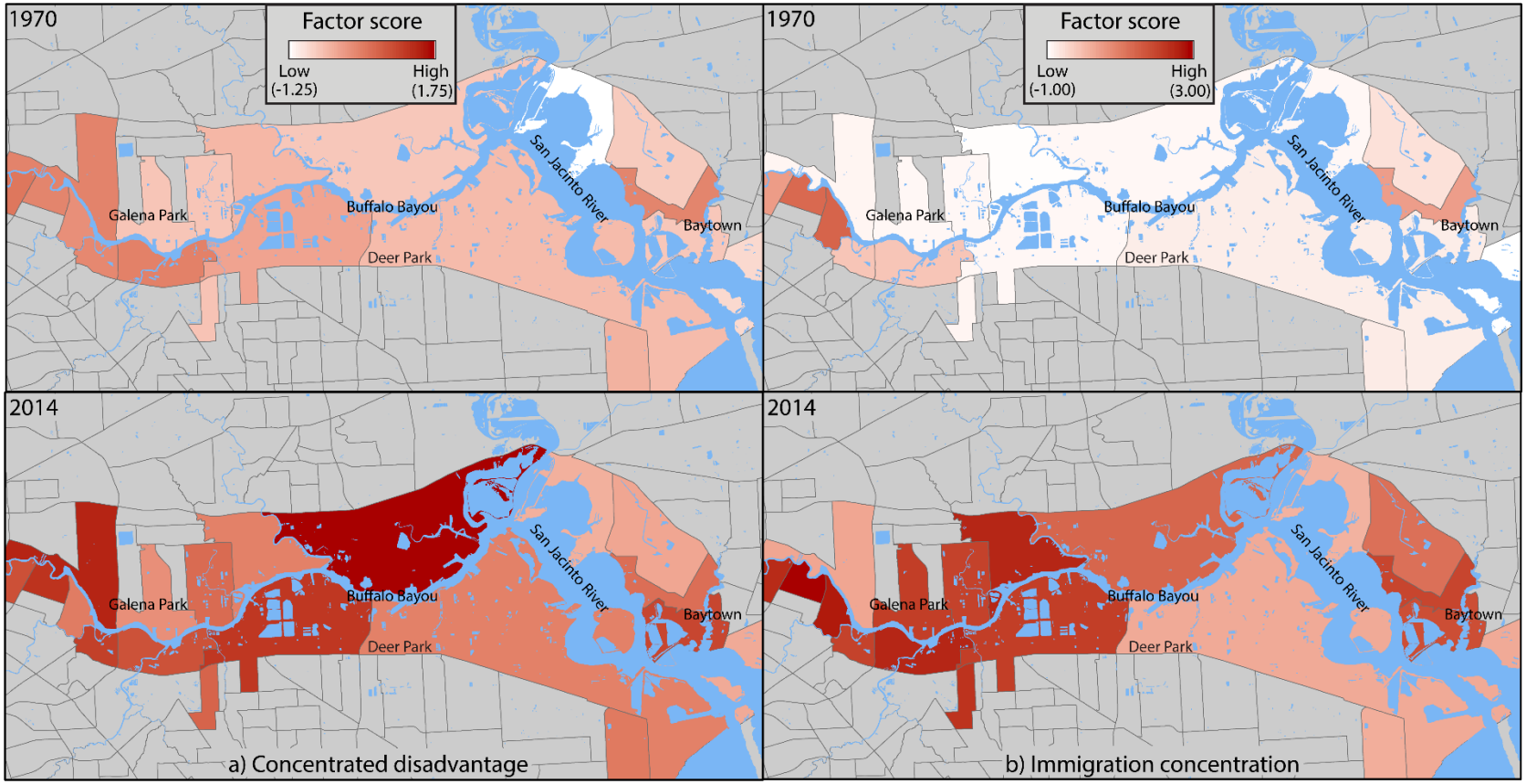
Spill Risk Assessment

- Evolution of potential storm-induced spills in the HSC



Social Vulnerability Assessment

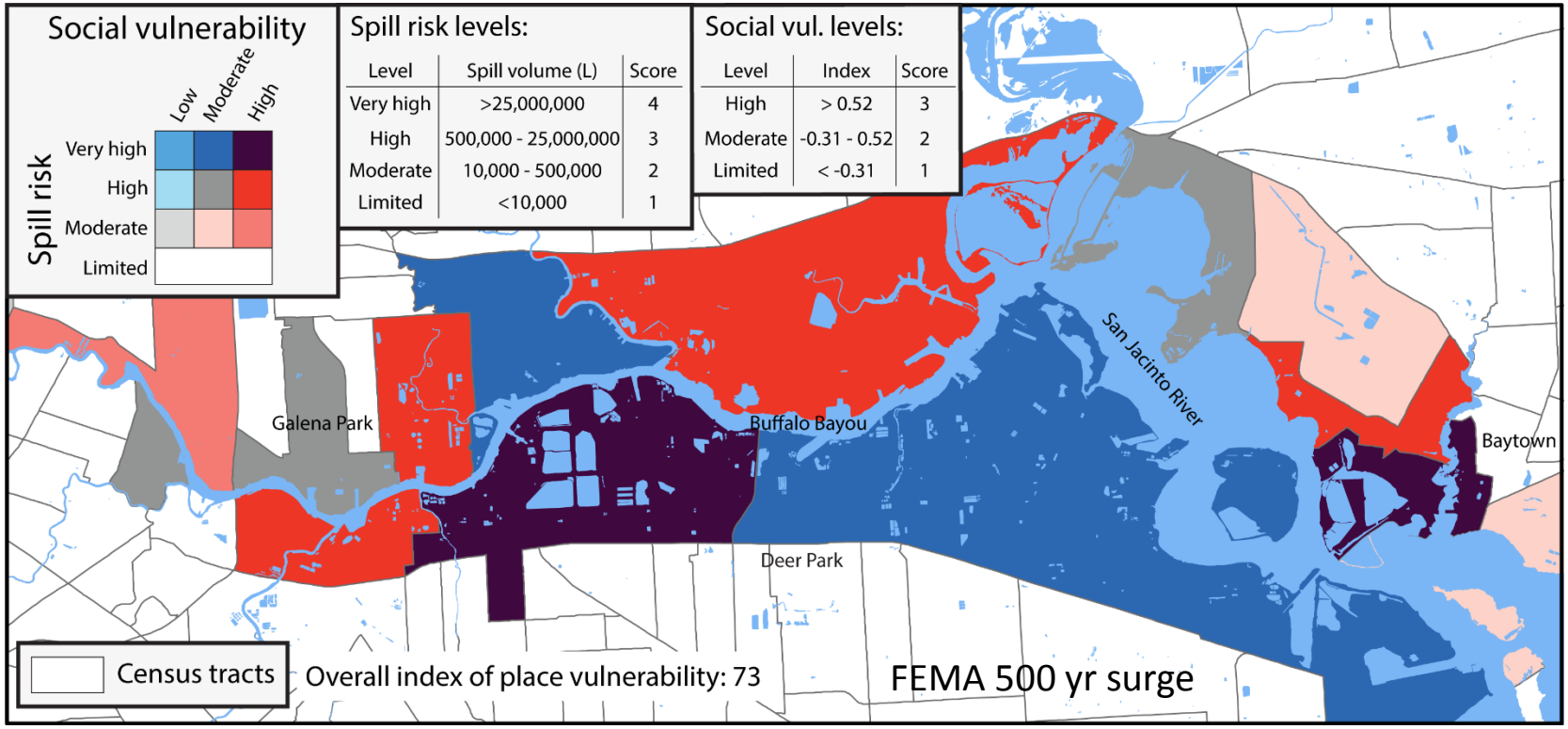
- Evolution of social vulnerability



Note: Factor scores are only presented for tracts where there is a risk of potential storm induced spills

Spill Risk and Social Vulnerability

- Evaluating intersection of spills with social vulnerability



Short Term Investment Needs

- Establish Center of Excellence on O&G Infrastructure Resilience
- Catalyze transdisciplinary research to integrate natural-physical-socio-economic systems
- Strengthen academic-industrial partnerships
- Address pressing topics:
  - Risk and resilience assessment for multi-hazard storm events (flood-surge-wind-wave-debris)
  - Incorporation of sea level rise and climate effects within framework (with implications on structure and hazard)
  - Modeling of O&G interdependence with other infrastructure and systems
  - Quantification and communication of uncertainty in social, environmental or economic risks

Long Term Needs

- Derive flexible resilience analysis tools for adaptation planning and investment across a broad range of O&G infrastructure
- Leverage high performance computing and data analytics to improve models and enable real-time assessment, monitoring and alert
- Establish methods for incorporating smart technologies to reduce uncertainties and support actionable sustainability and resilience enhancement plans
- Evaluate the resilience of future energy portfolios (non-renewable and renewables) considering full life-cycle performance

Potential Workshop or Policy Study

- Coastal Resilience of O&G Infrastructure
- Engineering, Social and Political Solutions to Improve O&G Infrastructure Resilience
- Climate Effects and Adaptation Planning in the O&G Industry
- Case Study of Energy and Industrial Infrastructure Resilience (Gulf Coast or HSC)