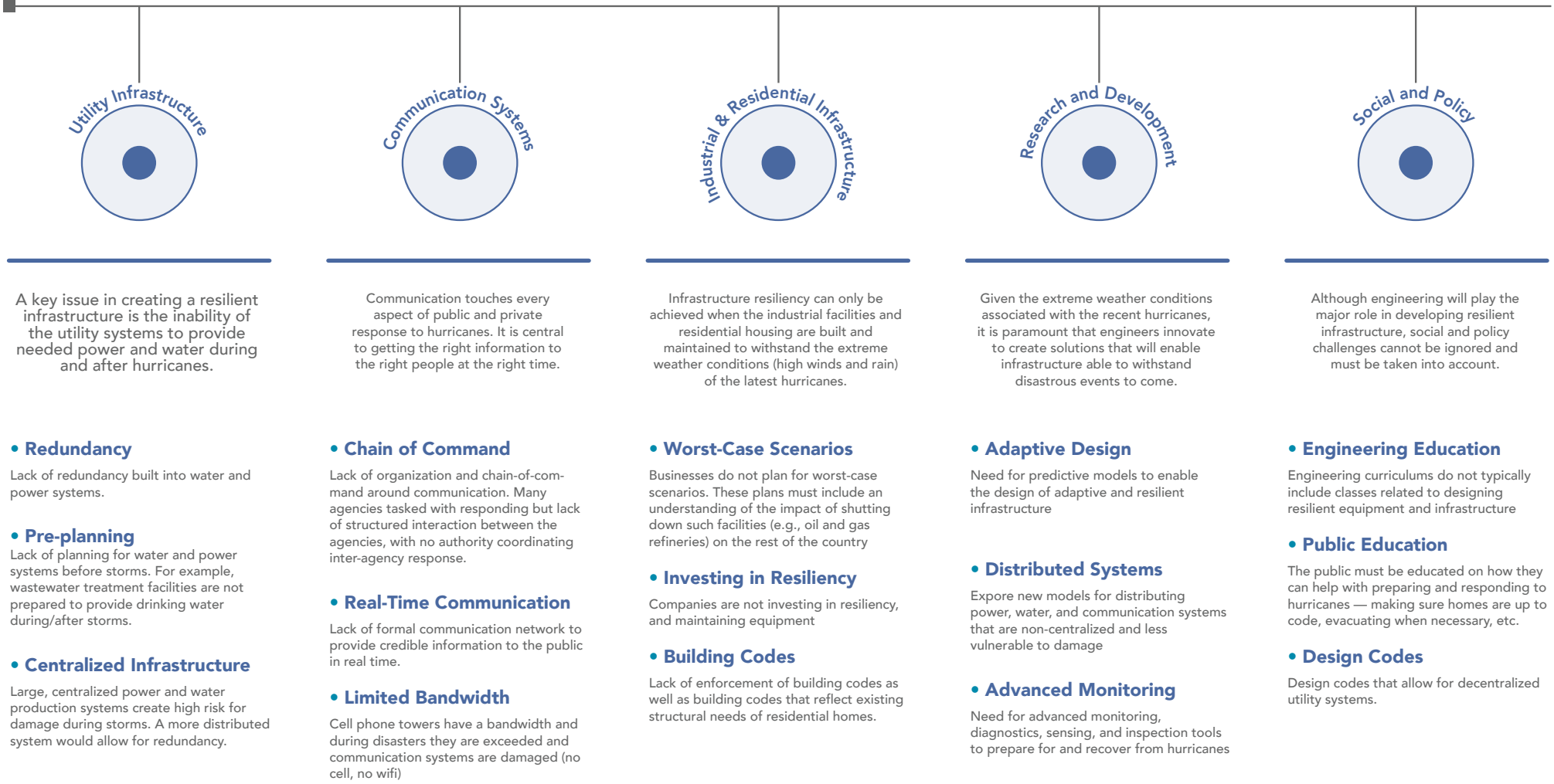




# Hurricane Disaster Infrastructure Planning Workshop

## Hurricane Resiliency Engineering Roadmap



### Utility Infrastructure

A key issue in creating a resilient infrastructure is the inability of the utility systems to provide needed power and water during and after hurricanes.

- **Redundancy**

Lack of redundancy built into water and power systems.

- **Pre-planning**

Lack of planning for water and power systems before storms. For example, wastewater treatment facilities are not prepared to provide drinking water during/after storms.

- **Centralized Infrastructure**

Large, centralized power and water production systems create high risk for damage during storms. A more distributed system would allow for redundancy.

### Communication Systems

Communication touches every aspect of public and private response to hurricanes. It is central to getting the right information to the right people at the right time.

- **Chain of Command**

Lack of organization and chain-of-command around communication. Many agencies tasked with responding but lack of structured interaction between the agencies, with no authority coordinating inter-agency response.

- **Real-Time Communication**

Lack of formal communication network to provide credible information to the public in real time.

- **Limited Bandwidth**

Cell phone towers have a bandwidth and during disasters they are exceeded and communication systems are damaged (no cell, no wifi)

### Industrial & Residential Infrastructure

Infrastructure resiliency can only be achieved when the industrial facilities and residential housing are built and maintained to withstand the extreme weather conditions (high winds and rain) of the latest hurricanes.

- **Worst-Case Scenarios**

Businesses do not plan for worst-case scenarios. These plans must include an understanding of the impact of shutting down such facilities (e.g., oil and gas refineries) on the rest of the country

- **Investing in Resiliency**

Companies are not investing in resiliency, and maintaining equipment

- **Building Codes**

Lack of enforcement of building codes as well as building codes that reflect existing structural needs of residential homes.

### Research and Development

Given the extreme weather conditions associated with the recent hurricanes, it is paramount that engineers innovate to create solutions that will enable infrastructure able to withstand disastrous events to come.

- **Adaptive Design**

Need for predictive models to enable the design of adaptive and resilient infrastructure

- **Distributed Systems**

Explore new models for distributing power, water, and communication systems that are non-centralized and less vulnerable to damage

- **Advanced Monitoring**

Need for advanced monitoring, diagnostics, sensing, and inspection tools to prepare for and recover from hurricanes

### Social and Policy

Although engineering will play the major role in developing resilient infrastructure, social and policy challenges cannot be ignored and must be taken into account.

- **Engineering Education**

Engineering curriculums do not typically include classes related to designing resilient equipment and infrastructure

- **Public Education**

The public must be educated on how they can help with preparing and responding to hurricanes — making sure homes are up to code, evacuating when necessary, etc.

- **Design Codes**

Design codes that allow for decentralized utility systems.