Network governance for coordinated efforts in building community resilience

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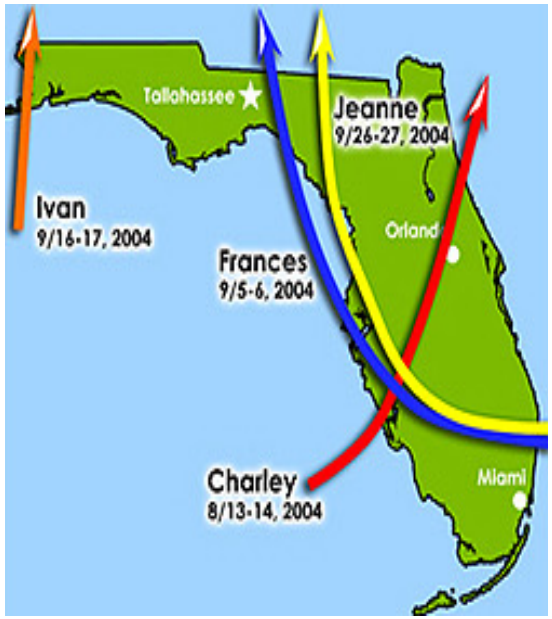
Outline

- Background
- Community resilience
- Urban resilience
- Network perspectives
  - Interconnected systems
  - Network governance
- Observations
  - Future research



Questions

- How can the resilience of interdependent urban infrastructure systems be enhanced through multi-level and multi-sector stakeholder collaboration and mobilization of community resources?
- How can governance structures influence the connectedness of multi-level, multi-sector, interdependent urban infrastructure systems?
- How can organizational capacity influence stakeholders' participation in multi-level, multi-sector, interdependent urban infrastructure systems?
- How can collaborative leadership help organizations span institutional boundaries, mobilize resources, facilitate knowledge sharing, and consequently, contribute to network resilience?
- How can collaborative leadership, organizational capacity, and governance structures contribute to the robustness and connectivity of urban infrastructure systems?

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Method

- Literature (scholarly and grey)
- Meetings with the experts (scholars and practitioners)
- Content analysis of documents (codebook)
- Network analysis
- Cases: Major disasters (After action report, Royal Commissions, & Independent inquiries)
- Conferences, workshops, forums, and focus groups
- Presentations and feedback

The Need for Resilience

- Scale and intensity of disasters continue to increase
- Emergencies and crises create challenges for communities
- Resilient communities can anticipate and manage these challenges
- Building and enhancing resilience to disasters is becoming a critical policy and governance issue in urban areas (over 89% in urban areas in Australia)
- Infrastructure as lifelines to enable the continuous operation of critical government and business functions
- Cybersecurity threats
- Compounding impacts of disasters

The path to resilience – Landmark events

1960's

- 1962. Thalidomide scandal.
- 1963. Nuclear Test Ban Treaty
- 1963. Vajont reservoir disaster.
- 1967. Greenpeace is founded.
- 1968. Paul Ehrlich: "The Population Bomb"
- 1969. UNESCO conference "Man and his Environment"
- 1969. US National Environmental Policy Act

1980's

- 1984 Bhopal disaster.
- 1985. Joe Farman: Ozone hole discovery
- 1986. Chernobyl nuclear disaster
- 1987. Montreal Protocol
- **1987. "Our Common Future" (The Brundtland Report)**

2000's

- **2001. 9/11 attacks**
- 2002. Johannesburg. Rio+10.
- 2003. European heatwave.
- 2004. United Cities and Local Governments
- **2005. Hurricane Katrina**
- 2006. Al Gore: "An Inconvenient Truth"
- 2006. The Stern Review
- 2009. Copenhagen. COP15.

1970's

- 1970. US Environmental Protection Agency
- 1972. J.S. Sawyer warns about global warning in Nature paper.
- 1972. Stockholm UN Conference on the Human Environment
- 1972. Club of Rome: Limits to Growth
- 1973. C.S. Holling: Resilience and Stability of Ecological Systems
- 1975. Banqiao Reservoir (China) collapse
- 1978. Love Canal Homeowners Association

1990's

- 1990. First IPCC Assessment Report
- 1992. Rio de Janeiro. Earth Summit on Sustainable Development. Local Agenda 21.
- 1995. Kobe Earthquake.
- **1997. Kyoto. COP 3.**
- 1998. Aarhus Convention on Access to Information, Public Participation and Access to Justice in Environmental Matters

2010's

- 2011 Japan Tsunami and Fukushima nuclear disaster
- 2012 Hurricane Sandy
- **2013 100 Resilient Cities**
- 2012. Rio de Janeiro. Rio+20
- 2015. Paris. COP21.
- **2015. Sustainable Development Goals. 2030 Agenda.**
- 2019. COVID-19 Pandemic

Source: Kapucu, Ge, Martin, & Williams, 2022

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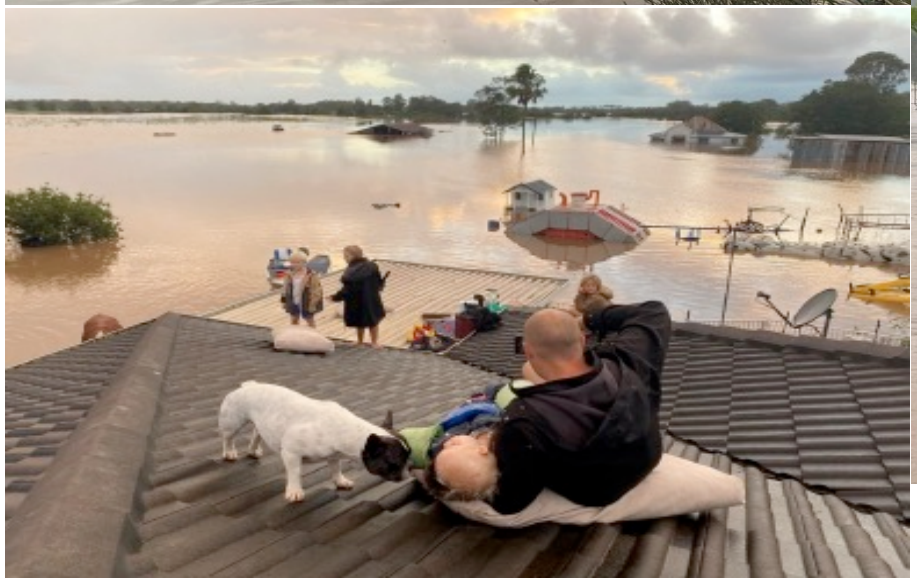
SA Statewide Blackout- September 28, 2016

Independent Review commissioned by the Premier of South Australia: Explore alternative emergency management models!

ABC News: Tom Fedorowytsch

Urban Flood Resilience – Sydney 2022

Two major inquiries: leadership, collaboration, community engagement



Source: Dean Betts, Director, Resilience NSW Independent Inquiry 2022

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Urban Resilience

- Natural, infrastructure, financial, human, social, and institutional dimensions of urban resilience
- The institutional dimension of urban resilience examines the interface between planning, policy, and governance to understand the resilience of urban infrastructure systems
- Elements of network governance—*organizational capacity, collaborative leadership, stakeholder interactions, governance structures, and network resilience*
- Urgent need to enhance the resilience of interdependent urban infrastructures, such as water (wastewater), electric power, transportation, and telecommunication in anticipation of future disasters
- Well-functioning community lifelines critical for urban resilience in the face of disasters
- Emergency management is a quintessential role of government

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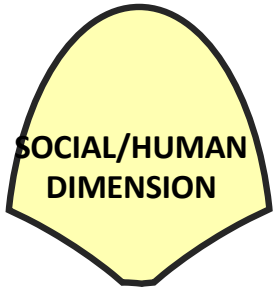
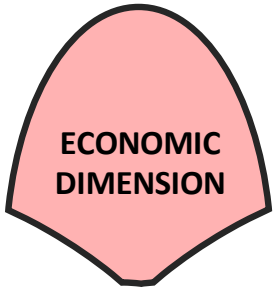
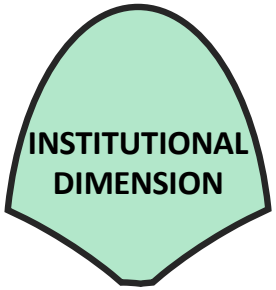
Multidimensional challenges



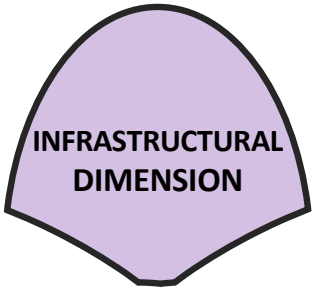
1. Food/water/energy insecurity
2. Violence and crime
3. Immigration
4. Civil unrest
5. Terrorism
6. Segregation
7. Gentrification
8. Globalization
9. Overpopulation
10. Social inequality



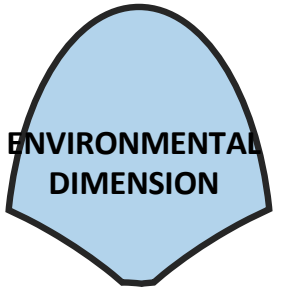
2. Shortage of affordable housing
3. Unemployment
4. Economic inequality
5. Urban poverty
6. Lack of economic diversity
7. Underground economy
8. Economic crises
9. Political instability
10. Urban speculation



1. Policy formulation challenges
2. Governance issues
3. Implementation challenges
4. Resource challenges
5. Institutional capacity constraints
6. Low level of social capital
7. Data management challenges
8. Organizational structural and cultural issues
9. Partnership challenges
10. Performance challenges



1. Aging infrastructure
2. Financial issues
3. Limiting regulatory policies
4. Cyber failures or attacks
5. Infrastructure failures and vulnerabilities
6. Lack of scalable infrastructure
7. Lack of environmentally-friendly infrastructure
8. Inefficient infrastructure
9. Complex interdependent infrastructure networks
10. Divergence of adopting technology



1. Air pollution
2. Water scarcity
3. Loss of biodiversity
4. Waste (soil contamination)
5. Biological pathogens
6. Noise
7. Atmospheric hazards
8. Water pollution
9. Fire (wildfire + property fires)
10. Urban pests

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Building urban infrastructure resilience through network governance

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Network governance
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ABSTRACT

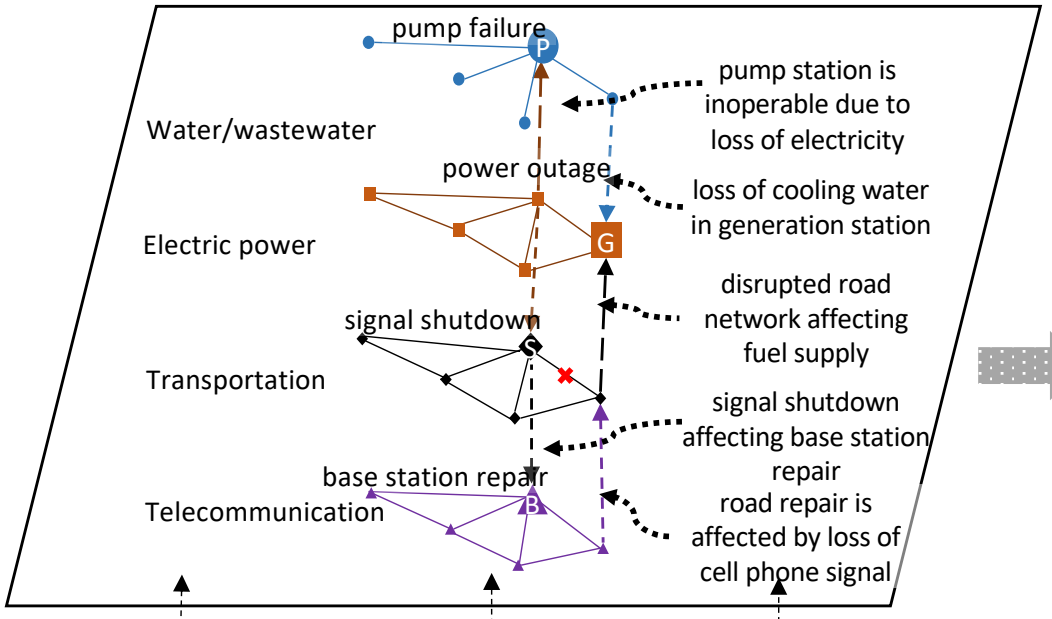
As the scale and intensity of disasters continue to increase, building and enhancing resilience to disasters has become a critical policy and governance issue. This topic is crucial to urban infrastructure resilience because infrastructure systems support the continuity of operations of governments and businesses, and are essential to the economy, health, and public safety. This paper proposes and applies a network governance perspective to examine interdependent infrastructure systems, such as water (wastewater), electric power, transportation, and telecommunication. The paper contributes to a better understanding of the role of interdependent infrastructure systems in enhancing urban infrastructure resilience to disasters. The paper also highlights the need to leverage collaborative leadership and organizational capacity to develop robust and connected community networks to enhance urban infrastructure resilience to disasters.

Elements of NG & Resilience

- **Governance Structures** contribute to a more effective resilience policy implementation and strengthen collective effort outcomes
- **Organizational Capacity** of a wide range of public, nonprofit, and private organizations embedded within the whole community of urban infrastructure systems
- **Collaborative Leadership:** "the behaviors of public managers that facilitate productive interaction and move the participants in the network toward effective resolution of a problem" (McGuire & Silvia, 2009, p. 35).
- **Network Resilience** of participating stakeholders for urban infrastructure systems with a specific focus on electric power, water (wastewater), transportation, and telecommunication. Resilient networks have the capacity to respond to external disruptions and sustain connectedness and functioning despite internal and external disruption

Context: Urban Infrastructure Resilience

Interdependent Urban Infrastructure Systems

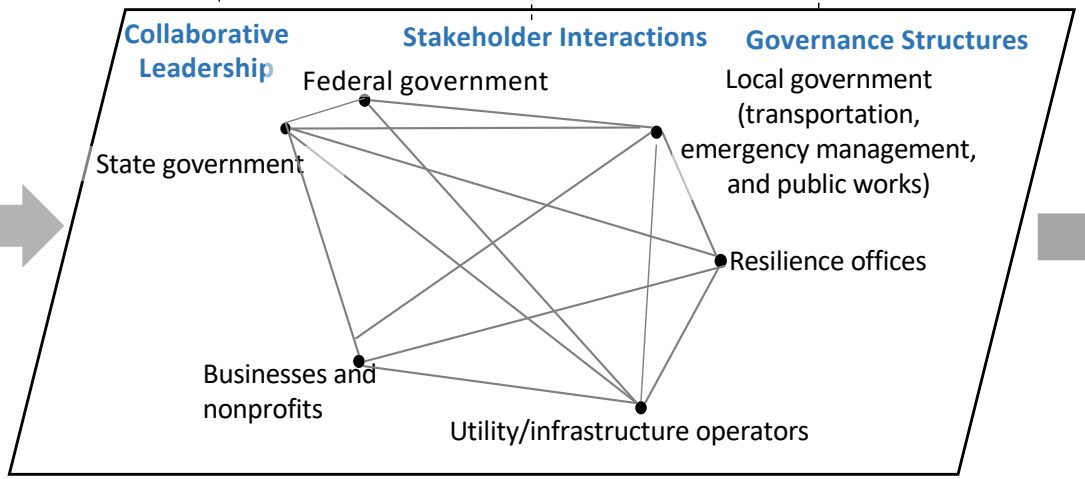


Community Capacity

Organizational Capacity
Organizational Characteristics

Community Capital
Diversity, Social, and Economic Capital

External Factors
Political, Economic, and Social Environments



Network Governance

Urban Infrastructure Resilience

Natural or environmental dimension

Infrastructure dimension

Financial and economic dimension

Human and cultural dimensions

Social dimensions

Institutional dimension
Network resilience - Robustness and Connectivity


SUSTAINABLE DEVELOPMENT GOALS
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS
SUSTAINABLE DEVELOPMENT GOALS

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administrative sciences

MDPI

Article

Network Governance for Collective Action in Implementing United Nations Sustainable Development Goals

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Abstract: As the number of complex transnational problems have continued to grow, so too has the desire to combat them through global partnerships and collective action. In response, the United Nations (U.N.) and member states created the Sustainable Development Goals (SDGs) in 2015. This study provides a background on international organizations and efforts in collectively moving towards sustainable development goals. It examines the SDGs (specific emphasis on Food–Energy–Water (FEW) Nexus) and means of governance and implementation at the global level. It also seeks to describe and visualize partnerships and collective action using network analysis tools and techniques. The network visualization demonstrates the organizations working together and towards the SDGs, which provides the type of structure and key actors and arrangements for implementation at the global stage.

Keywords: Sustainable Development Goals; network governance; partnerships; collective action; Food–Energy–Water (FEW) Nexus

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NETWORK GOVERNANCE AND STAKEHOLDER ENGAGEMENT FOR SUSTAINABLE DEVELOPMENT

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ABSTRACT

In 2015, the United Nations (U.N.) and member states created goals and benchmarks for the Sustainable Development Goals (SDGs) to address decades of inequality, environmental degradation, and economic disparity. Further, as human populations are expanding around the globe, and especially in urban settings, the New Urban Agenda was created a year later acknowledging that urbanization is one of this century's most transformative trends. A primary concern is understanding what actions municipalities have taken that lead to more sustainable cities and communities, and how stakeholder engagement has aided in the process. One other facet is to understand how communities can incorporate the food, energy, and water resources in projects to reduce waste and tradeoffs, otherwise known as the Food-Energy-Water (FEW) Nexus. We conducted a multi-stage systematic literature review and examined a case study of the City of Orlando, Florida, United States. Major findings were that widespread stakeholder engagement, dedicated funding, institutionalization of plans and actions, and public leadership support were critical in local sustainable development.

Keywords: Stakeholder Engagement, Network Governance, Sustainability, Sustainable Development Goals, Orlando

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"We are driving a **coordinated effort to build disaster resilience** and embed consideration for disaster risk across and within many sectors including land use planning, infrastructure, emergency management, social policy, agriculture, education, health, community development, energy and the environment."

NATIONAL STRATEGY FOR DISASTER RESILIENCE

Building the resilience of our nation to disasters

"Disaster resilience is the ability of a **system, community or society** exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management."

"Australia's National Strategy for Disaster Resilience (NSDR) acknowledges the increasing severity and regularity of disasters in Australia and the need for a **coordinated, cooperative** national effort to enhance Australia's **capacity to withstand** and recover from emergencies and disasters."

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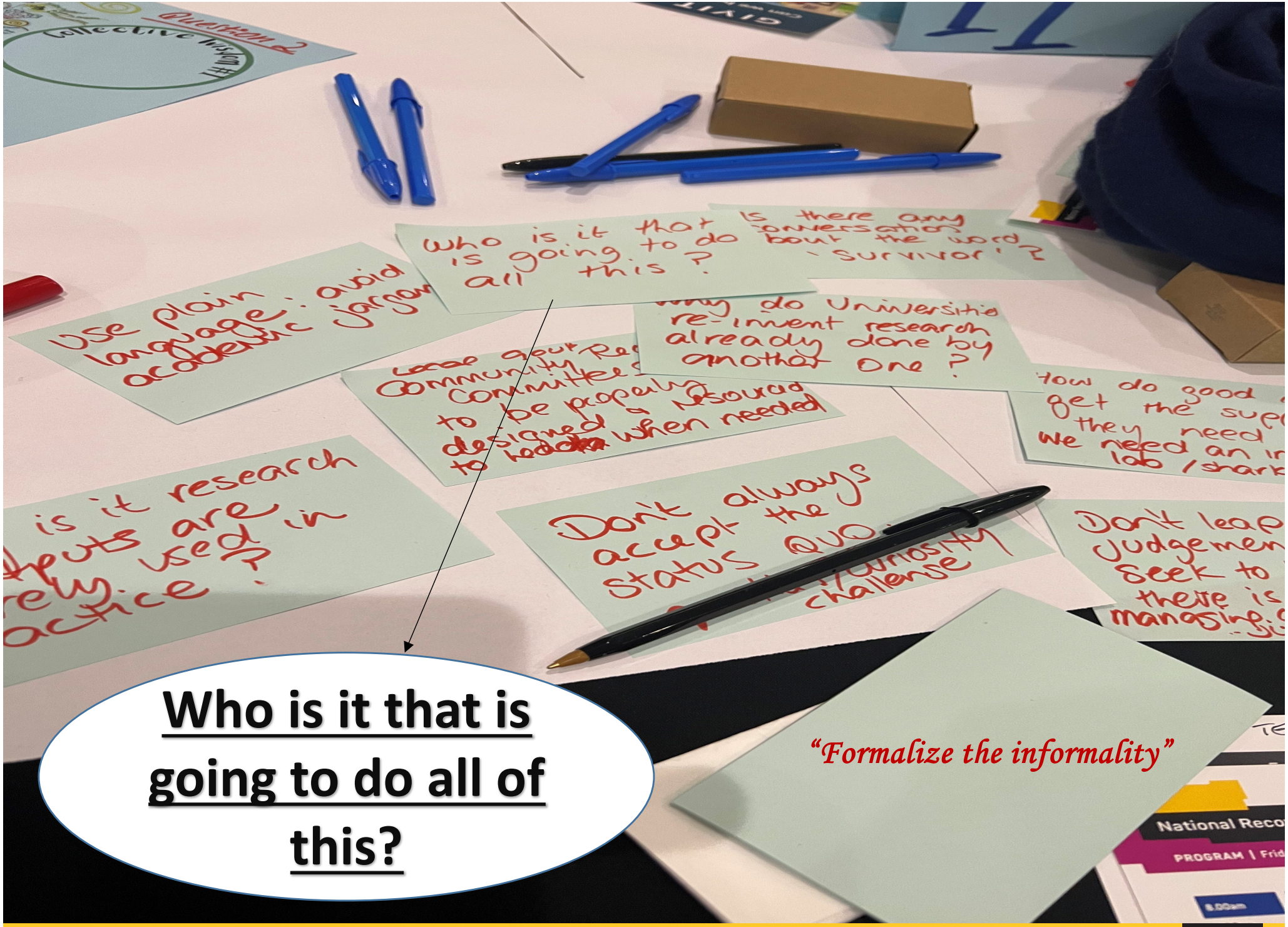
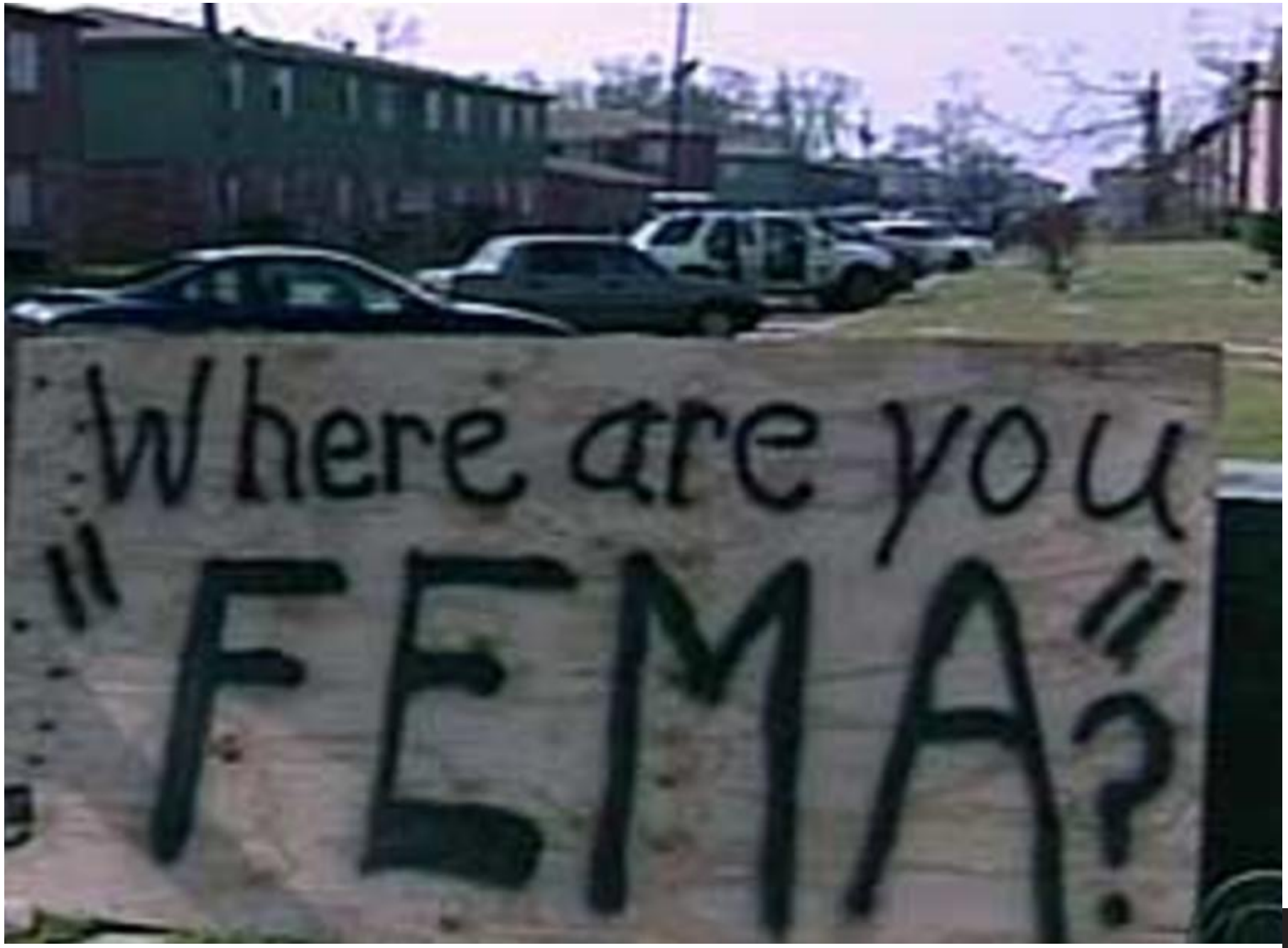

Who is it that is going to do all of this?
"Formalize the informality"


ESF - 13
Military Support,
Florida National Guard

Activated EOC

The County's Emergency Operations Center (EOC) serves as the central coordination point for information and resources during an emergency. Orange County Emergency Response Team members work out of this facility to coordinate their activities on a strategic level.


Where are you
"FEMA"?

Policies, Plans, & Frameworks

The United States	Australia
National	
☐ National Planning Frameworks - The National Response Framework (2019) - National Prevention Framework (2016) - National Protection Framework (2016) - National Mitigation Framework (2016) - National Disaster Recovery Framework (2016) ☐ National Incident Management System (NIMS) (2017) ☐ The Robert T. Stafford Disaster Relief and Emergency Assistance Act (The Stafford Act) (1974; amended in 1988, 2013) ☐ Presidential Policy Directive 8: National Preparedness (PPD-8) (2011) ☐ National Preparedness Goal (2015) and National Preparedness System (2011)	☐ The Australian Government Crisis Management Framework (2021) ☐ National Emergency Declaration Act (2020) ☐ Australian Emergency Management Arrangements ☐ Australian Government Disaster Response Plan 2020 (COMDISPLAN) ☐ Strategic Directions for Fire and Emergency Services in Australia and New Zealand (2022-2026) ☐ National Disaster Risk Reduction Framework (2018) (Action Plan, 2020) ☐ National Strategy for Disaster Resilience (2011)
State/Local	
Florida (state and counties responsible)	**New South Wales (state responsible)**
☐ Comprehensive Emergency Management Plan (CEMP) (2020) ☐ State Emergency Response Team (SERT) & Emergency Support Functions ☐ Florida Law 252.35 (Emergency management powers; Division of Emergency Management) ☐ Local Emergency Management Plans ☐ Local Disaster Recovery Arrangements	☐ Rescue and Emergency Management ☐ State Emergency Management Plan (2018) ☐ Regional Emergency Management Plans ☐ State Emergency and Rescue Management Act 1989 ☐ State Rescue Policy (2021) ☐ State EM sub plans/ supporting plans ☐ Flood Emergency Subplan (2021) ☐ NSW Reconstruction Authority/Recovery Plan

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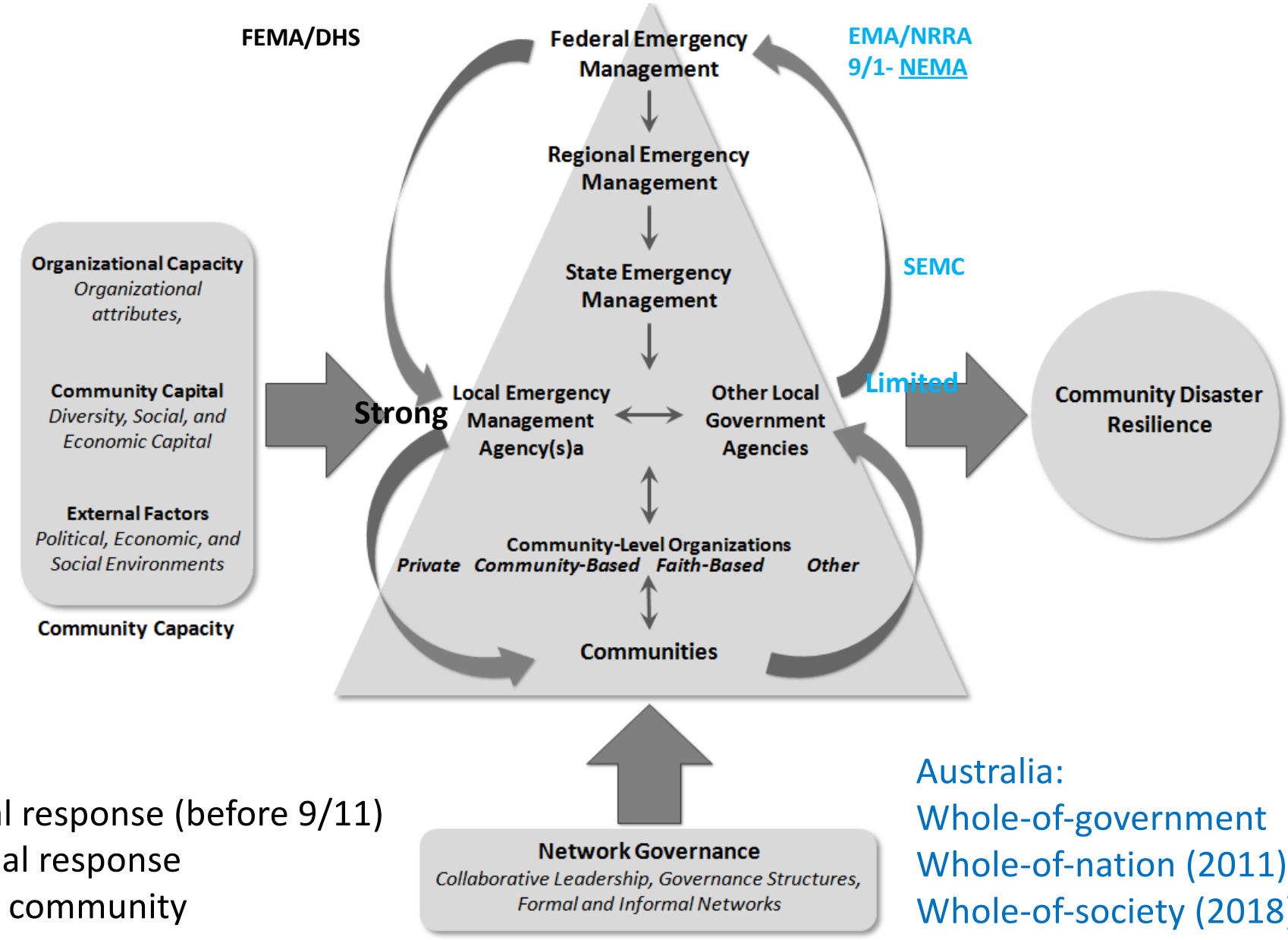
The System for Disaster Resilience



US:
Federal response (before 9/11)
National response
Whole community

Australia:
Whole-of-government
Whole-of-nation (2011)
Whole-of-society (2018)

(Adapted from Kapucu & Sadiq, 2016)

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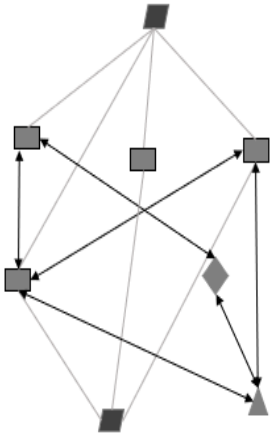
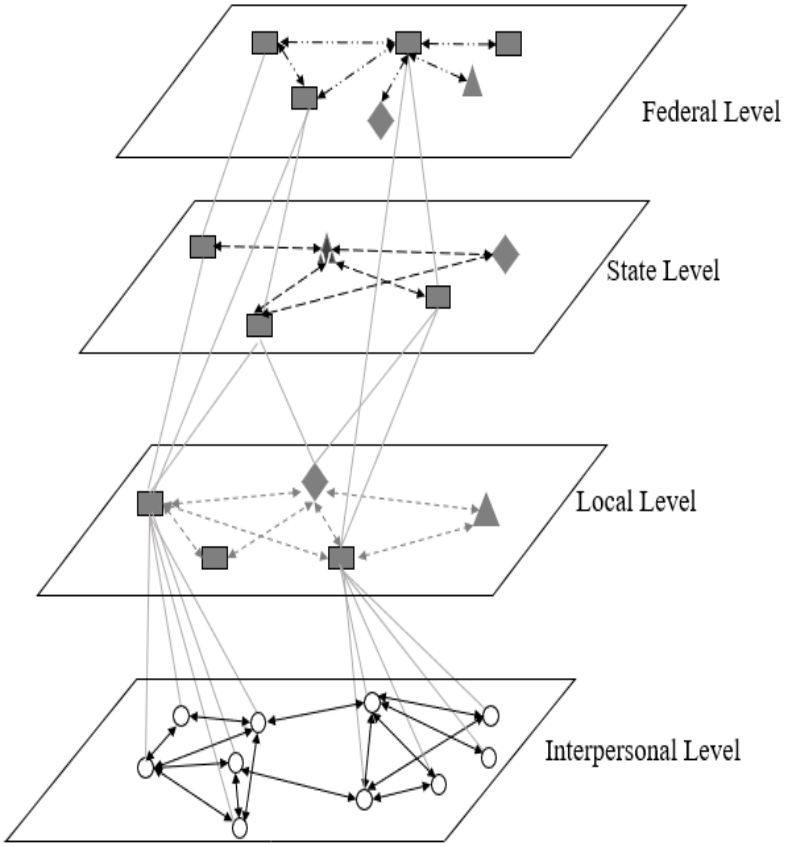
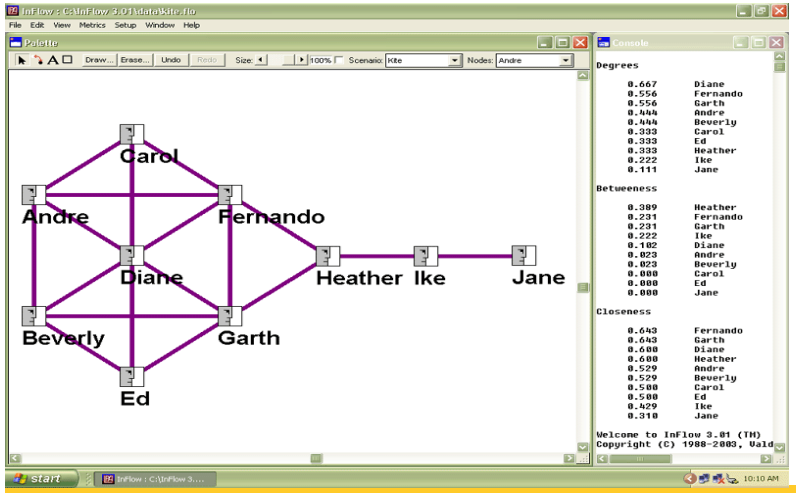
Multilevel Networks Governance

- Emergency and crisis management system is multilevel in federal systems – intergovernmental
- Complex arrangements and relationships
- Research primarily focused on single-level network, more is needed in multilevel networks







(Adapted from Kapucu & Hu, 2020)

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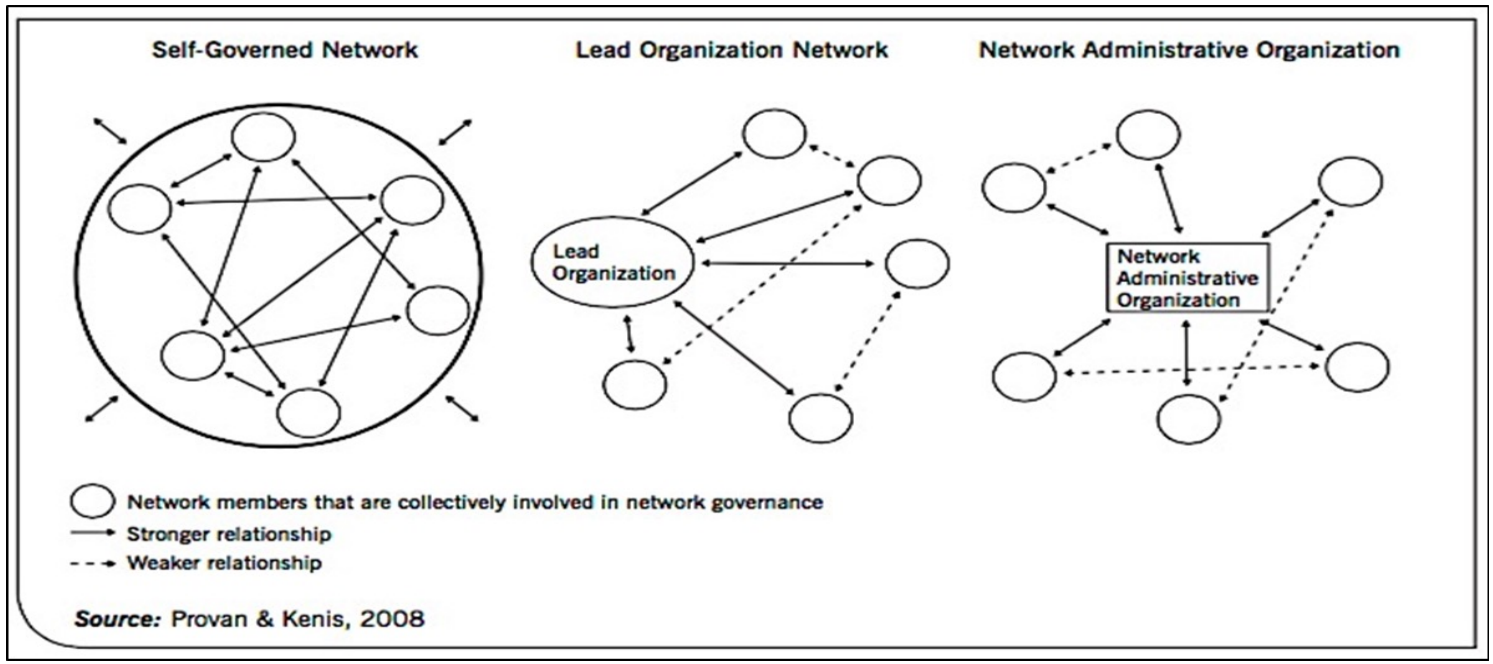
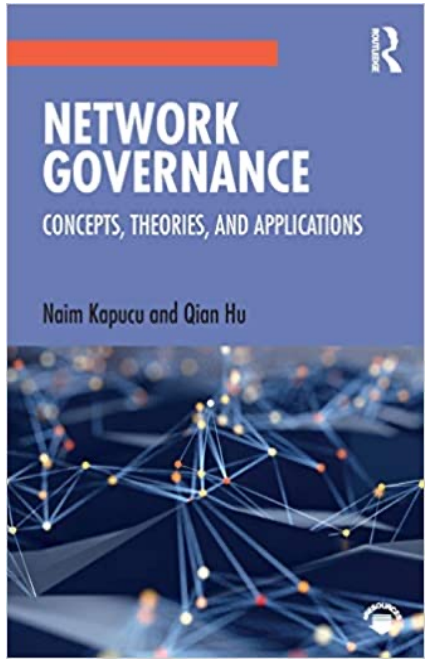
Network Governance Structure

"The use of institutions and structures of authority and collaboration to allocate resources and to coordinate and control joint action across the network as a whole" (Provan and Kenis, 2008, p 230).

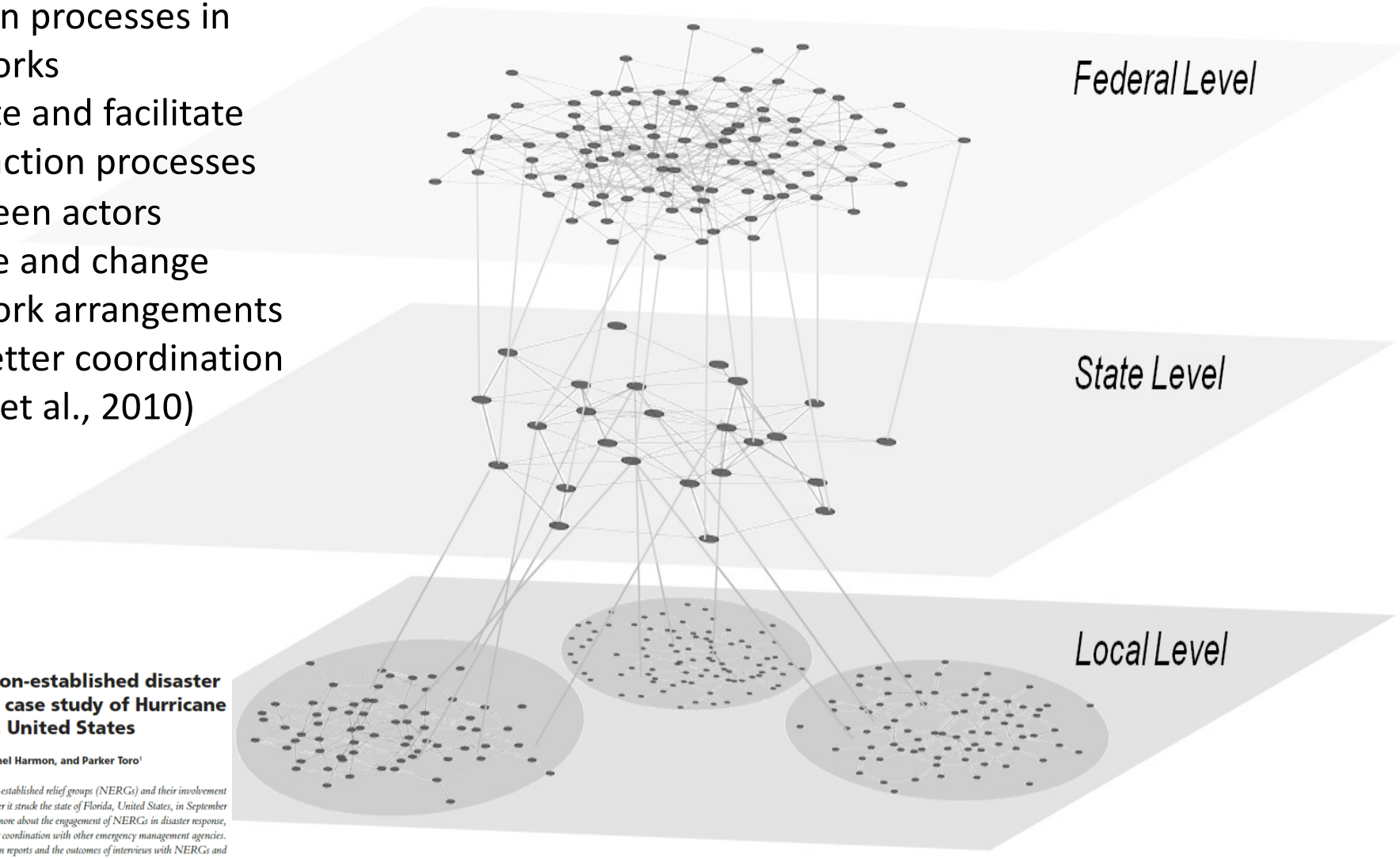




Collaboration & Multi-level Networks

The deliberate attempt to –

- govern processes in networks
- initiate and facilitate interaction processes between actors
- create and change network arrangements for better coordination (Klijn et al., 2010)



Coordinating non-established disaster relief groups: a case study of Hurricane Irma in Florida, United States

Naim Kapucu, Qian Hu, Mitchel Harmon, and Parker Toro[1]

This study examines the role of non-established relief groups (NERGs) and their involvement in the response to Hurricane Irma after it struck the state of Florida, United States, in September 2017. Its principal goal is to discover more about the engagement of NERGs in disaster response, as well as their motivations and their coordination with other emergency management agencies. The findings of a review of after-action reports and the outcomes of interviews with NERGs and other established organisations suggest that these groups often work with previously established networks. Many of the emergent type of NERGs have not worked with any established organisations prior to a disaster; frequently, therefore, they reach out to other emergent groups to acquire information and coordinate relief efforts. Given that emergent actors tend to lack a strict hierarchical structure for decision-making and coordination, there is a need to enhance communication between NERGs and established response bodies.

Coordination in the Federal Response Plan

Appendix I) Federal Response Plan (FRP) - 1999

ESF/ Agency	Transportation	Communications	Public Works and Engineering	Firefighting	Information and Planning	Mass Care	Resource Support	Health and Medical Services	Urban Search and rescue	Hazardous material	Food	Energy
USDA	S	S	S	**P**	S	S	S	S	S	S	**P**	S
DOC		S	S	S	S		S			S		
DOD	S	S	**P**	S	S	S	S	S	S	S	S	S
DOeD					S							
DOE					S		S	S		S		**P**
HHS			S		S	S		**P**	S	S	S	
HUD						S						
DOI		S	S	S	S					S		S
DOJ					S			S	S	S		
DOL			S				S		S	S		
DOS	S									S		S
DOT	**P**				S		S	S		S		S
TREAS	S				S		S					
VA			S			S	S	S				
AID								S	S			
ARC					S	**P**		S			S	
EPA			S	S	S			S		**P**	S	
FCC		S										
FEMA	S	S		S	**P**	S	S	S	**P**		S	
GSA	S	S			S	S	**P**	S			S	
NASA					S		S		S			
NCS		**P**			S		S	S				S
NRC					S					S		S
P: Primary Agency- Responsible for coordination of ESF												
S: Support Agency- Responsible for supporting the primary agency												

ESF #1 Transportation
ESF #2 Communications
ESF #3 Public Works and Engineering
ESF #4 Firefighting
ESF #5 Emergency Management
ESF #6 Mass Care, Emergency Assistance, Housing, HS
ESF #7 Logistics Management and Resource Support
ESF #8 Public Health and Medical Services
ESF #9 Search and Rescue
ESF #10 Oil and Hazardous Materials Response
ESF #11 Agriculture and Natural Resources
ESF #12 Energy
ESF #13 Public Safety and Security
ESF #14 Long-Term Community Recovery
ESF #15 External Affairs

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ORIGINAL PAPER

The use of documentary data for network analysis in emergency and crisis management

Naim Kapucu[1] · Ratna Okhai[1] · Yue Ge[1] · Chris Zobel[1,2]

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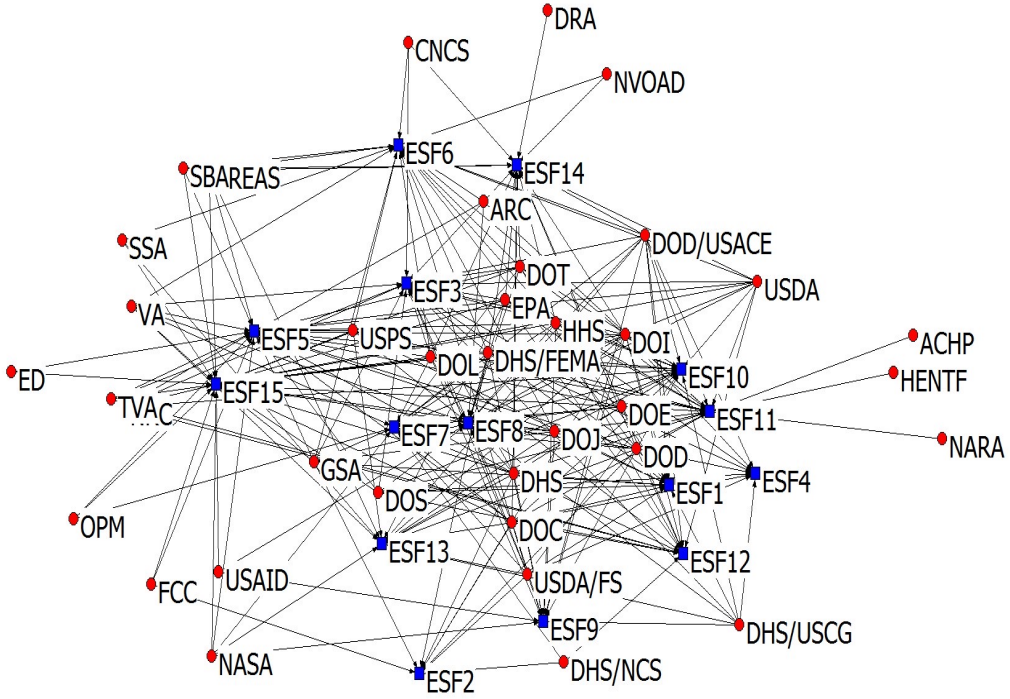
Abstract

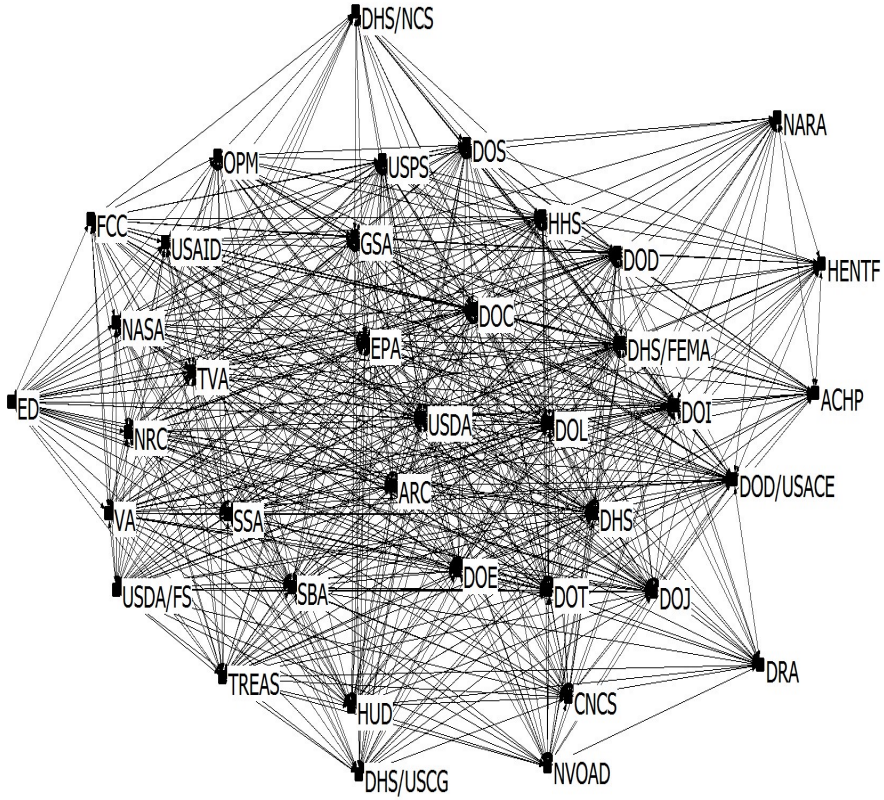
The use of network analysis to understand relationships among actors and organizations in coordinated actions has grown in recent years. Examining the network structure and functions in disaster response has gained particular attention. Different methods of data collection and analysis are utilized in network research. The use of documents as a data source has also gained traction. Scholars utilize content analysis of documents to uncover network structure, i.e., core "nodes," and functions. This is especially critical in emergency and crisis management as the associated network involves complex set of actors from different sectors and jurisdictions, and first-hand recollections of representatives might not be inclusive of every interaction and specific actors they worked with. With augmented utilization, there is a need to understand the methodological process of document use as a primary means of data analysis in emergency management. This study fills that gap by providing a systematic literature review of empirical studies across a broad range of subjects that have discussed document collection and use for network analysis. Furthermore, this study provides a detailed example of the method of document identification and collection, data generation and organization process, and network visualization and analysis in an emergency and crisis management context. The study concludes with answering, for disaster response networks, what types of documentary data are utilized and how they are used, the types of disasters that have been prevalent in utilizing this method, and the process undertaken to analyze and visualize networks.

Keywords Networks · Network data · Content analysis · Network analysis · Network visualization · Disaster

Key actors and Network Structures



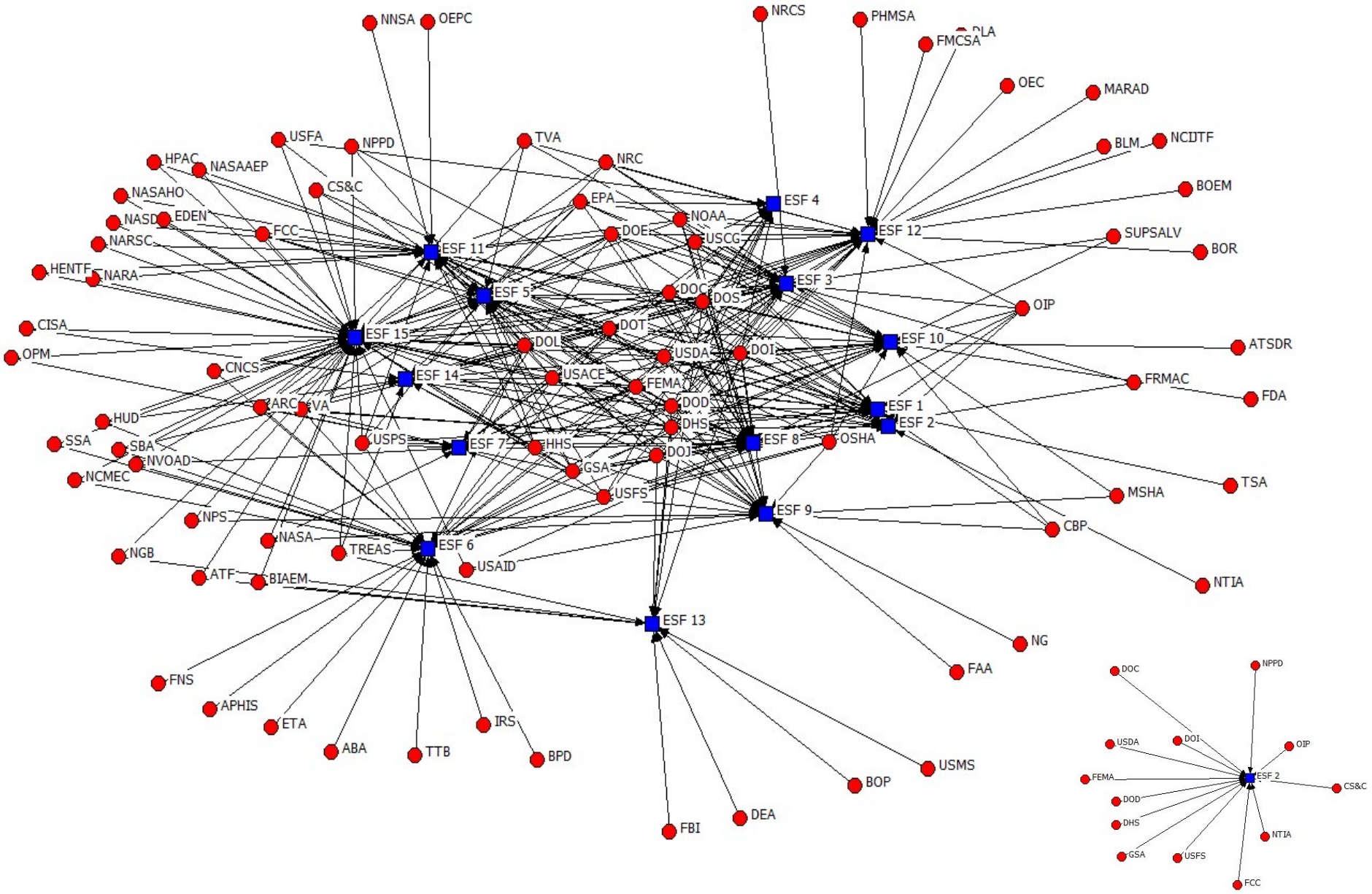
A formal affiliation network based on the NRF



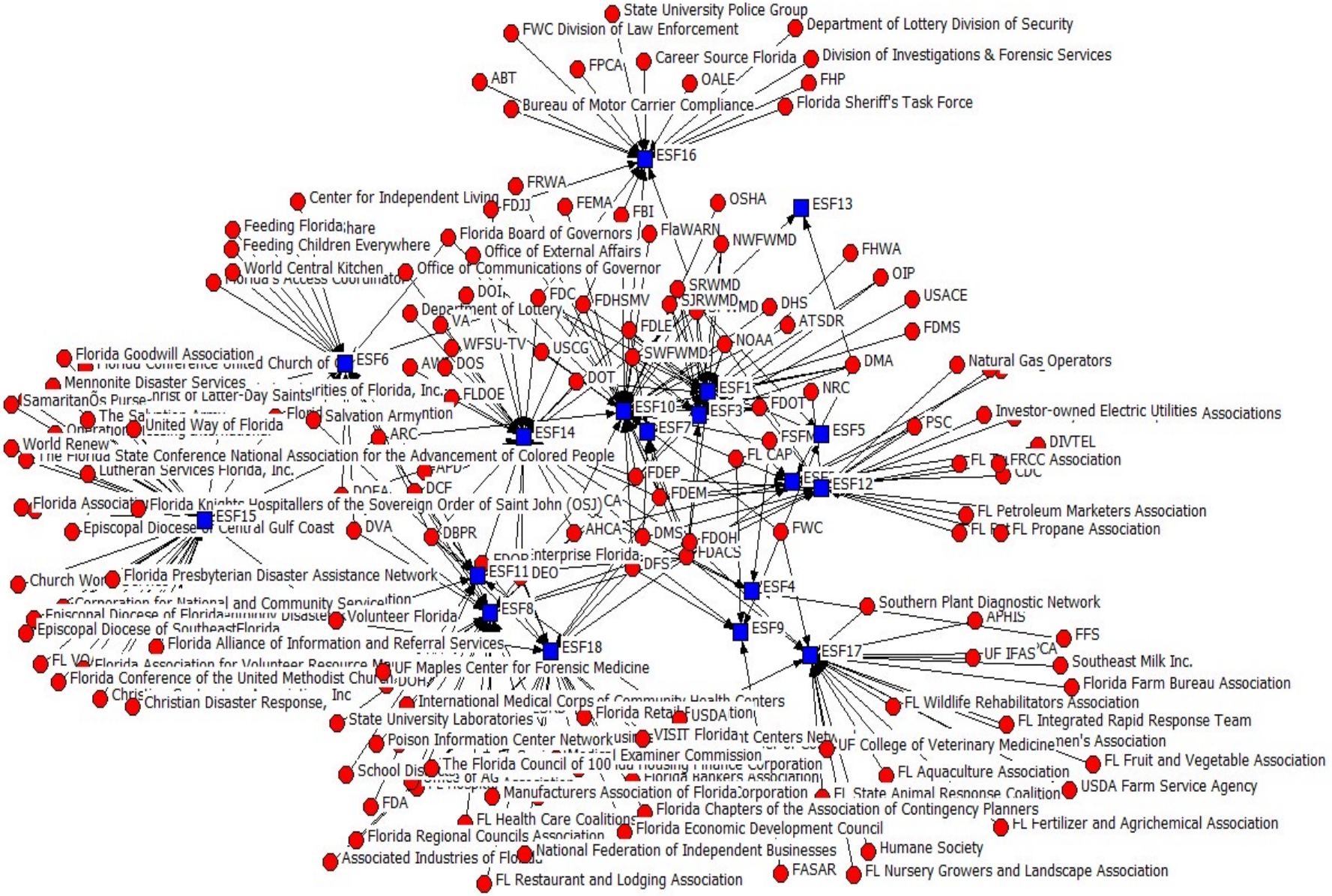
An organizational interaction network based on the NRF

Kapucu & Hu (2020)

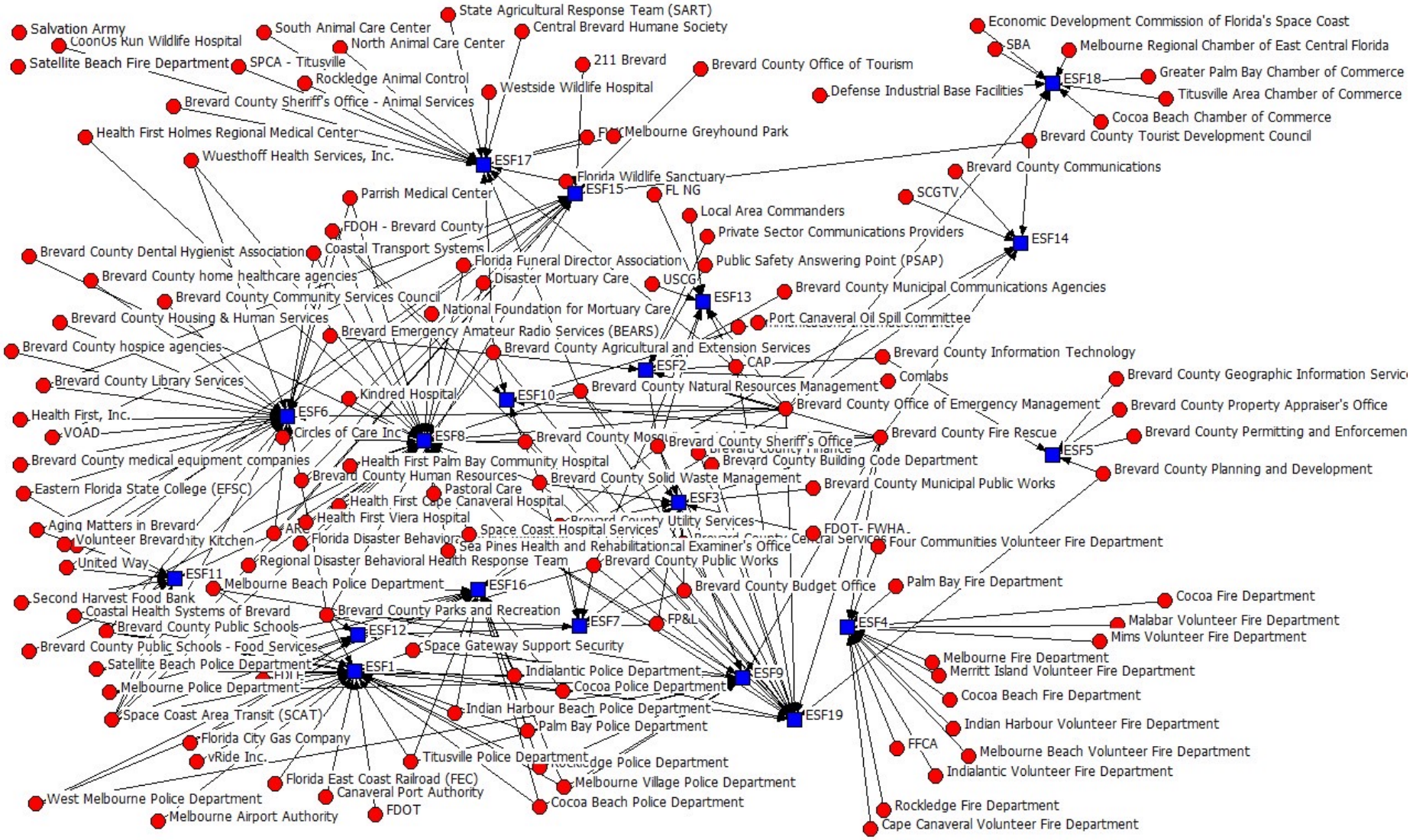
Affiliation Networks - National



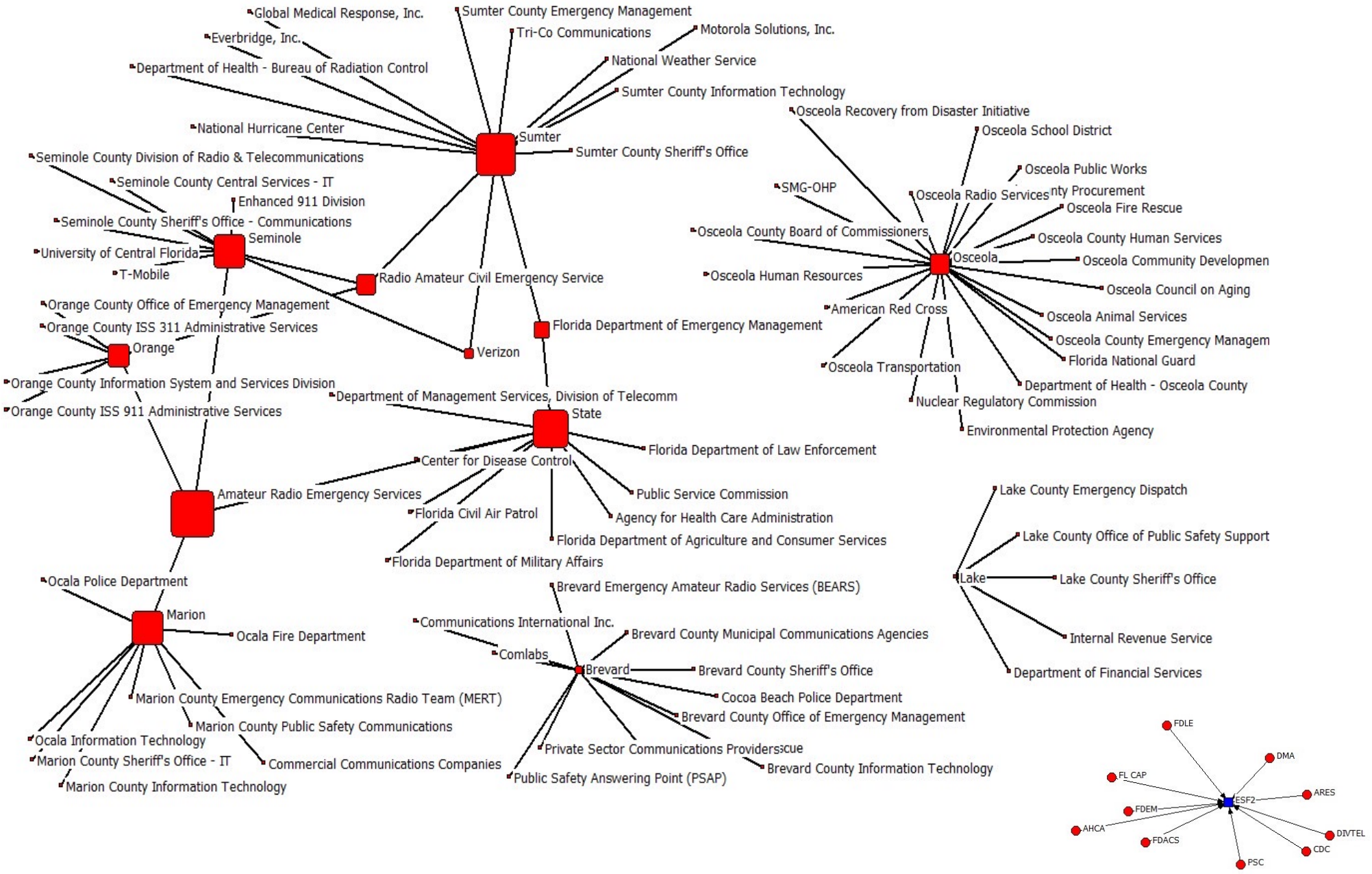
State of Florida

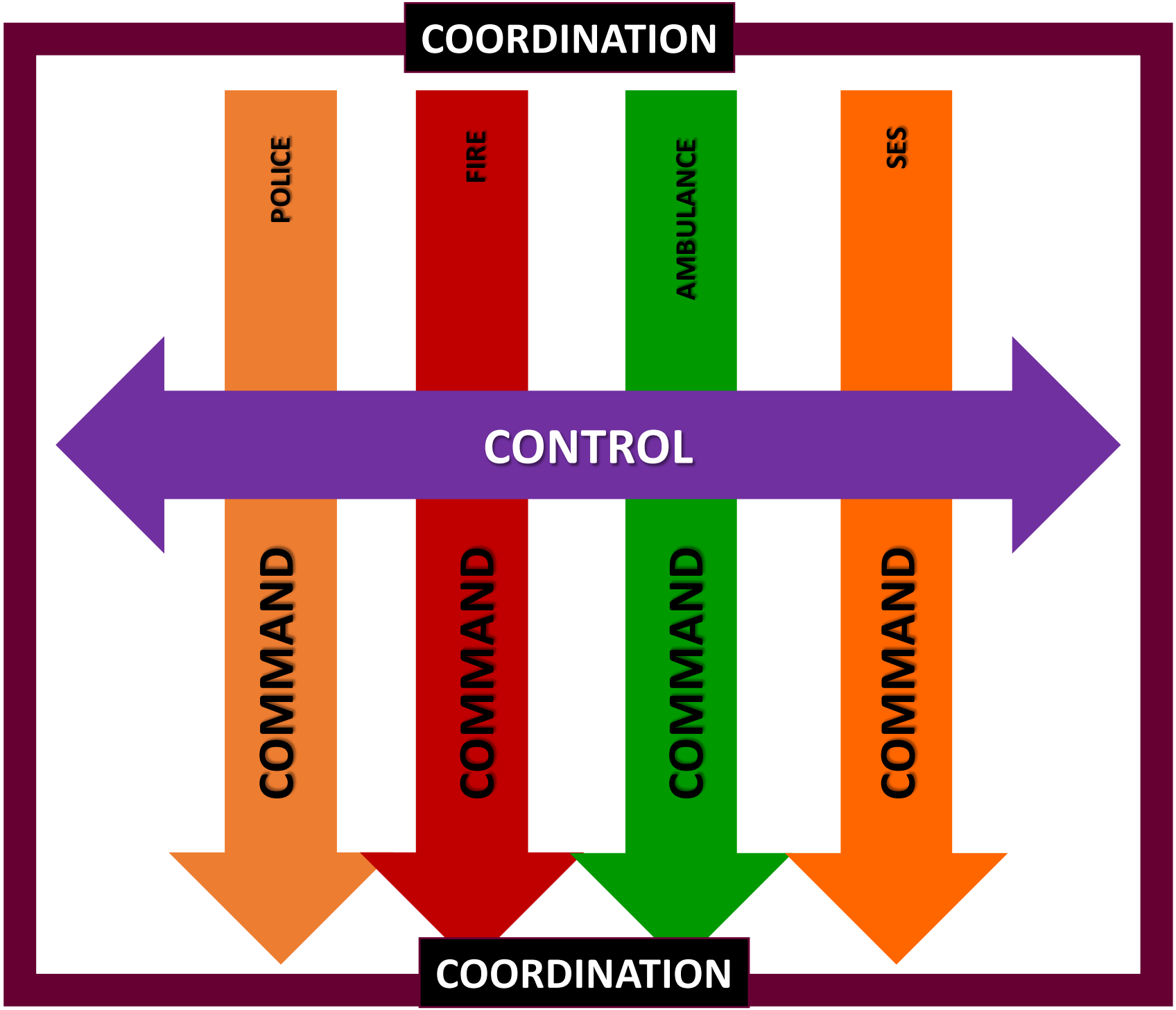


Brevard County Affiliation Networks



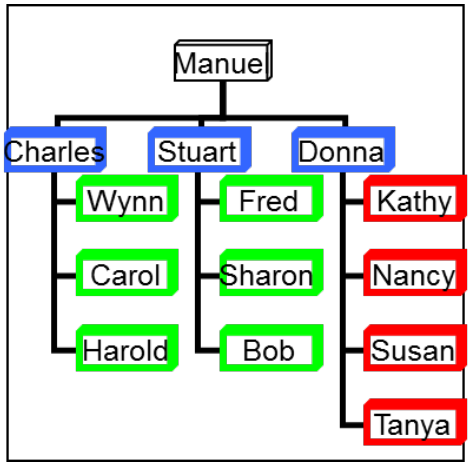
ESF 2- Communication Networks

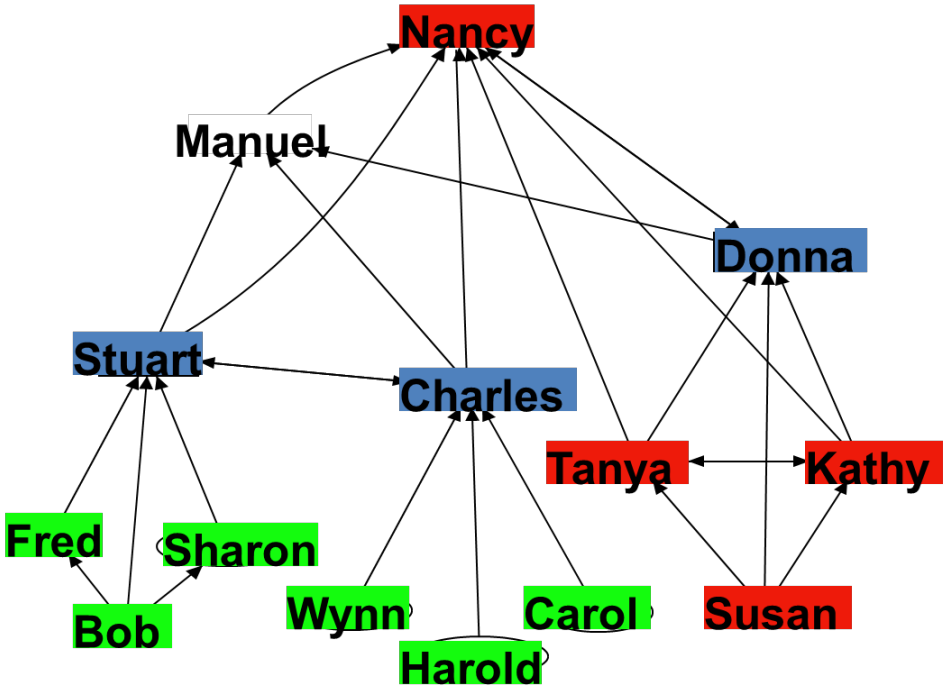



COORDINATION
POLICE
FIRE
AMBULANCE
SES
CONTROL
COMMAND
COMMAND
COMMAND
COMMAND
COORDINATION

Implications: Design vs. Practice

Advice Network for Auditors





Source: Krackhardt, D. (1996). "Social Networks and Liability of Newness for Managers." In C. L. Cooper and D. M. Rousseau (eds.) *Trends in Organizational Behavior*, *3*, pp. 159-173. Wiley.

Functionally Collaborative Networks

Facilitating Factors

* Degree of problem severity *Past experiences with disasters *Capacity and capabilities of public agencies/ managers (trainings and certifications) * Trust between agencies *Interoperable communication systems *(technical and cultural) *Information technologies that support effective communication * Pre-existing relationships * Funding initiatives* MOUs

Hindering Factors

* Power differentials between agencies and jurisdictions*Mission and cultural conflicts *Role ambiguity *Lack of communication plans * Of course, the lack of facilitating factors

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Collaboration in Disaster/Crisis Response

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VIEWPOINT

Building community resilience through cross-sector partnerships and interdisciplinary research

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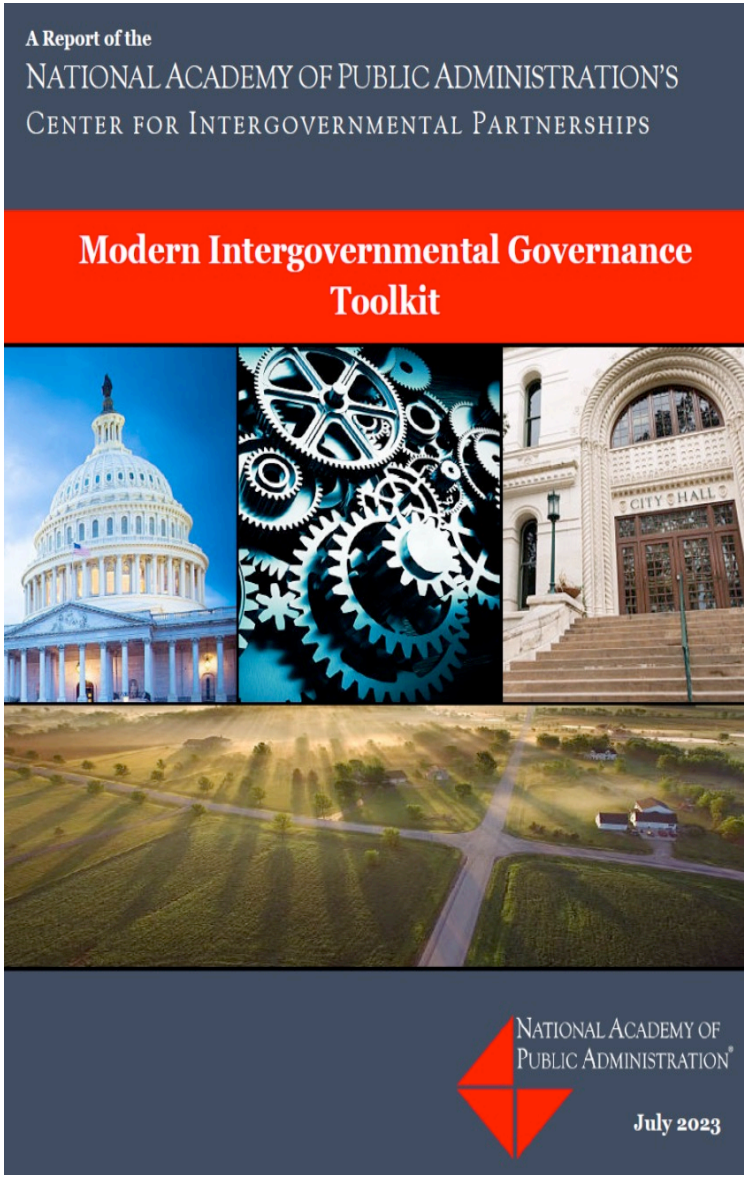
Abstract

Building community resilience has become a national imperative. Substantial uncertainties in dynamic environments of emergencies and crises require real-time information collection and dissemination based on big data analytics. These, in turn, require networked communities and cross-sector partnerships to build lasting resilience. This viewpoint article highlights an interdisciplinary approach to building community resilience through community-engaged research and partnerships. This perspective leverages existing community partnerships and network resources, undertakes an all-hazard and whole-community approach, and evaluates the use of state-of-the-art information communication technologies. In doing so, it reinforces the multifaceted intergovernmental and cross-sector networks through which resilience can be developed and sustained.

Evidence for practice

- Local communities can benefit from resources aggregated from different sectors and academia to enhance their capacity to plan, prepare for, and respond to emergencies.
- Interdisciplinary collaboration with community partners and stakeholders can help build community resilience in dealing with all hazards and public emergencies.
- Recent technological advancements can help improve real-time data collection and information sharing for networked and connected communities.



Source: https://napawash.org/academy-studies/intergovernmental-governance-models-for-the-21st-century

Observations

Governance Structures

- Systems approach – fragmented
- Policy, frameworks, confusion and implementation gaps
- Coordinating disasters in polycentric governance structures
  - Command, control, and coordination

Organizational Capacity

- Local capacities vary
- "Formalize the informality"

Collaborative Leadership

- Cultural interoperability- trust
  - People with uniform – people without uniform
- Better coordination across organizational and sectoral boundaries

Network Resilience

- Connecting the dots
- Centralized systems are fragile
- Redundancy in networks not efficiency (effectiveness)
- Lessons learned or 'fantasy documents'

Future Directions

- What nodes are included in a multilevel network? What types of relations are included?
- How does a network at one level influence the formation of ties and the structure of relations at another level?
- What leadership behaviors are needed most in a complex multilevel network setting?
- What type of governance structure is effective in a complex multilevel network setting?
- How does context influence the formation, development, function and structure of multilevel networks?
- Development of network-level resilience metrics to assess the resourcefulness, interdependency, rapidity, and adaptability

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Thank you!

Discussions & Questions

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