

Resilient by Design: Rethinking Network Governance for a Disruptive World

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Agenda

- My journey
- Resilience research
- Network perspectives in resilience building
 - Urban resilience
 - Interconnected systems
 - Network governance
- Cases, challenges, opportunities
- Conversation

Crisis Governance: Four Core Domains

Anticipation: Effective crisis governance begins with the ability to detect, interpret, and act on early signals before a crisis unfolds.

Coping: During a crisis, organizations must respond swiftly while managing trust and coordination across stakeholders.

Adaptation: Resilience depends on the ability to learn from past crises and transform organizational behavior and systems accordingly.

Governance: Robust governance structures are essential for preparing, coordinating, and sustaining crisis response across sectors.

Resilience

Resilience is the capacity of organizations and systems to anticipate potential crises, respond effectively under pressure, adapt through learning, and maintain robust governance to sustain coordinated action across sectors.

- Many definitions (abstract in nature)
- Relations to high reliability organizations
- Investment in resilience building

Disaster resilience

- Disaster resilience refers to the ability of individuals, communities, organizations, and systems to anticipate, prepare for, respond to, and recover from hazardous events in ways that minimize damage, preserve essential functions, and adapt to future risks.
 - Testable
 - Focusing events
 - Window of opportunities

Questions for consideration

- How can the resilience of interdependent 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 systems?
- How can organizational capacity influence stakeholders' participation in multi-level, multi-sector, interdependent 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 resilience of systems?

Usable knowledge

Big question: What conditions, capacities, and methodological approaches are required to effectively integrate co-produced, socially relevant knowledge into policy and practice through collaborative, problem-driven research in crisis governance?

Solution-Oriented Science: A research approach focused on addressing real-world problems through actionable, evidence-based knowledge (Watts, 2017).

Research Practice Partnerships: Involves coproduction of knowledge, collaboration with stakeholders, interdisciplinary / transdisciplinary methods, use-inspired research, and practical outcomes.

		Considerations of Use?	
		No	Yes
Quest for Fundamental Understanding?	Yes	Pure Basic Research (Bohr)	Use-inspired Basic Research (Pasteur)
	No		Pure Applied Research (Edison)

Stokes, 1997, p. 73

Method(s)

- Literature (scholarly and grey)
- Research-practice partnership(s)
- Expert feedback (scholars and practitioners)
- Content analysis of documents
 - After action report, Royal Commissions, & Independent inquiries, etc.
- Network analysis
- Cases: Major disasters
- Workshops, forums, and focus groups



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, for example)
- Infrastructure as lifelines to enable the continuous operation of critical government and business functions
- Cybersecurity threats
- Compounding impacts of disasters
- Emergency management is a quintessential role of government

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

Emphasis on 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

SA Statewide Blackout- September 28, 2016



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



ABC News: Tom Fedorowytch

Urban Flood Resilience – Sydney 2022



Two major inquiries: leadership,
collaboration, community engagement

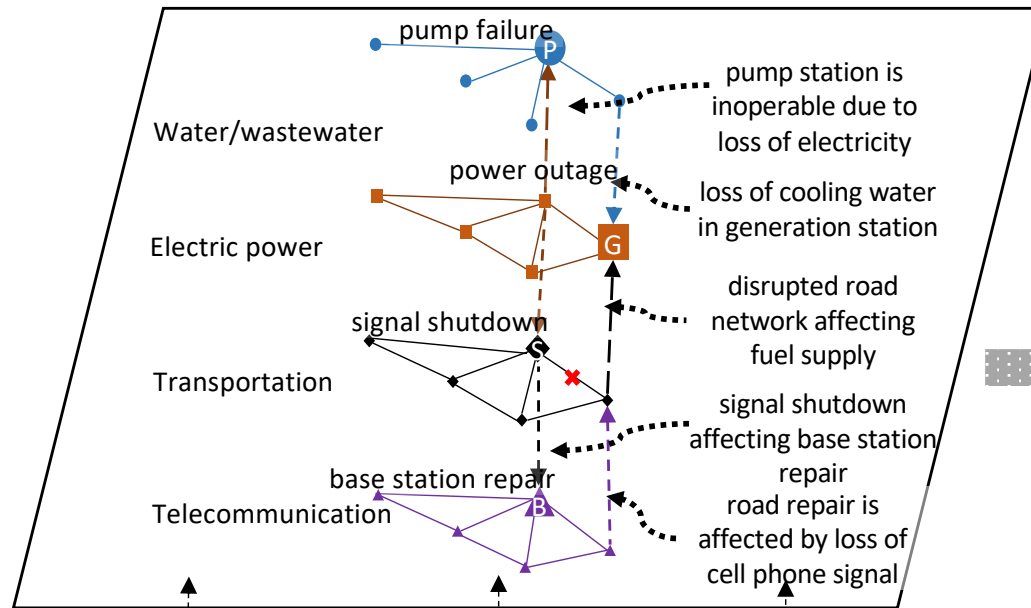


Source: Dean Betts, Director, Resilience NSW
Independent Inquiry 2022

Context: Urban Infrastructure Resilience



Interdependent Urban Infrastructure Systems



Urban Infrastructure Resilience

Natural or environmental dimension

Infrastructure dimension

Financial and economic dimension

Human and cultural dimensions

Social dimensions

Institutional dimension

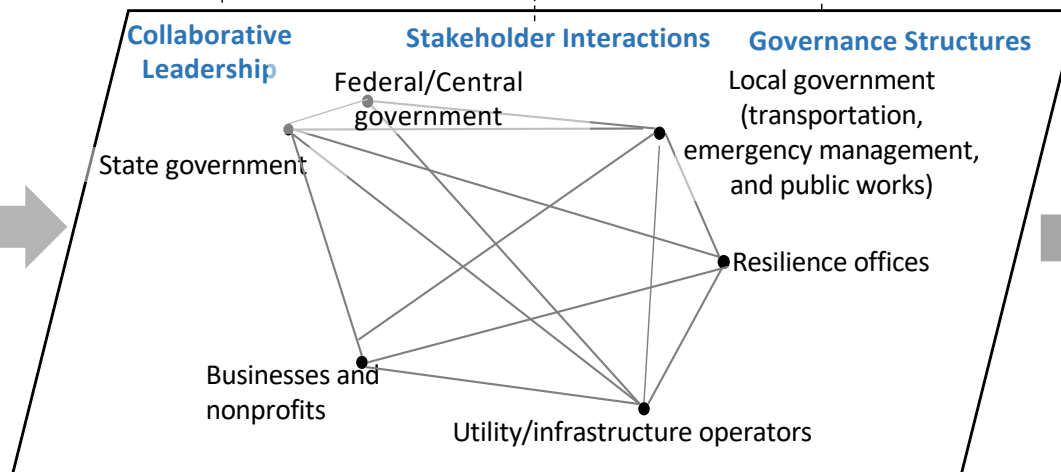
Network resilience - Robustness and Connectivity

Community Capacity

Organizational Capacity
Organizational Characteristics

Community Capital
Diversity, Social, and Economic Capital

External Factors
Political, Economic, and Social Environments



Network Governance



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Policies, Plans, & Frameworks

The United States

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)

State/Local

Florida (state and counties 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

Australia

- 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)

(Disaster resilience hub)

New South Wales (state responsible)

- 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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“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.”

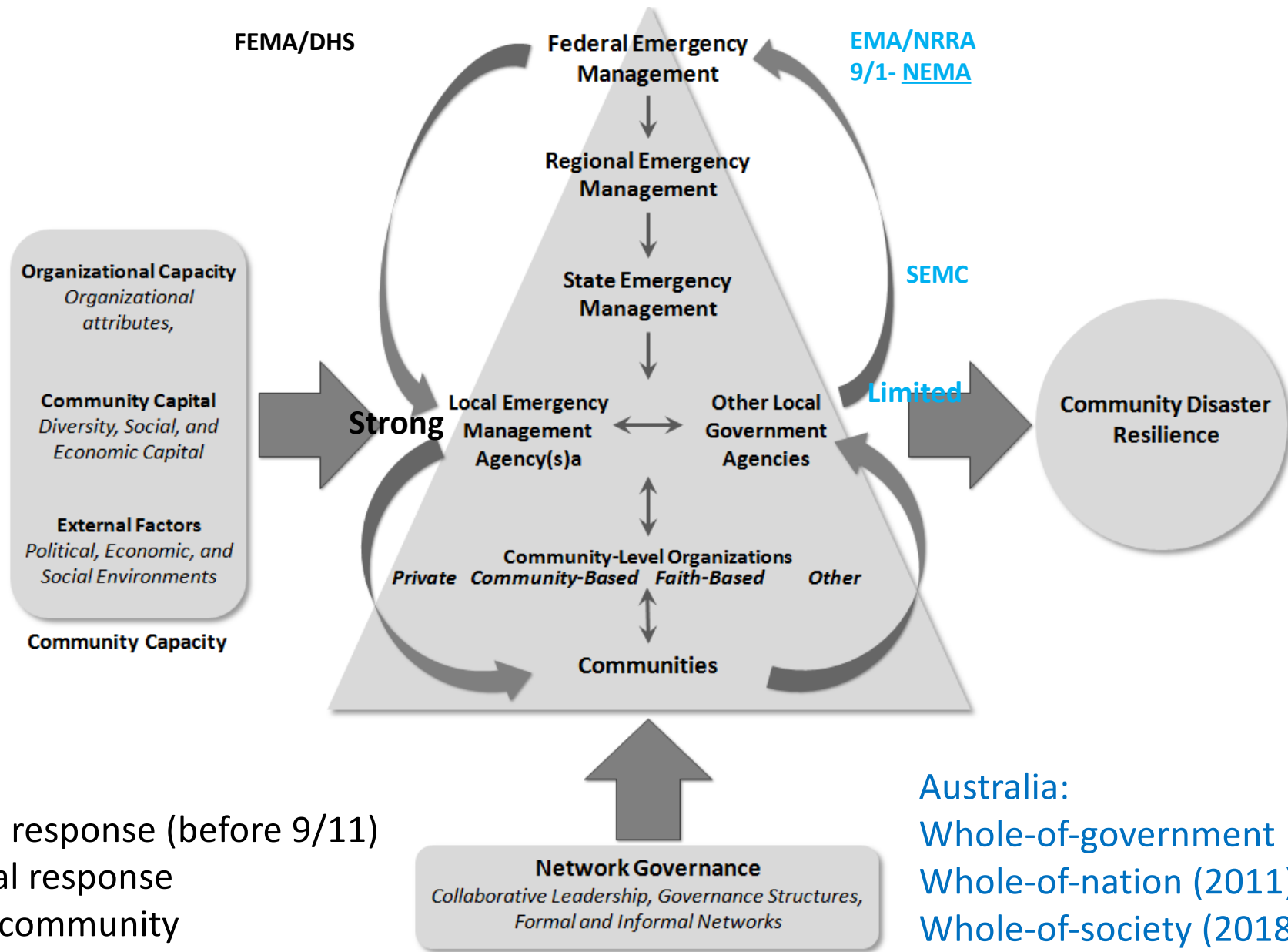
“Australia's National Strategy for Disaster Resilience (NSDR) acknowledges the increasing severity and regularity of disasters in Australia and the need for a **coordinated, cooperative** national effort to enhance Australia's **capacity to withstand** and recover from emergencies and disasters.”

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.”

System(s) for Resilience



(Adapted from Kapucu & Sadiq, 2016)



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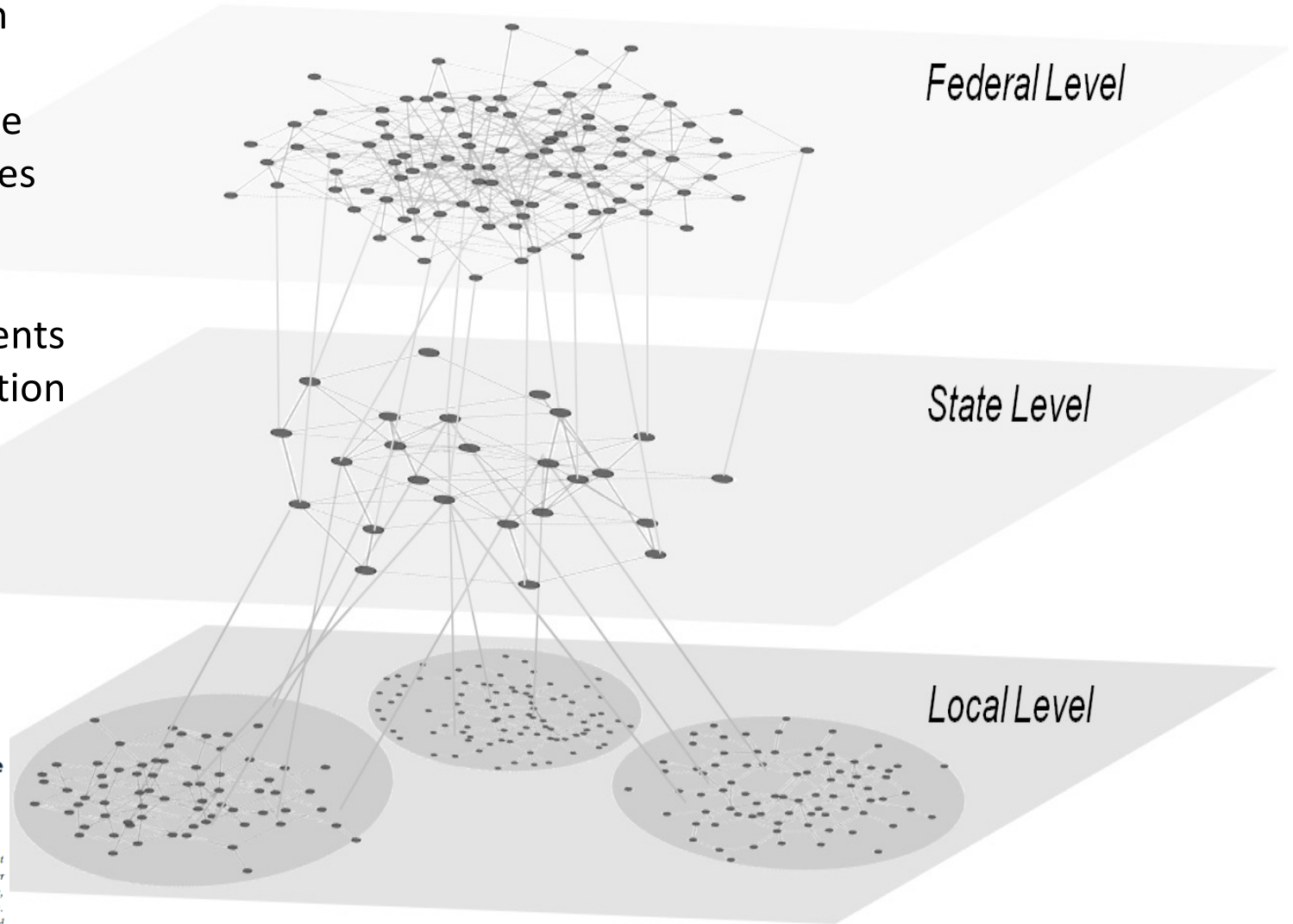
Network Governance

A system of coordination and decision making that facilitates interorganizational arrangements by relying more on interdependent relations, social norms, and trust than hierarchical structures to address issues in collective action. (Kapucu & Hu, 2026, forthcoming)

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 Toro¹

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.



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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 materials	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

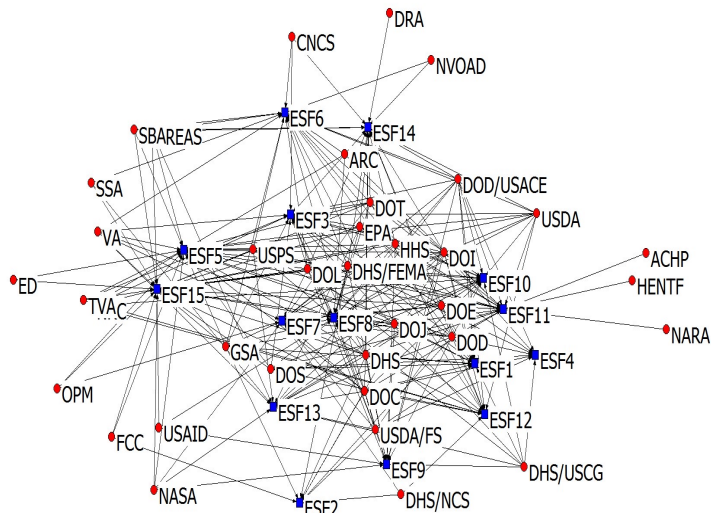
ESF #14 Long-Term Community Recovery

ESF #15 External Affairs

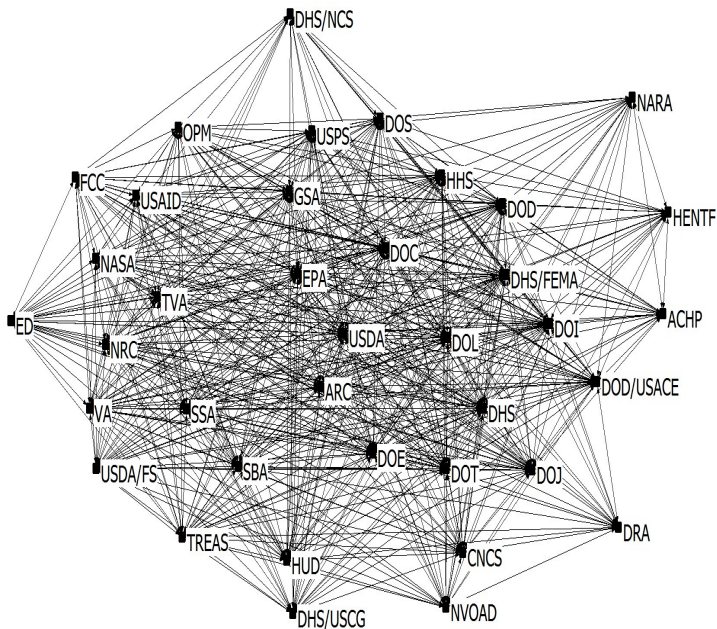


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Key actors and Network Structures



A formal affiliation network based on the NRF



An organizational interaction network based on the NRF

Natural Hazards (2023) 116:425–445
<https://doi.org/10.1007/s11069-022-05681-5>

ORIGINAL PAPER



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

Naim Kapucu¹ · Ratna Okhai¹ · Yue Ge¹ · Chris Zobel^{1,2}

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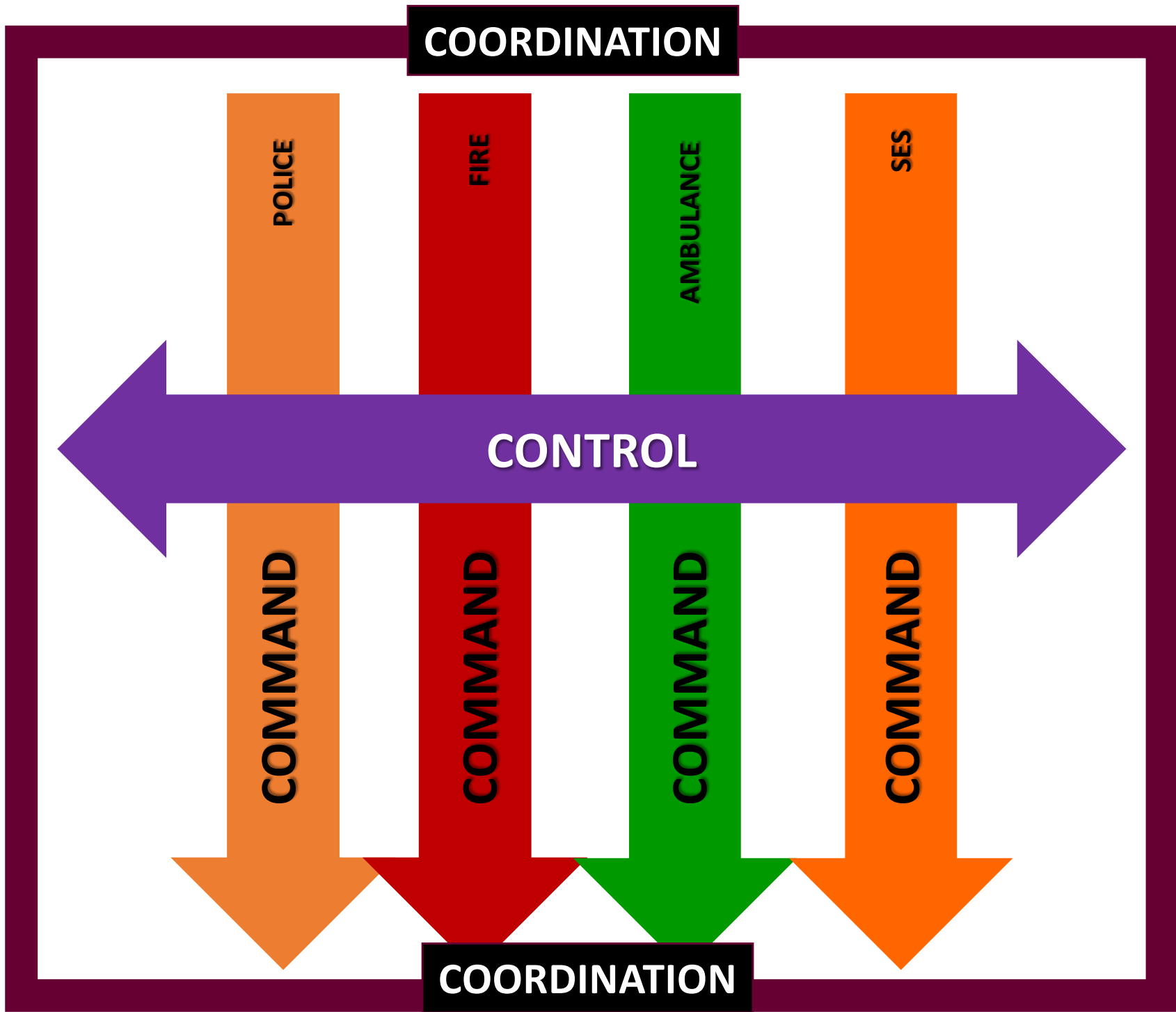
Abstract

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.

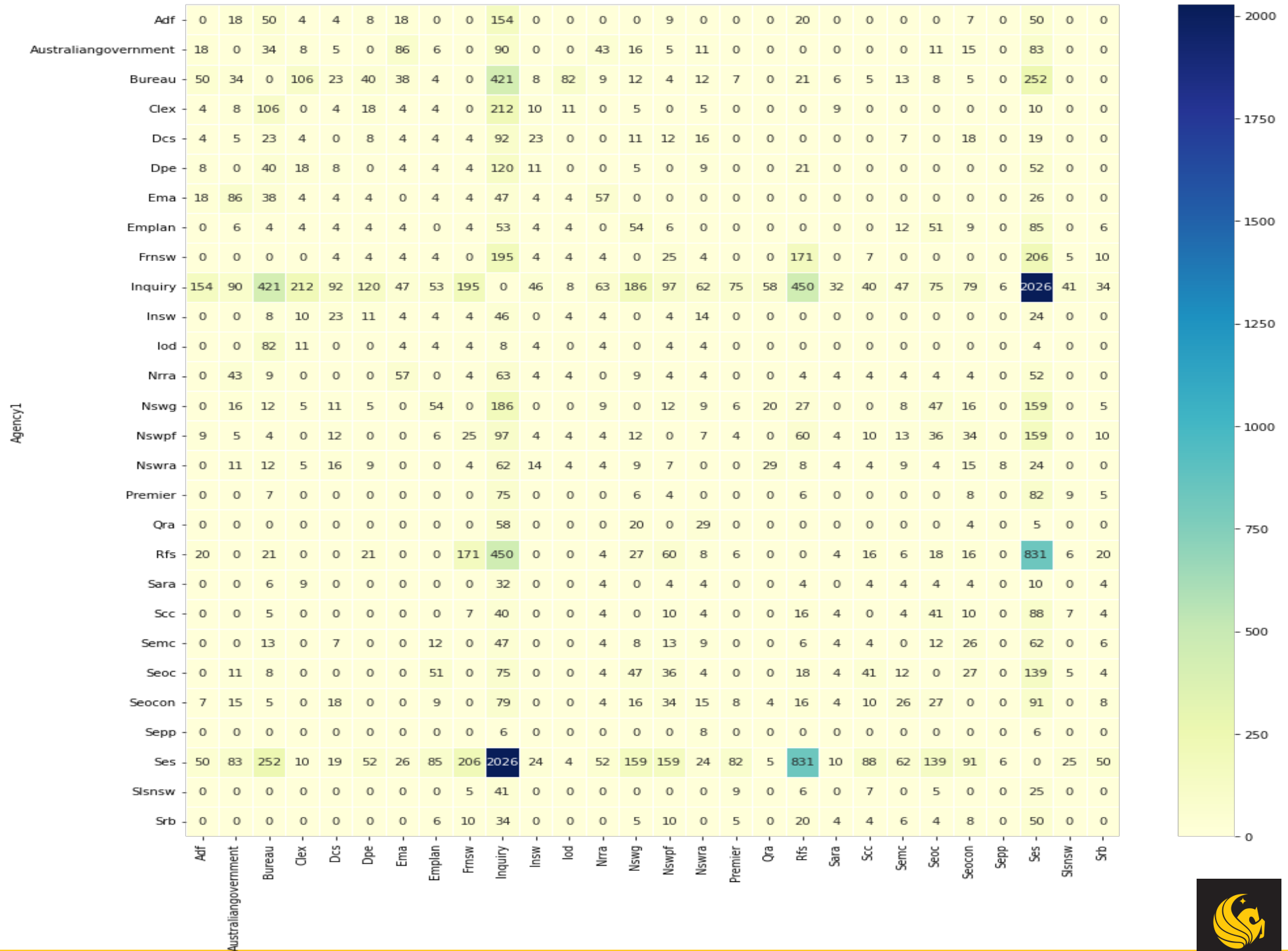
Keywords Networks · Network data · Content analysis · Network analysis · Network visualization · Disaster

NEMA and EMAC in Disaster Response

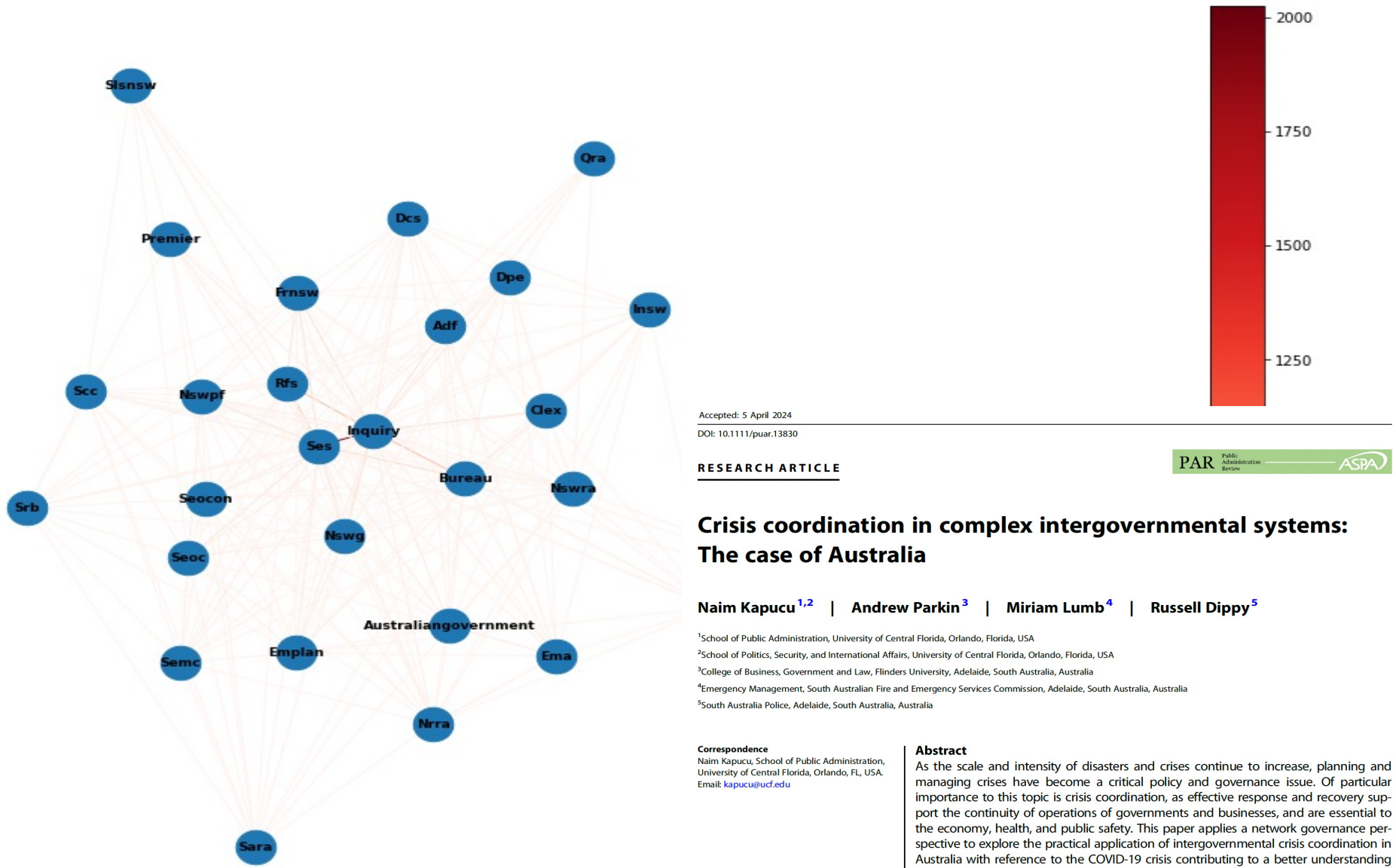
- National Emergency Management Association (NEMA) administers Emergency Management Assistant Compact (EMAC), the national mutual aid system.
- Provides day-to-day management, training, and coordination.
- Supports states during disaster response and recovery operations.
- Facilitates legal, financial, and operational frameworks for EMAC deployments.
- Acts as the Network Administrative Organization (NAO) ensuring seamless interstate collaboration.
- Enhances trust and collaboration among states.
- Provides training and capacity building.



Co-occurrence Matrix



Agency interactions- Coordination



Design vs. Practice



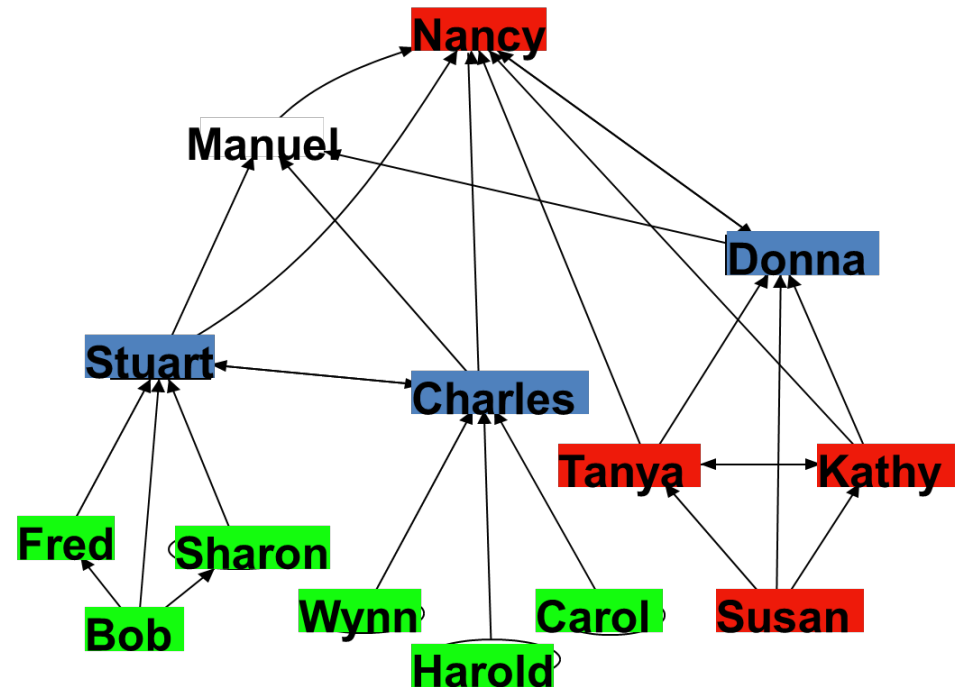
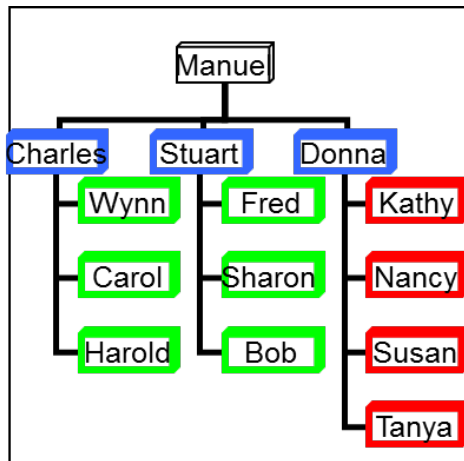
User experience

Design



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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.

Networks, Processes, Intervention

Formation Why networks arise	Design & Development How networks evolve	Sustainability and Resilience How networks survive
• Naturally emergent or deliberately designed • Previous failure by sector • Resource dependency • Pre-existing relationships between organizations • Sudden change in external circumstances • Old networks are transformed to suit new purpose	• Power imbalance and tensions • Level of formality • Institutionalizing processes • Building legitimacy and public value • Social capital and trust • Unique solutions • Adding and losing members • Formation of informal and formal leadership roles	• Committed leaders using consensus-based decision making • Continuous building of legitimacy and trust • Stakeholder analysis and use of specializations (asset mapping) • Build in resources to adapt to shock • Evaluations based on quality planning, purge weak links
Network leaders build relationships and trust, maintain expectations and open minds, and remain aware that competing logics are likely		

Adapted from Kapucu & Hu, 2020



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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.

A Report of the
NATIONAL ACADEMY OF PUBLIC ADMINISTRATION'S
CENTER FOR INTERGOVERNMENTAL PARTNERSHIPS

Modern Intergovernmental Governance Toolkit



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



Observations: Collective action

Governance Structures

- Systems approach – fragmented
- Policy, frameworks, confusion and implementation gaps
- Lessons learned or ‘fantasy documents’
- 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

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Thank you!



Discussions & Questions