

**Towards a C² Poly-Visualization
Tool:
Leveraging the Power of
Social Network Analysis and GIS**

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Introduction

- Emergency response needs timely information and effective communication.
- Inter- and Intra- organizational networks facilitate the flow of information.
- Building Social Capital improves information sharing, coordination, and decision-making.
- Combining the strengths of Social Network Analysis with GIS can highlight such networks and identify areas to build social capital.

Social Network Analysis (SNA)

What is SNA?

- Relationships among interacting units are important.
- Main principles underlying SNA.
- Unit of analysis can be individuals or groups.
- Graphic representation consists of nodes and ties.
- Cutting-edge SNA.
- Depends on three mathematical fundamentals.

SNA Methods

- Sampling (full network, snowball, and ego-centric).
- Data sources (key informant interviews, surveys, participant observation, and documents).
- Data entry format (adjacency matrix)

Current SNA Tools

- Options include commercial and freeware/shareware products.
- Sample of products:
AutoMap, BioWar, Construct, DyNet, I2 Analyst's Notebook, Organizational Risk Analyzer (ORA), Palantir, R, Starlight Information Visualization System, UCINet

SNA Key Measures: Network

Individual-Actor Measures	Network Measures
Degree	Size
In-degree	Inclusiveness
Out-degree	Component
Range (diversity)	Connectivity
Closeness	Cohesion
Betweenness	Density
Centrality	Centralization
Prestige	Symmetry
Brokerage	Transitivity

Key Measures important to disaster preparedness / emergency response: density and centralization.

SNA Key Measures: Individual

Measure	Definition
Centrality	Degree to which an actor/node plays a central role in the network
Homophily	Degree to which information is shared among similar actors in similar roles
Actor	Definition
Gatekeeper	An actor who serves as a connection to outside influences
Cutpoint	An actor who, when removed, results in unconnected paths in the network
Isolate	An actor in the network who has no ties to other actors

Measures of interest to disaster preparedness / emergency response: all.

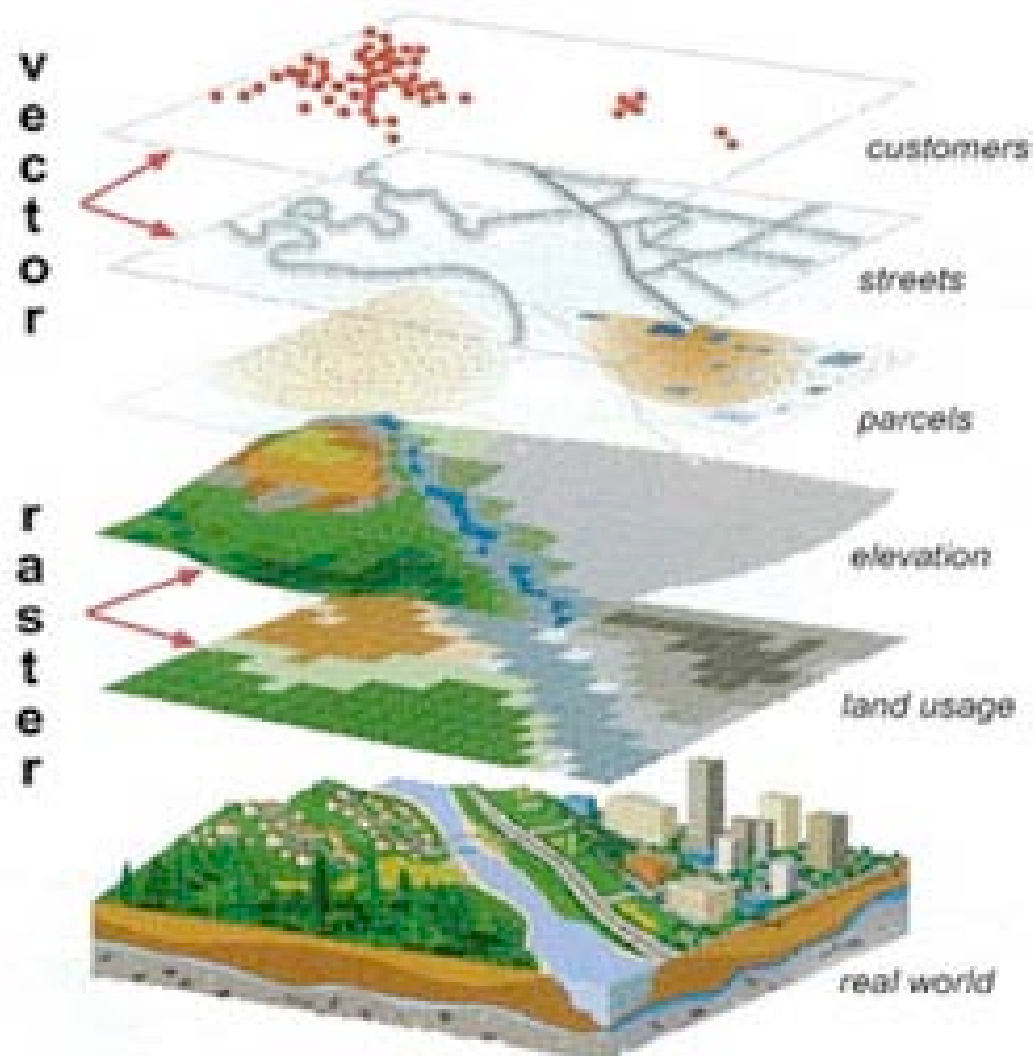
Advantages of SNA

- SNA research of disasters/emergencies topics include: preparedness and response, cross-agency coordination, reducing complex vulnerabilities, boundary spanners, information/communication in disaster situations.
- SNA analysis types of interest: emergent leaders, vulnerabilities, information loss/gain, organizational behavior change, belief structure mapping.
- The ability to identify: optimal communication methods with communities, how to enlist help within communities, critical network features, opportunities for intervention-based action or analysis, potential events with event forecasting.

SNA Barriers

- Tools designed for academic use
- Labor-intensive
- Data availability
- Data quality
- Lack of anonymity
- Impact of missing data

Geographic Information Systems (GIS)



<http://www.cowleycounty.org/gis/>

GIS Uses in Command and Control

- Framework for decision-making
- Identify community vulnerabilities
- Evaluate extent of disasters and require level of response

GIS Barriers

- Communication redundancy of cartographic communication
- Inability to quickly share relevant information in a crisis
- Difficult user-interface
- Cannot show “non-observational” social elements

Making SNA-GIS Accessible

- A new tool that combines SNA and GIS analysis in a user-friendly manner is needed.
- Training on how to use SNA and GIS

If Successful....

- SNA/GIS analysis could result in planners better understanding: the physical layout of the community of question, the social networks that are active within the community, the implications related to the behavior of the social network and the physical environment.