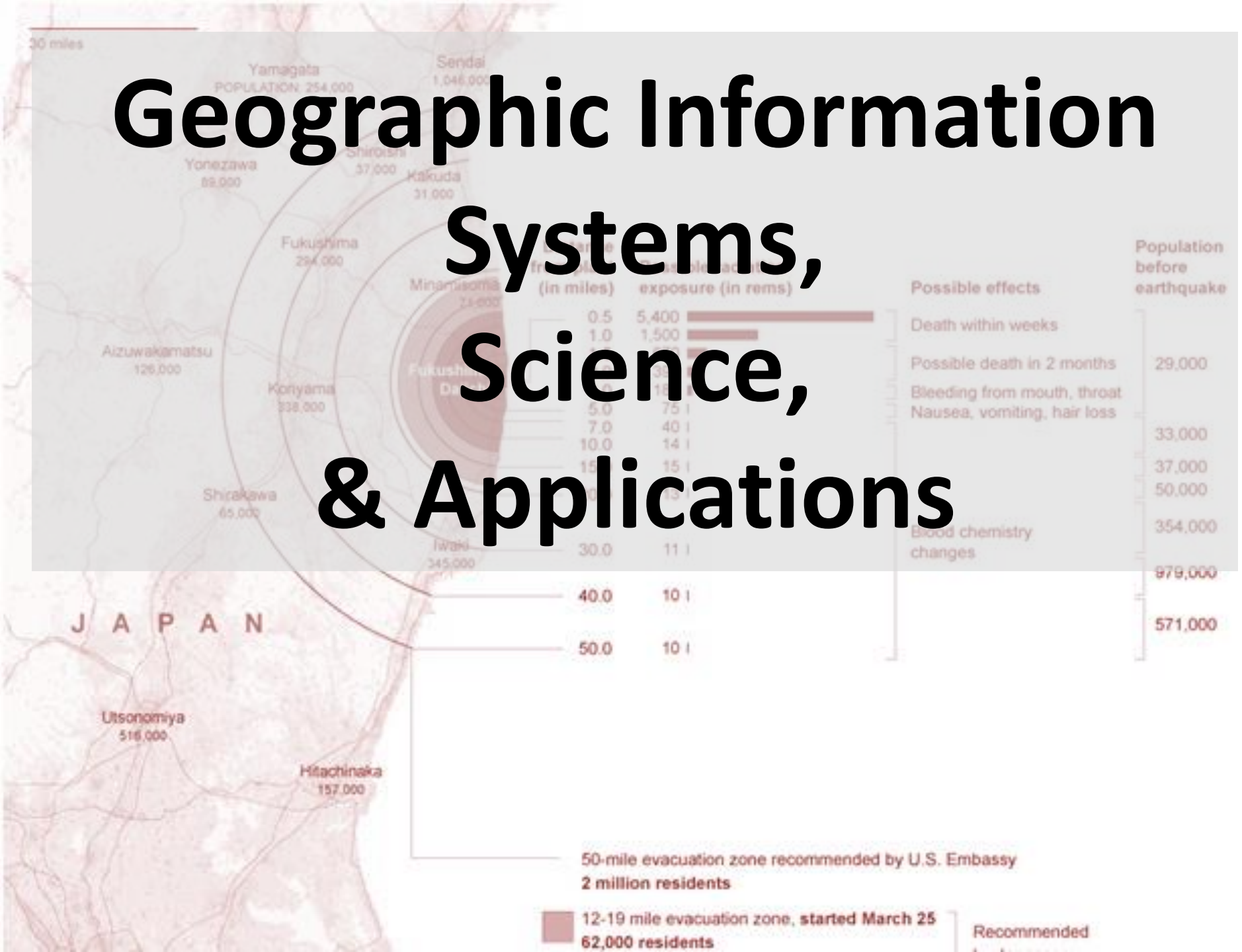
Geographic Information Systems, Science, & Applications



GIS: Geographic Information **Systems**

- Emphasis on Technology and Tools
- Definitions:
  - " A powerful set of tools for storing and retrieving at will, transforming and displaying spatial data from the real world for a particular set of purposes."
    Peter Burrough

GIS: Geographic Information **Systems**

- Definitions:
  - "Automated systems for the capture, storage, retrieval, analysis, and display of spatial data." Keith Clarke

GIS: Geographic Information **Systems**

- Definitions:
  - "An information system that is designed to work with data referenced by spatial or geographic coordinates. In other words, a GIS is both a database system with specific capabilities for spatially-referenced data, as well as a set of operations for working with the data." Jack Estes

GIS: Geographic Information **Systems**

- Definitions:
  - "A GIS is a special case of IS where the database consists of observations on spatially-distributed features, activities, or events which are definable in space as points, lines, and areas to retrieve data for ad hoc *(the purpose of doing)* queries and analyses." Ken Duecker

GIS: Geographic Inform

- Components:
  - Software products
  - Data Sets and databases
  - Community of people working with the data and tools
  - Application of technology for advanced science and problem solving
  - Hardware
  - Network

GIS: Geographic Information **Systems**

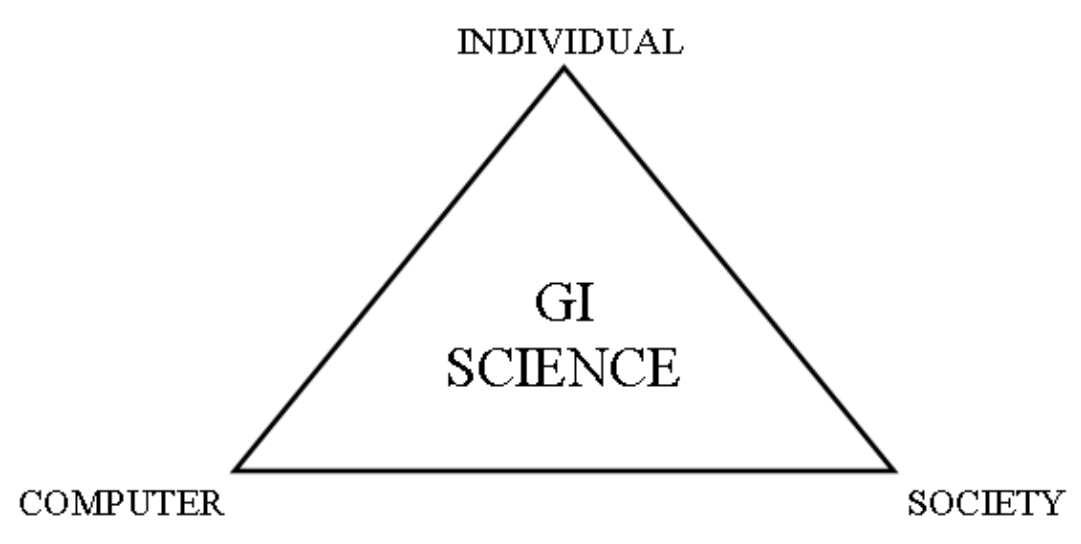
- Geographic vs Spatial vs Geospatial Info:
  - Geographic Information: Data about the Earth's surface and near surface.
  - Spatial Information: Any space, including geographic, medical imaging, molecular level, space on other planets, etc.
  - Geospatial: synonymous with geographic.

GI**Science** Michael Goodchild (1992)

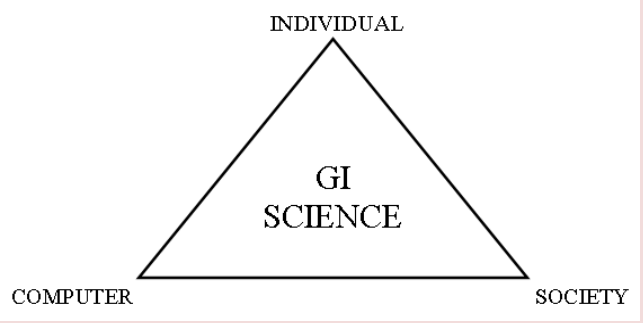
- Questions that arise from the use of GIS are addressed through GIScience.
  - Understanding GIS use
    - Questions raised…
      - What principles might help design a better map?
    - Scientific Approach
      - Examines the fundamental issues arising from the creation, handling, storage, and use of geographic information.

GI**Science** Michael Goodchild (1992)

- Three elements to GIScience



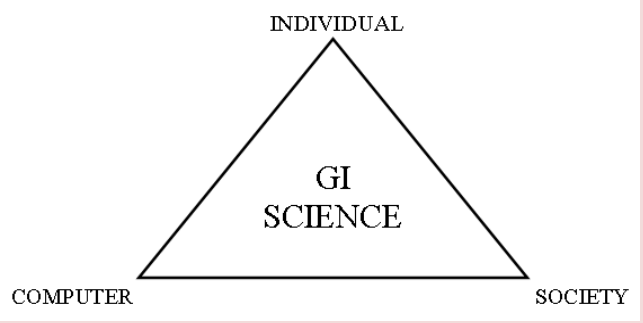
  - Individual, computer, and society



GI**Science**

Michael Goodchild (1992)

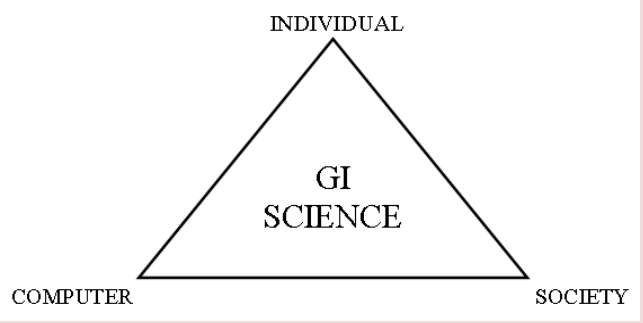
- Individual
  - Research focused on cognitive science (the process of learning and knowing).
  - How well are users understanding spatial concepts, learning and reasoning with geographic data, and effectively interacting with the computer?



GI**Science**

Michael Goodchild (1992)

- Computer
  - Research about….
    - …representation of geographic information.
    - …the adoption of new technologies.
    - …computation.
    - …visualization.



GI**Science** Michael Goodchild (1992)

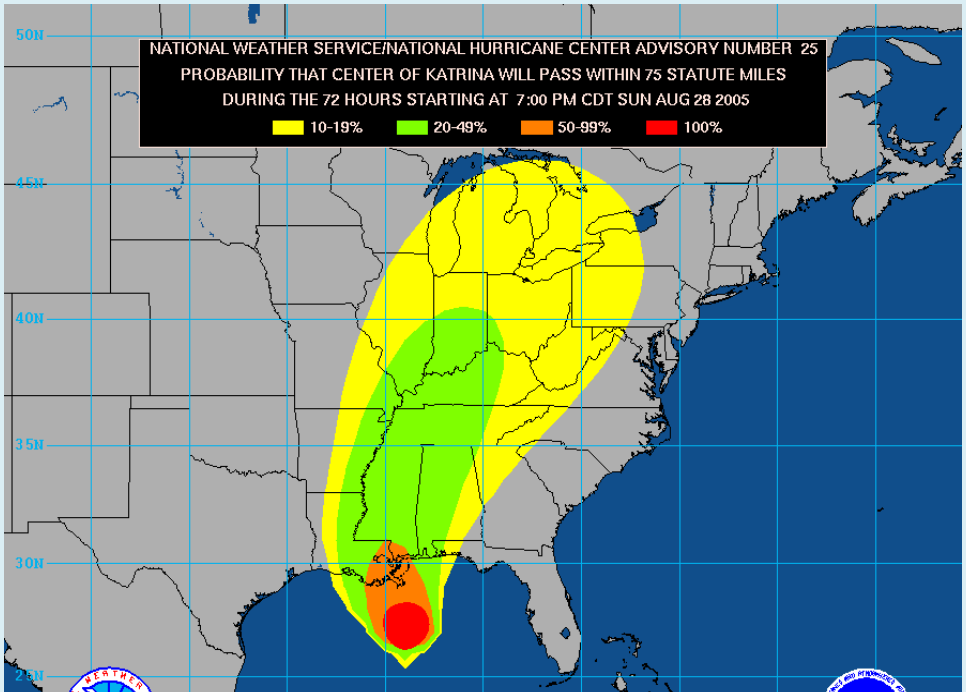
- Society
  - Research about the impacts to society
    - Political
    - Economic
    - Social

Applications

- Problem Solving
  - Objective or Goal-Driven
    - Maximizing/minimizing cost distance
  - Tangible vs Intangible
  - Multiple Objective
    - Cost and environmental impacts = Multi-criteria decision-making
  - Example: “Finding the Best Location for a New San Diego Airport”

Applications

- Scientific Modeling
  - Mathematical representations of reality
    - Identifying the variables that affect a system
    - Knowing how the variables correlate quantitatively



Applications

- Examples
  - Land-Use Planning
  - Environmental Resource Analysis
  - Tax Appraisal
  - Utility and Infrastructure Planning
  - Real-Estate Analysis
  - Marketing and Demographics
  - Habitat Studies
  - Archaelogical Analysis
  - Private Companies and Corporations: “CoinStar”
  - Disaster Relief