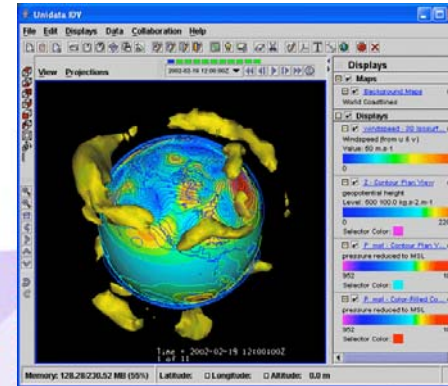


Integration of Quantitative and Qualitative Information



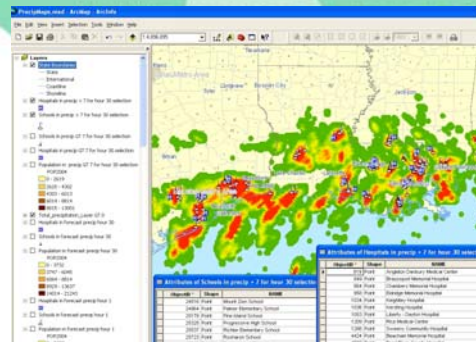
**Social
Science**

**Data /
Information**



Earth Sciences

GIS



**Olga Wilhelmi
NCAR
Boulder, CO**

**PLAN Workshop
Oslo
12-13 April, 2007**

Different Ways of Thinking about Data



- **In the GIS (solid earth and societal impacts) community, common data are:**
 - A collection of *features* (e.g., roads, lakes, plots of land, census blocks, zip codes) with geographic footprints on the Earth (surface).
 - The *features* are discrete objects with attributes which can be stored and manipulated in a **database**
- **In the Earth Science (atmosphere and oceans) community, common data are:**
 - A set of *parameters* (e.g., pressure, temperature, wind speed) which vary as continuous functions in 3-dimensional space and time.
 - Data are simply discrete points in the mathematical function space
- **In the Social Sciences community common data are:**
 - spatially and/or temporally structured *quantitative* or *qualitative* and *context-specific* pieces of information
 - *Quantitative* data are represented by numbers and statistics
 - *Qualitative* data are represented by words (interviews), objects (artifacts), pictures (photo, video)

Spatial Integration (quantitative)

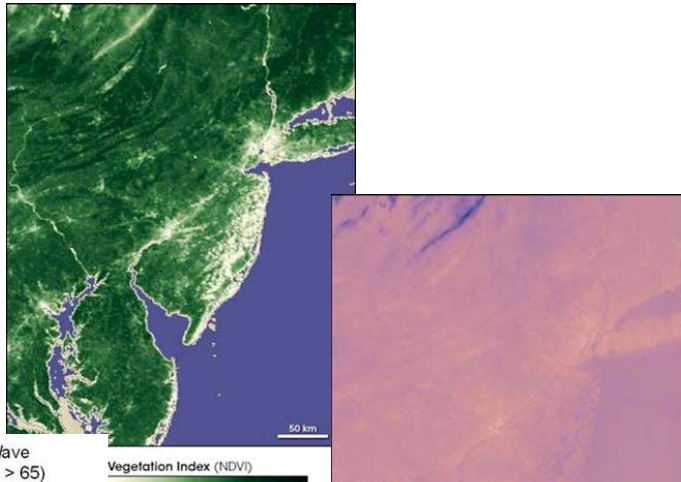


The screenshot displays the ArcMap interface with several key components:

- Map View (Top Left):** A world map showing a global road network. Major cities like Chicago, New York, Los Angeles, Mexico City, London, Paris, Moscow, and Tokyo are labeled. The map uses a color gradient from blue to red to represent road density or length.
- Data Table (Top Right):** A table with columns: S_ID, RO_TYPE, RO_STAT, and kilometer. It lists individual road segments with their IDs, types (e.g., Primary/Secondary Road), status (Functioning), and lengths in kilometers.
- Selection Statistics of roads (Middle Right):** A dialog box showing statistical data for the selected roads:

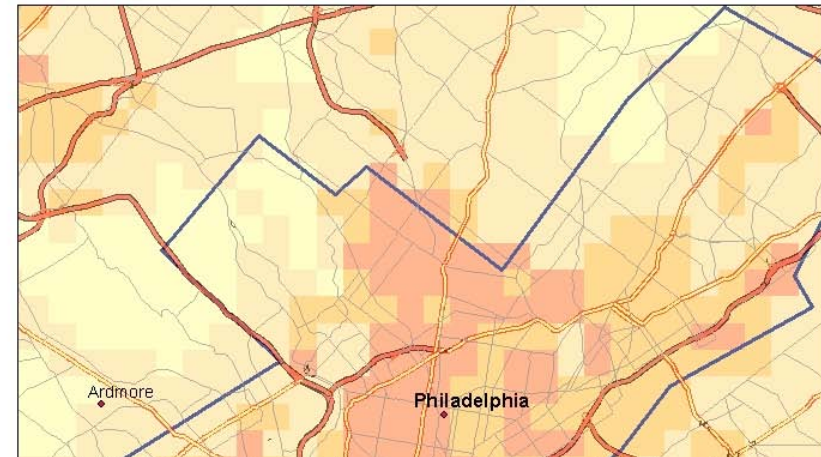
Field	Value
kilometer	4480
Count	0.033774
Minimum	195.505005
Maximum	67493.535322
Sum	15.064628
Mean	13.855149
Standard Deviation	13.855149
- Frequency Distribution (Middle Right):** A histogram showing the distribution of road lengths. The x-axis represents length in kilometers (0.0, 38.5, 77.0, 115.4, 153.8) and the y-axis represents frequency (0 to 2,500).
- Map View (Bottom Left):** A world map showing a different road network visualization, possibly highlighting specific regions or road types.
- Map View (Bottom Right):** A detailed map of Asia and surrounding regions, showing road networks in red and orange. Countries labeled include Russia, Kazakhstan, Mongolia, China, India, and others.

Spatial Integration (quantitative)

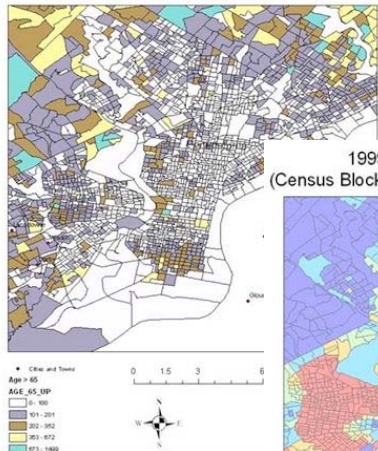


1999 Philadelphia Heat Wave
(Census Block Groups: Age > 65)

Vegetation Index (NDVI)



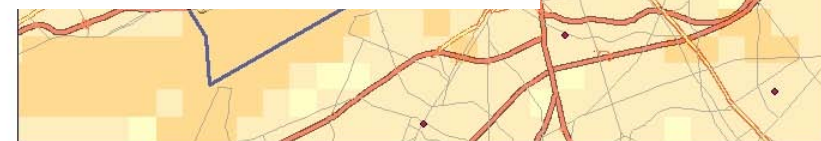
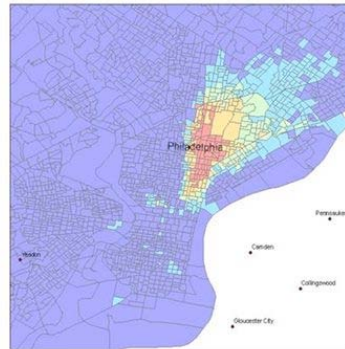
Weighting of different layers can be either quantitative (spatial statistics) or qualitative (informed judgment)



1999 Philad:
(Census Block Groups)



(Census Block Groups: Hispanic Population Density)



Philadelphia County

Major Roads

- Limited Access
- Highways
- Secondary Roads
- - - Other
- Highway Ramp

Excessive heat risk

- Low
- High

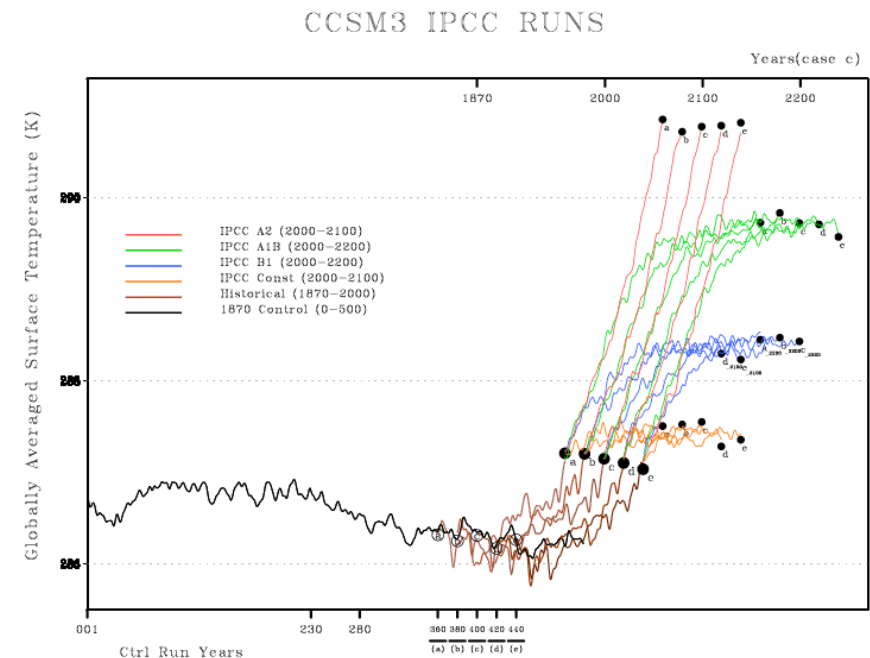
Spatial Integration (challenges)



- **Data formats**
- **How data are stored and retrieved**
- **Semantics**
- **How metadata collected and made available**
- **How the Earth is represented and its impact on spatial accuracy**
- **How uncertainties and errors are measured and quantified**
- **Different scales may affect the end result (have to work at the resolution of the coarsest data set)**
- **How well information can be modeled?
Generalized? Upscaled/downscaled?**

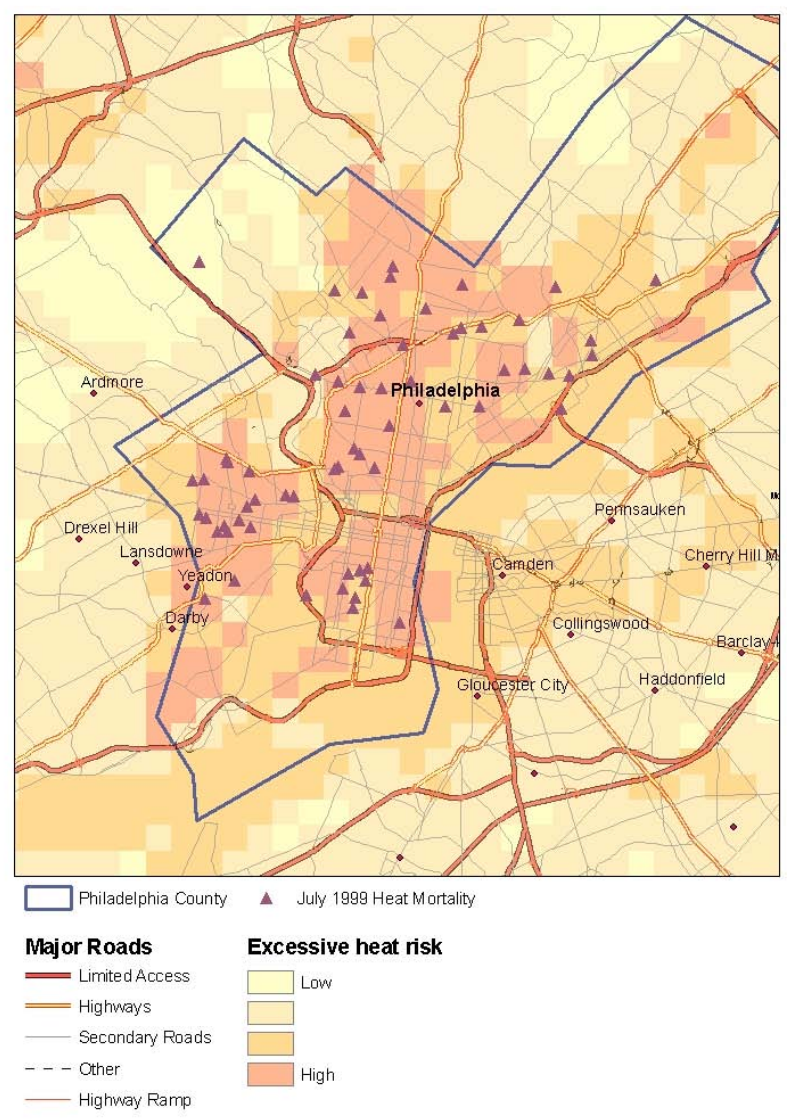
Temporal Integration

- **Temporal dimension of PLAN data (dynamic nature of human and natural systems)**
- **Social science data (both quantitative and especially qualitative) are snapshots in time, while natural system can be monitored or modeled continuously**
- **Range of climate projections; few (mostly on national level) demographic and economic projections**
- **Uncertainty of future projections**
- **Legacy of quantitative and qualitative data**

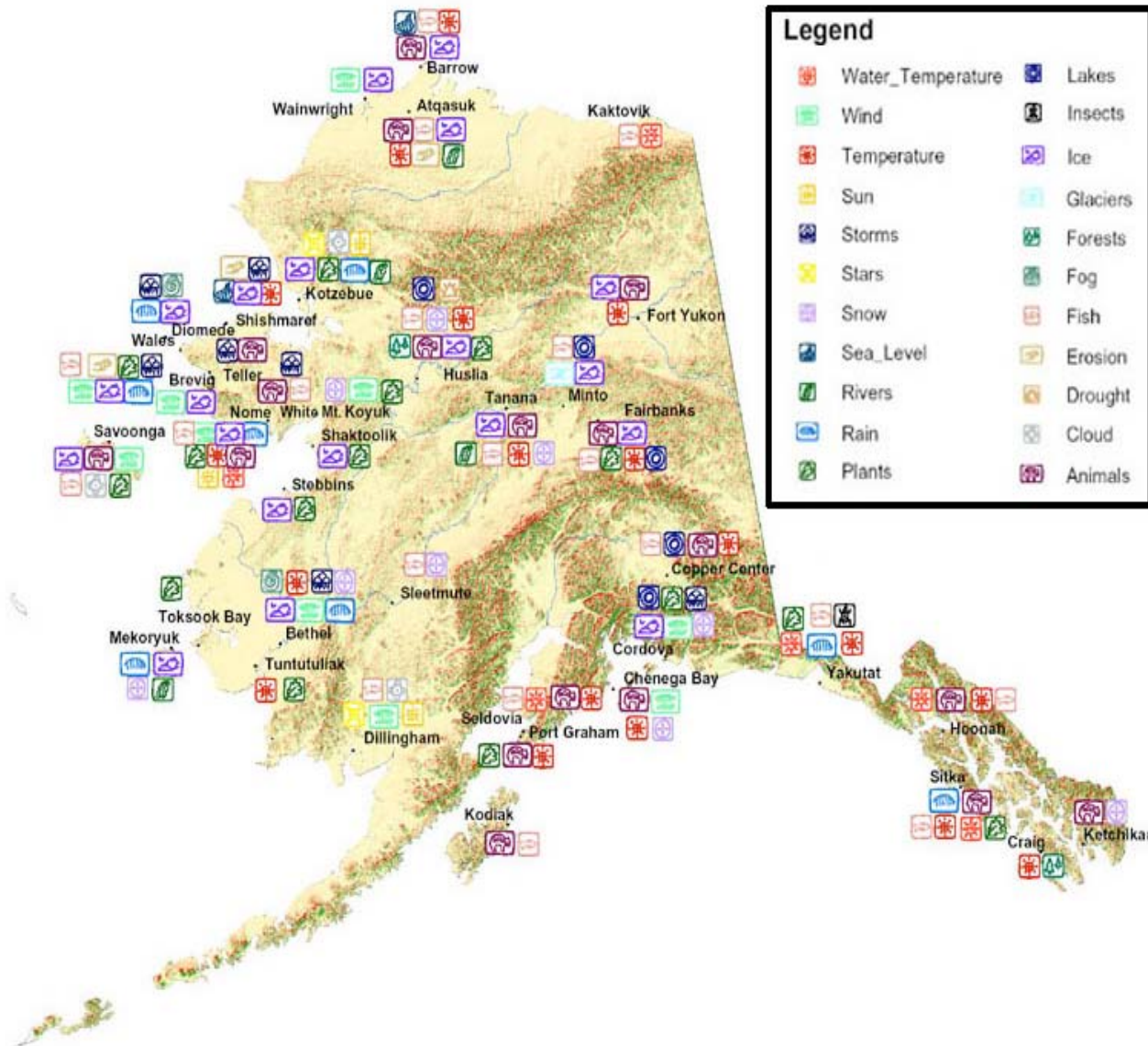


Conceptual Integration

- Visualization of information
- Geographical referencing (XY, place name, geographic identifier) allows for mapping data together to reach a *common interpretation*
- Methodological differences (concepts and study objects) may create challenges



Observations of Climate Change



From S. McNeeley