Journey to Work and Carbon Emissions

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http://wiki.ornl.gov/sites/rams09/k_fernandez/Documents/Fernandez_K_Poster.ppt

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Geographic Information Science and Technology

Background Information

- Energy saving potential in regional to nation level
- Potential driven by individual socioeconomic behavior at local level
- Interaction characterization among humans, energy, and transportation networks

Research Objectives

- Test proposed hypothesis
  - 80% of Americans work within the county and its adjacent counties of the one they reside
  - Relate findings to carbon emissions

Methods

- LandScan USA
- ArcMap
  - Model Builder
  - Scripting
- Data management
  - Microsoft Access
  - Queries
  - Calculated results

Carbon Emissions

- Transportation produces 33% of all U.S. carbon emissions[1]
- 77% of Americans drive to work alone[2]
- One American commuter produces 6,000 pounds of carbon in one year[4]
- SUVs and light trucks produce 8,300 pounds anually[4]
- Motorcycles produce 3,100 pounds per year[4]

Possible Solutions

- Utilize public transportation
- Carpool incentives
- Restrict vehicle miles driven

What different transportation modes do workers utilize? How do these transportation modes impact the environment?

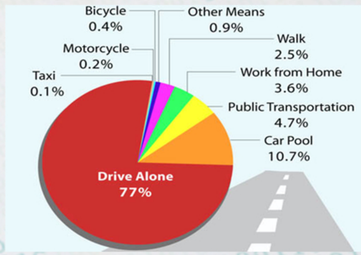


Figure 1. Representation of different modes of travel, (U.S. Census Bureau).

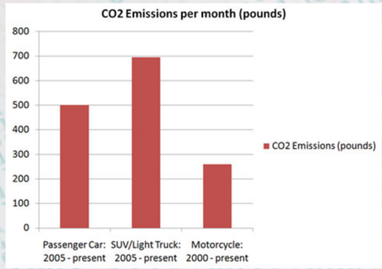


Figure 2. Emissions due to different automobiles, (Bureau of Transportation Statistics, 2009).

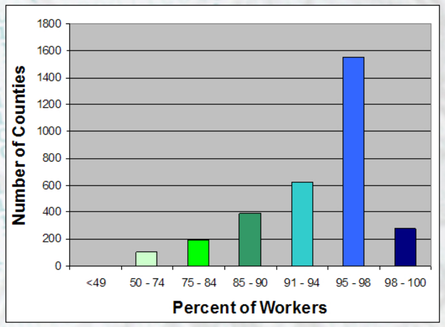


Figure 3. Histogram of percent of workers by county and adjacent county map.

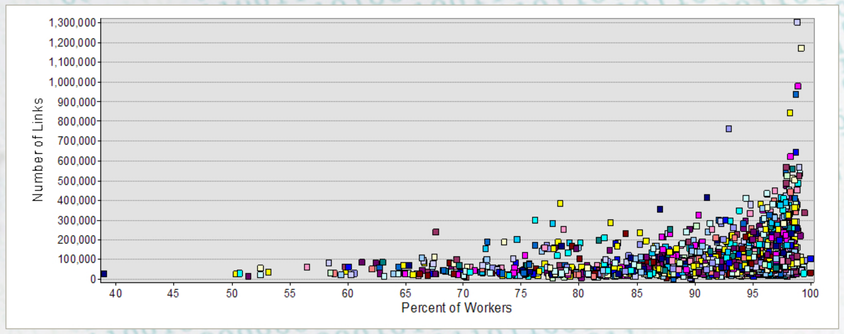
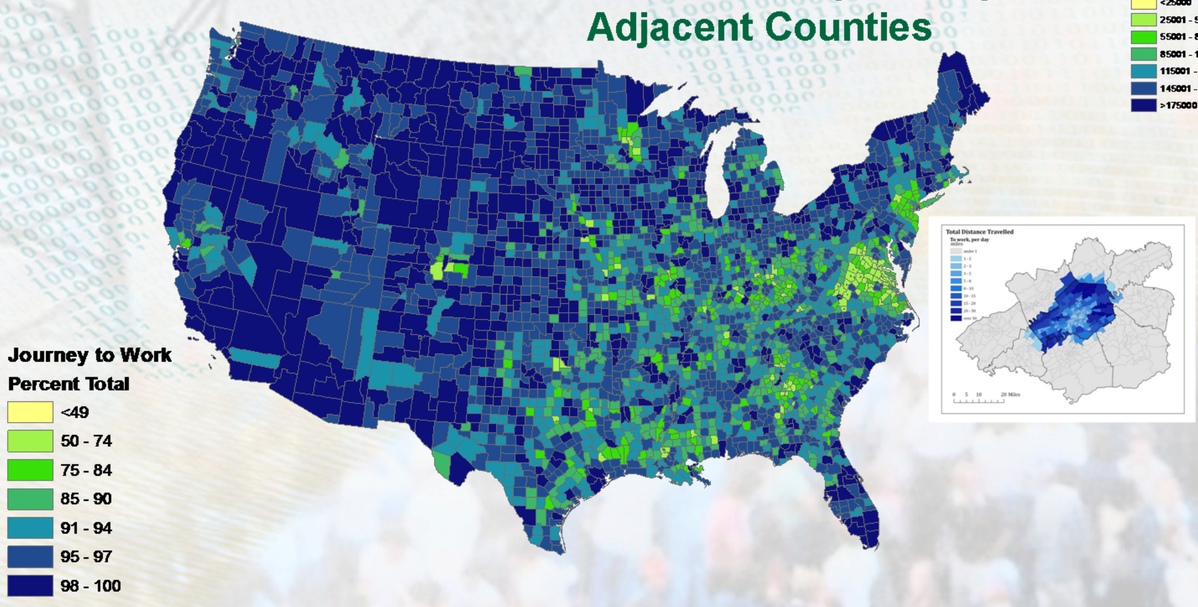
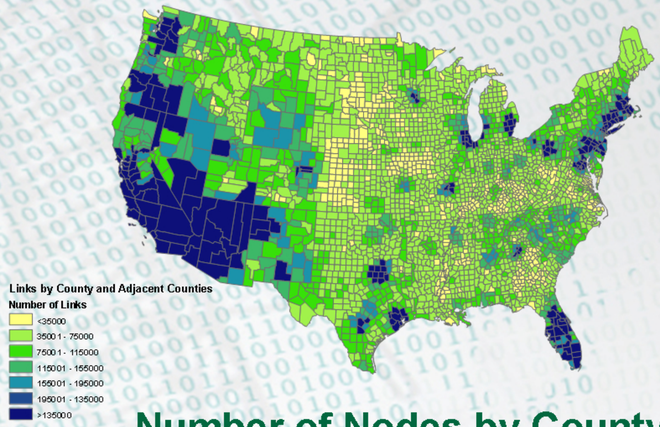


Figure 4. Scatter plot to represent to trend between the number of links and percent of worker travel.

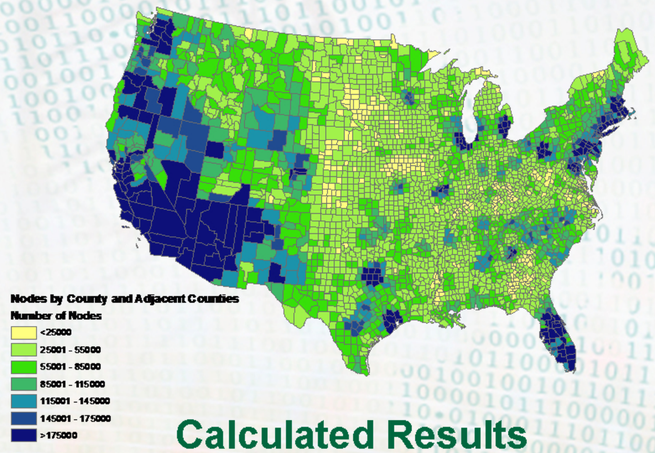
Percent of Workers by County and Adjacent Counties



Number of Links by County and Adjacent Counties



Number of Nodes by County and Adjacent Counties



Calculated Results

- Final results significantly higher than hypothesized 80%
- National average: 92.55%
- Minimum: Manassas Park City, Virginia 38.9%
- Maximum: Blain, Nebraska 100%

References

1. Brown, M., Southworth, F., and Sarzynski, A. (2008). Shrinking the Carbon Footprint of Metropolitan America. Metropolitan Policy Program, Brookings.
2. Buckner, S. and Gonzalez, J. (2005). Americans Spend More Than 100 Hours Commuting to Work Each Year. Census Bureau Reports, Washington, D.C.
3. Bhaduri, B., Bright, E., Coleman, P., and Urban, M. (2007). LandScan USA: a high-resolution geospatial and temporal modeling approach for population distribution and dynamics. Springer Science+Business Media, GeoJournal.
4. Wackernagel, M. and Rees, W.E. (1996). Our Ecological Footprint – Reducing Human Impact on the Earth. New Society publishers Gabriola Island, B.C., Canada

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