

# Developing Indiana's Alternative & Renewable Energy Cluster

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## What are business and industry clusters?

Local and regional **concentration** and **network** of competitive firms

- Buy and sell from each other
- Share labor pools, supply chains and technologies
- Include supporting services and specialized infrastructure
- Include both high and low value-added employment
- Produce for exports outside the region
- Drive the creation of wealth in a region
- Share, leverage and promote innovation

# Example: Supply Chain Cluster

**Supply Chain Cluster**  
Examples: Auto cluster in Tennessee, aerospace in Alabama  
emerging wind power cluster in Northeast Ohio, Chicago

Strategy defined by the business model of the dominant firm

Economic and workforce development organizations may provide incentives

Larger, established Stage 3 and 4 firms attract their supplier base

Out-of-region suppliers that can be displaced by local suppliers

Supply chain clusters form in one of two ways. In the most common situation, firms attract their supplier base to locate near their main production facilities. Japanese transplant auto factories provide a clear example. Their business model dictates close proximity.

In a second path, companies within a region survey existing supply chain patterns and look for opportunities to source supply from more local sources. This path requires detailed analysis of the existing supply chains and capabilities of potential, alternative in-region suppliers. This strategy is emerging in places like Northeast Ohio, where economic development organizations are looking at the supply chain for wind power components.

Companies within a region share supplier needs and production/service capabilities to shift supply chain toward more local sourcing

Economic development organization provides analytic support to identify alternative sourcing patterns from in-region suppliers and to recruit outside suppliers to relocate

Coherent strategy emerges to support the development of more localized supply chains

Supply chain for wind power components

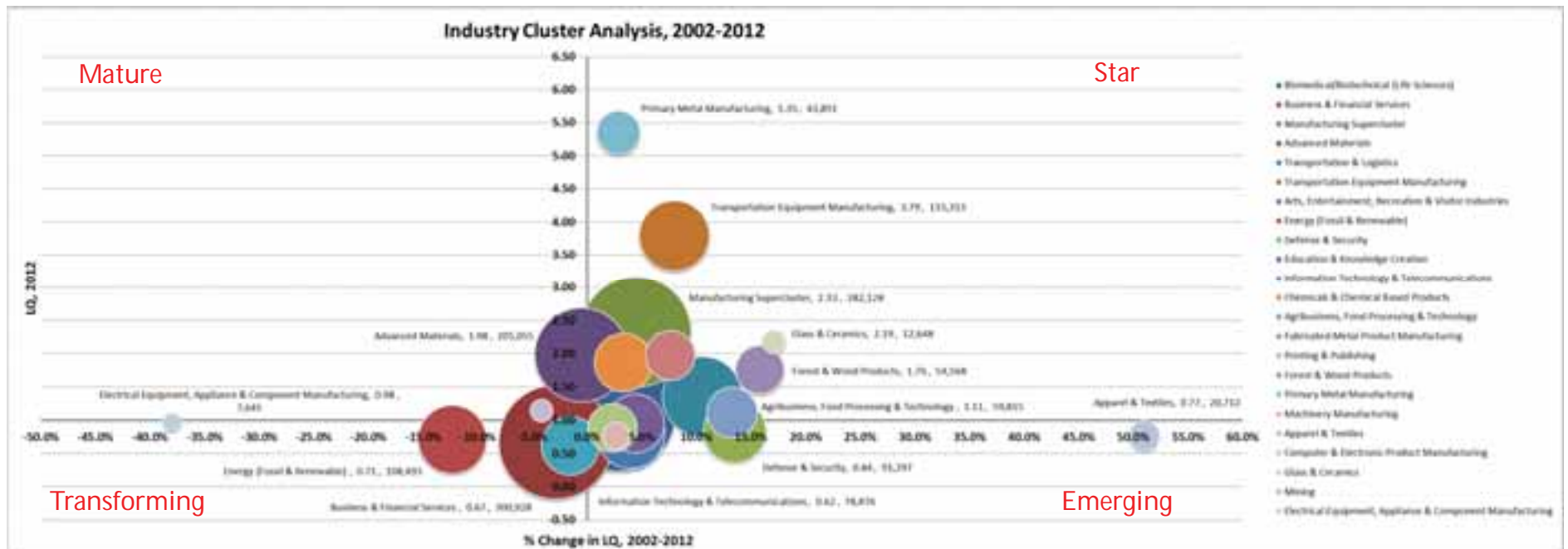
# Business and industry clusters

Industry Clusters
Advanced Materials
Agribusiness, Food Processing & Technology
Apparel & Textiles
Arts, Entertainment, Recreation & Visitor Industries
Biomedical / Biotechnical (Life Sciences)
Business & Financial Services
Chemicals & Chemical Based Products
Defense & Security
Education & Knowledge Creation
Energy (Fossil & Renewable)
Forest & Wood Products
Glass & Ceramics
Manufacturing Supercluster
Information Technology & Telecommunications
Transportation & Logistics
Mining
Printing & Publishing

- 17 major industry clusters are identified (EDA 1st Grant)
- Manufacturing cluster is subdivided into 6 sub clusters
- Energy cluster consists of fossil and renewables

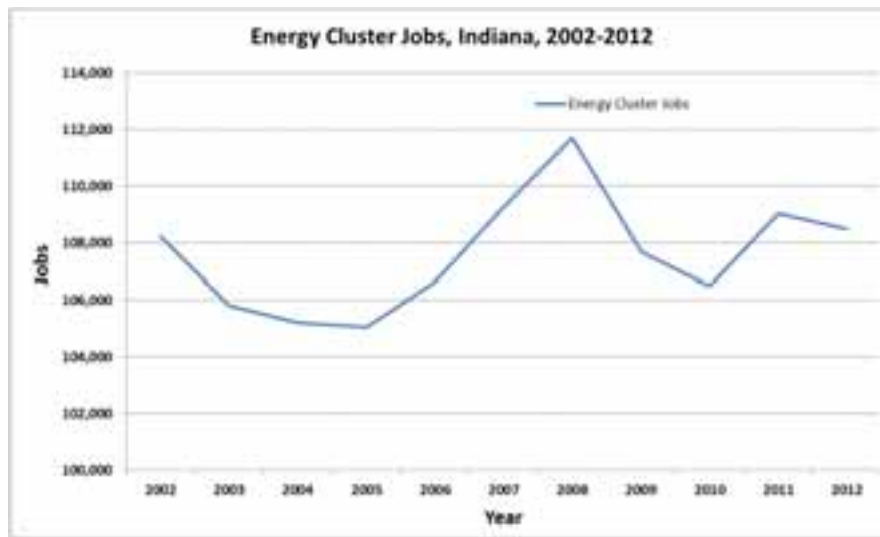
Manufacturing Sub Clusters
Primary Metal Manufacturing
Computer & Electronic Product Manufacturing
Fabricated Metal Product Manufacturing
Transportation Equipment Manufacturing
Machinery Manufacturing
Electrical Equipment, Appliance & Component Manufacturing

# Industry cluster analysis

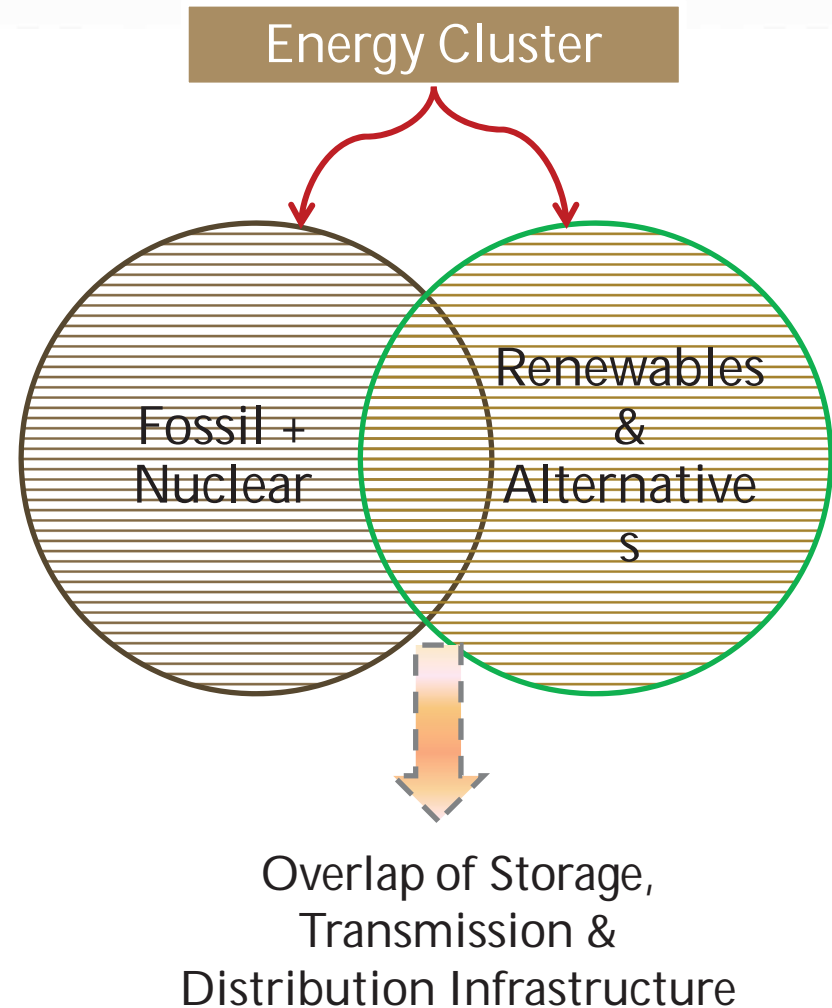


Data: EMSI complete employment, 2012.4  
PCRD cluster definitions

# Energy Cluster in Indiana

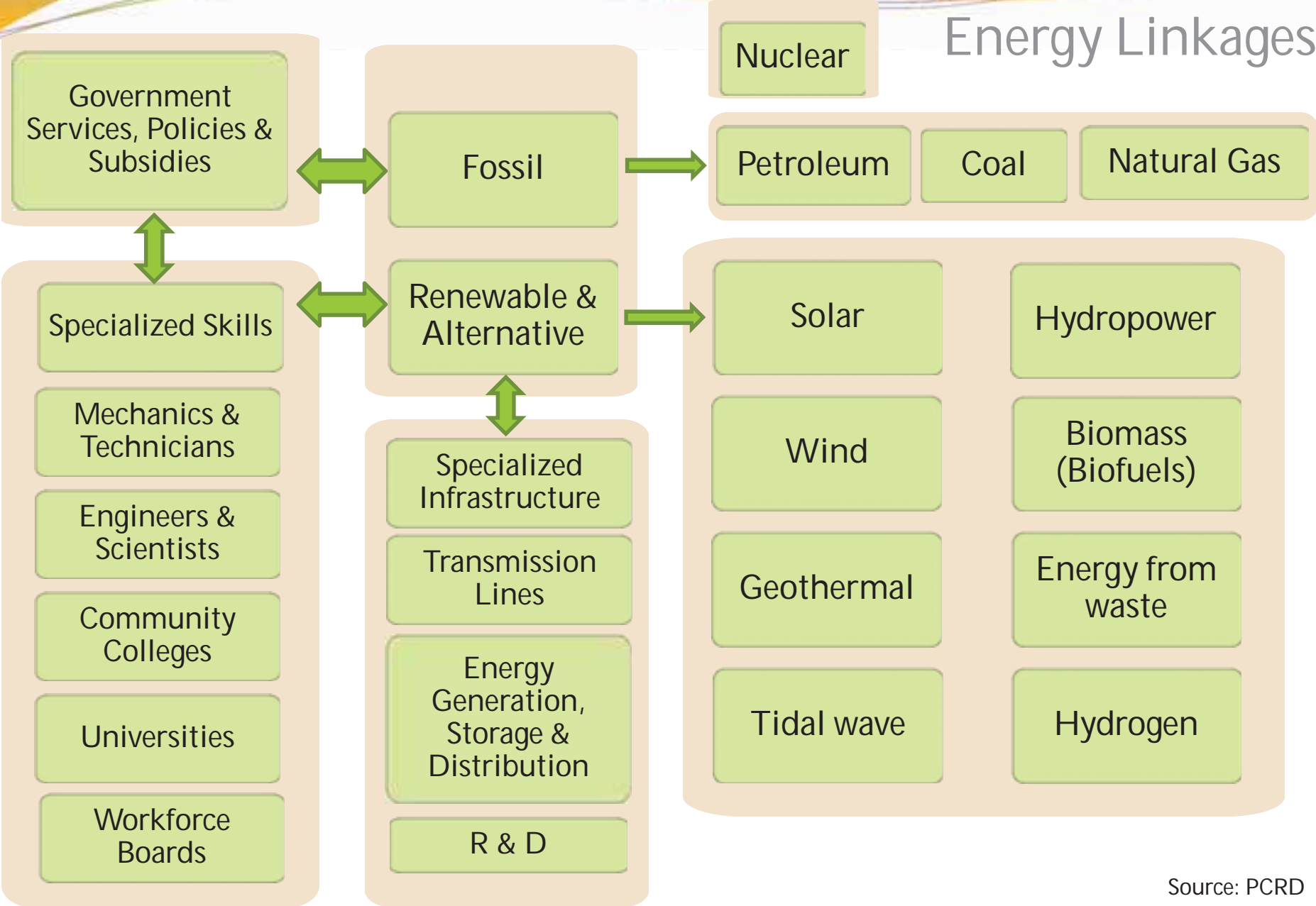


Energy cluster, Indiana	Value
Average earnings per job, 2012	\$ 67,938
Establishments, 2012	7,524
Jobs change, 2002-2012	280
Industry sectors	71



- Mining, utilities, construction, manufacturing, wholesale, retail, transportation and warehousing, finance and insurance, real estate rental and leasing, professional scientific and technical services

# Energy Linkages



Source: PCRD

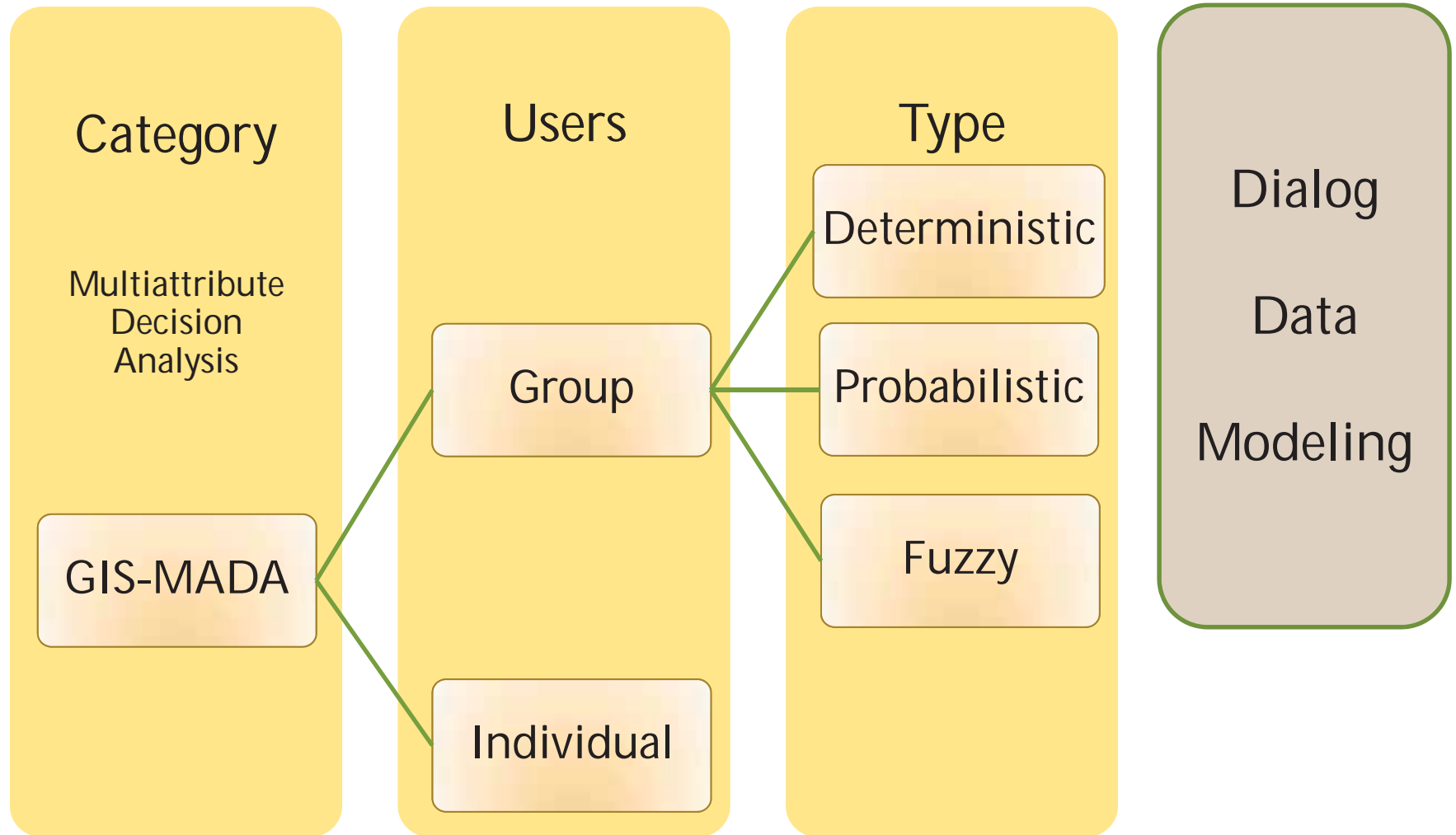


# Spatial Decision Support System

- SDSS is one of many types of DSS (Decision Support Systems)
- DSS varies from data- to knowledge- to model-driven (Power, 2003)
- Earliest example of SDSS-
  - Geo-data Analysis and Display System (GADS) [IBM Research Lab, 1970s]
  - Man computer interaction and problem solving
- Expert systems can be integrated
  - Expert system (rule based) + GIS + sensors [WaterKY.org]
  - Artificial Intelligence & Data Mining techniques
  - Agent-based Modeling Platform, for example GAMA



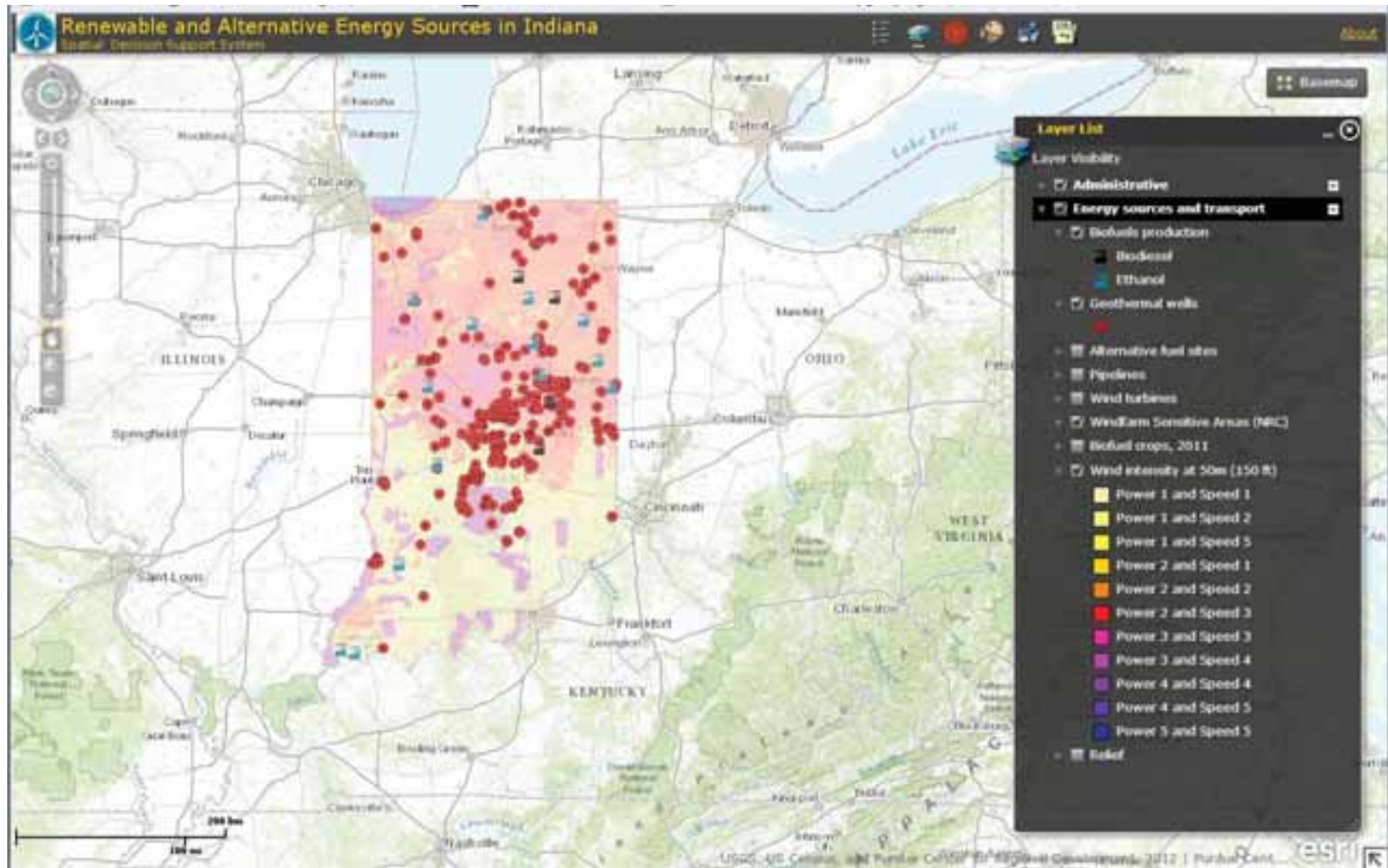
# Typology of SDSS



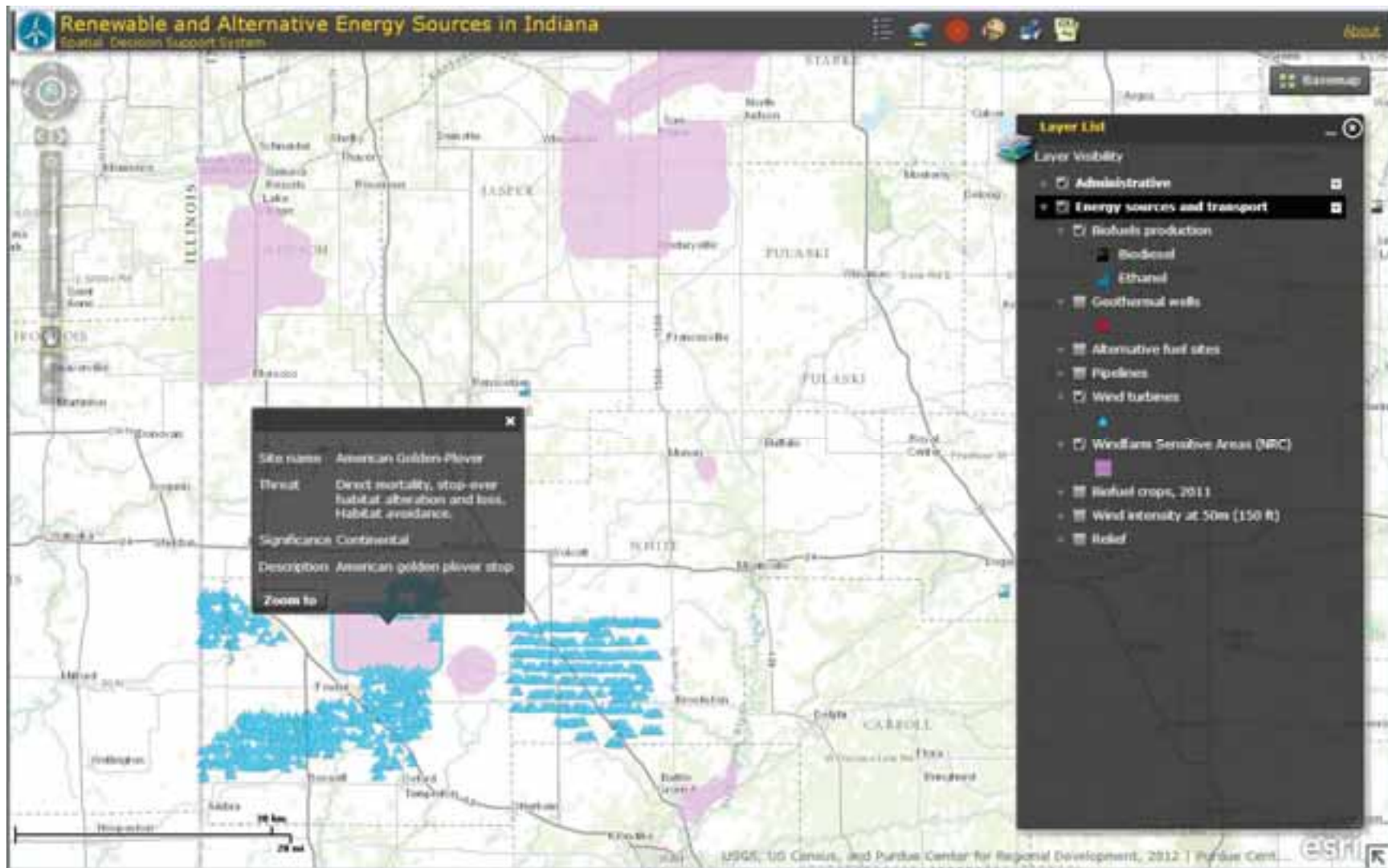
Source: Malczewski, Jacek. 2006. GIS-based multicriteria decision analysis: a survey of the literature. International Journal of Geographical Information Science 20:7, 703-726.

Based on Malczewski, 2006;  
Jabeur, Sahli and Haddad, 2011

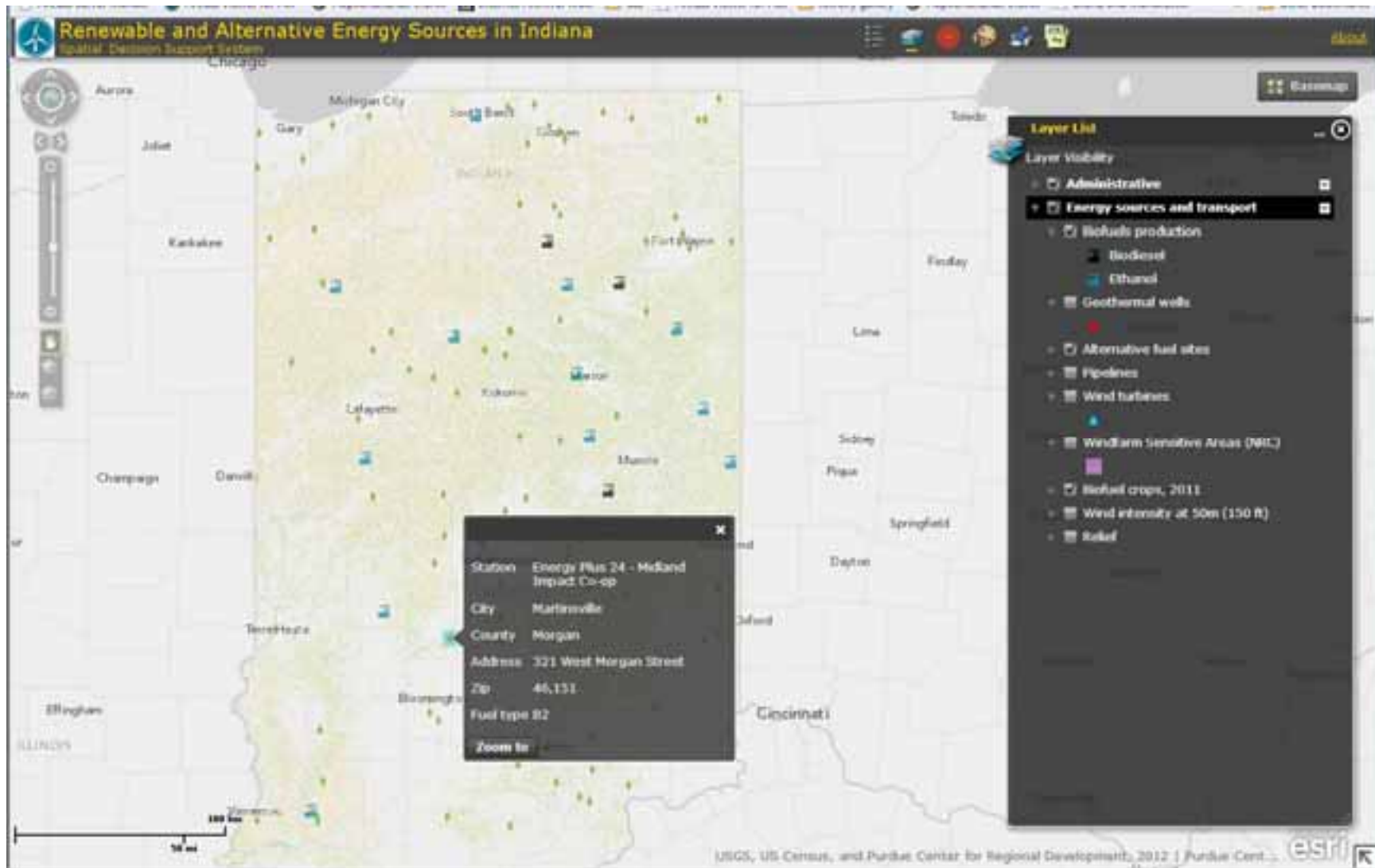
# Online decision support system



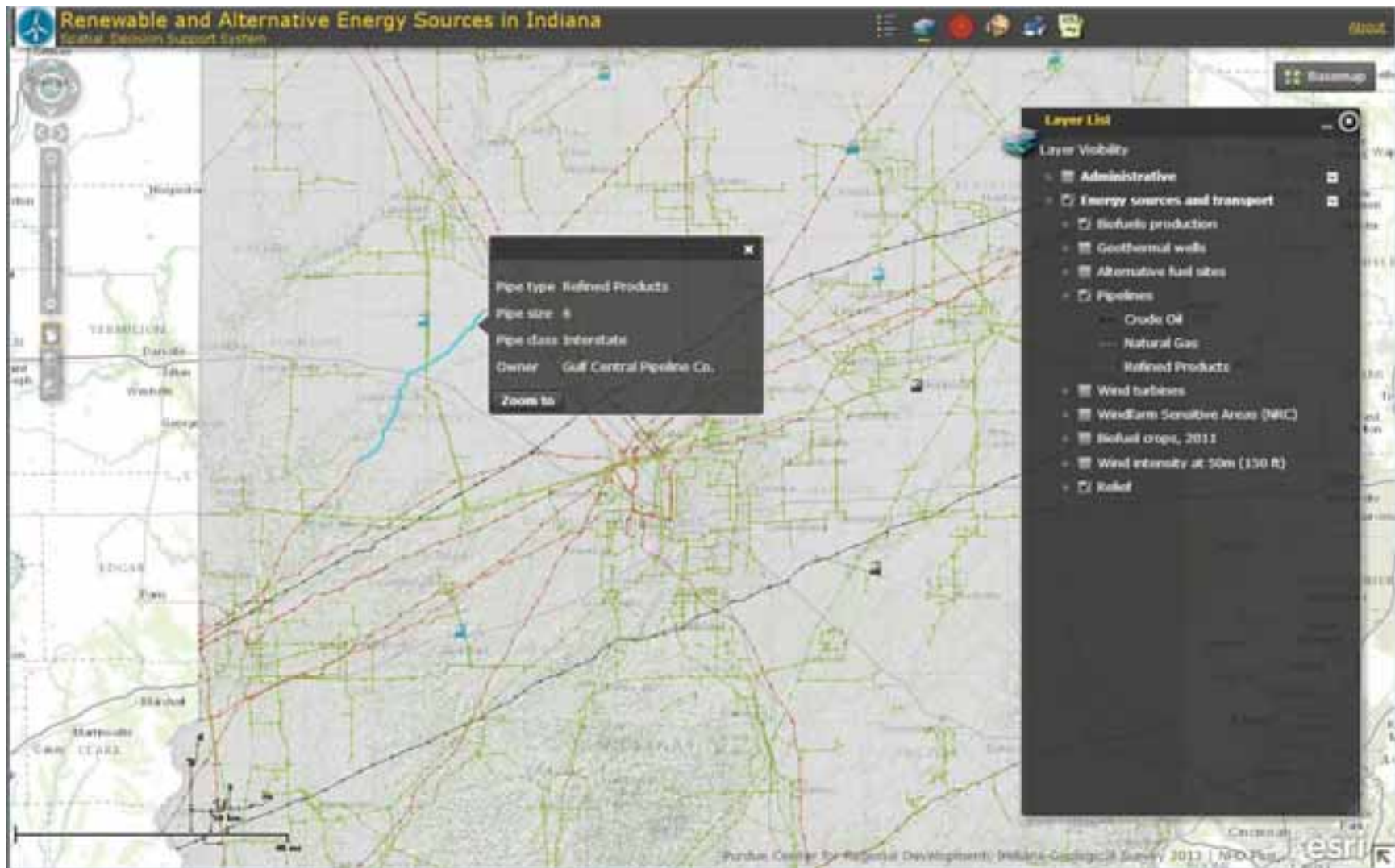
# Wind energy – wind farms and sensitive areas



# Biofuels production and distribution



# Transport of natural gas and oil products





# Questions & Answers

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Thank you!