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

Source: PCRD, 2007
Example: Supply Chain Cluster

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

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.

Larger, established Stage 3 and 4 firms attract their supplier base
Economic and workforce development organizations may provide incentives
Out-of-region suppliers that can be displaced by local suppliers
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

Source: Ed Morrison, PCRD
Business and industry clusters

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

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<th>Industry Clusters</th>
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<td>Advanced Materials</td>
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<td>Agribusiness, Food Processing &amp; Technology</td>
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<td>Apparel &amp; Textiles</td>
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<td>Arts, Entertainment, Recreation &amp; Visitor Industries</td>
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<tr>
<td>Biomedical / Biotechnical (Life Sciences)</td>
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<td>Business &amp; Financial Services</td>
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<td>Chemicals &amp; Chemical Based Products</td>
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<td>Defense &amp; Security</td>
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<td>Education &amp; Knowledge Creation</td>
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<td>Energy (Fossil &amp; Renewable)</td>
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<tr>
<td>Forest &amp; Wood Products</td>
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<tr>
<td>Glass &amp; Ceramics</td>
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<tr>
<td>Manufacturing Supercluster</td>
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<tr>
<td>Information Technology &amp; Telecommunications</td>
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<td>Transportation &amp; Logistics</td>
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<td>Mining</td>
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<td>Printing &amp; Publishing</td>
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<th>Manufacturing Sub Clusters</th>
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<td>Primary Metal Manufacturing</td>
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<td>Computer &amp; Electronic Product Manufacturing</td>
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<td>Fabricated Metal Product Manufacturing</td>
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<td>Transportation Equipment Manufacturing</td>
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<td>Machinery Manufacturing</td>
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<tr>
<td>Electrical Equipment, Appliance &amp; Component Manufacturing</td>
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Source: PCRD, 2007
Industry cluster analysis

Data: EMSI complete employment, 2012.4
PCRD cluster definitions

Source: PCRD
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

- **Overlap of Storage, Transmission & Distribution Infrastructure**

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

- Fossil
  - Petroleum
  - Coal
  - Natural Gas

- Renewable & Alternative
  - Solar
  - Wind
  - Geothermal
  - Tidal wave
  - Biomass (Biofuels)
  - Energy from waste
  - Hydrogen

- Specialized Skills
  - Mechanics & Technicians
  - Engineers & Scientists
  - Community Colleges
  - Universities
  - Workforce Boards

- Specialized Infrastructure
  - Transmission Lines
  - Energy Generation, Storage & Distribution
  - R & D

- Government Services, Policies & Subsidies

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

Category

Multiattribute Decision Analysis

GIS-MADA

Users

Group

Individual

Type

Deterministic

Probabilistic

Fuzzy

Dialog Data Modeling


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!