Development of a Software Toolkit to Support Industrial Ecology Networks

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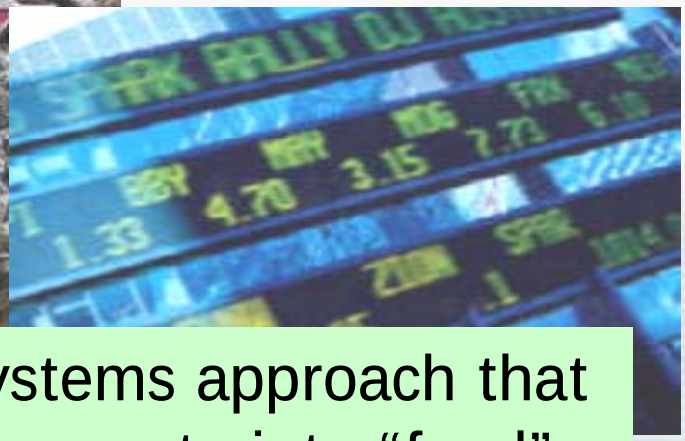
OSU Industrial Ecology Project

Waste = Food

= Value

= Profit



Industrial ecology is a process systems approach that mimics natural cycles, converting waste into “food”

Project Objectives

- Develop a systems-level model of resource flows and interdependencies in Central Ohio
  - Existing Eco-Flow™ model developed for SWACO provides basic software prototype
- Implement decision tools for evaluating costs and benefits of innovative IE opportunities.
  - Industrial Ecosystem Toolkit will incorporate material flow analysis, economic input-output, life cycle analysis, and system dynamics methods
- Promote acceptance of IE innovations by regional businesses, citizens, public agencies
  - 15% reduction in waste disposal to landfill by 2012, =150,000 tons/yr converted to value streams

Current and Potential Partners

- EPA awarded OSU a grant for an **Industrial Ecosystem toolkit**, linking an existing tool (Eco-Flow™) with LCA and other tools, to help significantly reduce solid waste in Ohio
- Bridging the Gap is applying the tools to the **Kansas City** Byproduct Synergy Network (Hallmark, Harley-Davidson, Lafarge, etc.)
- OSU is working with the U.S. Business Council for Sustainable Development to develop similar industrial networks in Ohio and encourage **systems thinking**

Bridging The Gap

USBCSD

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

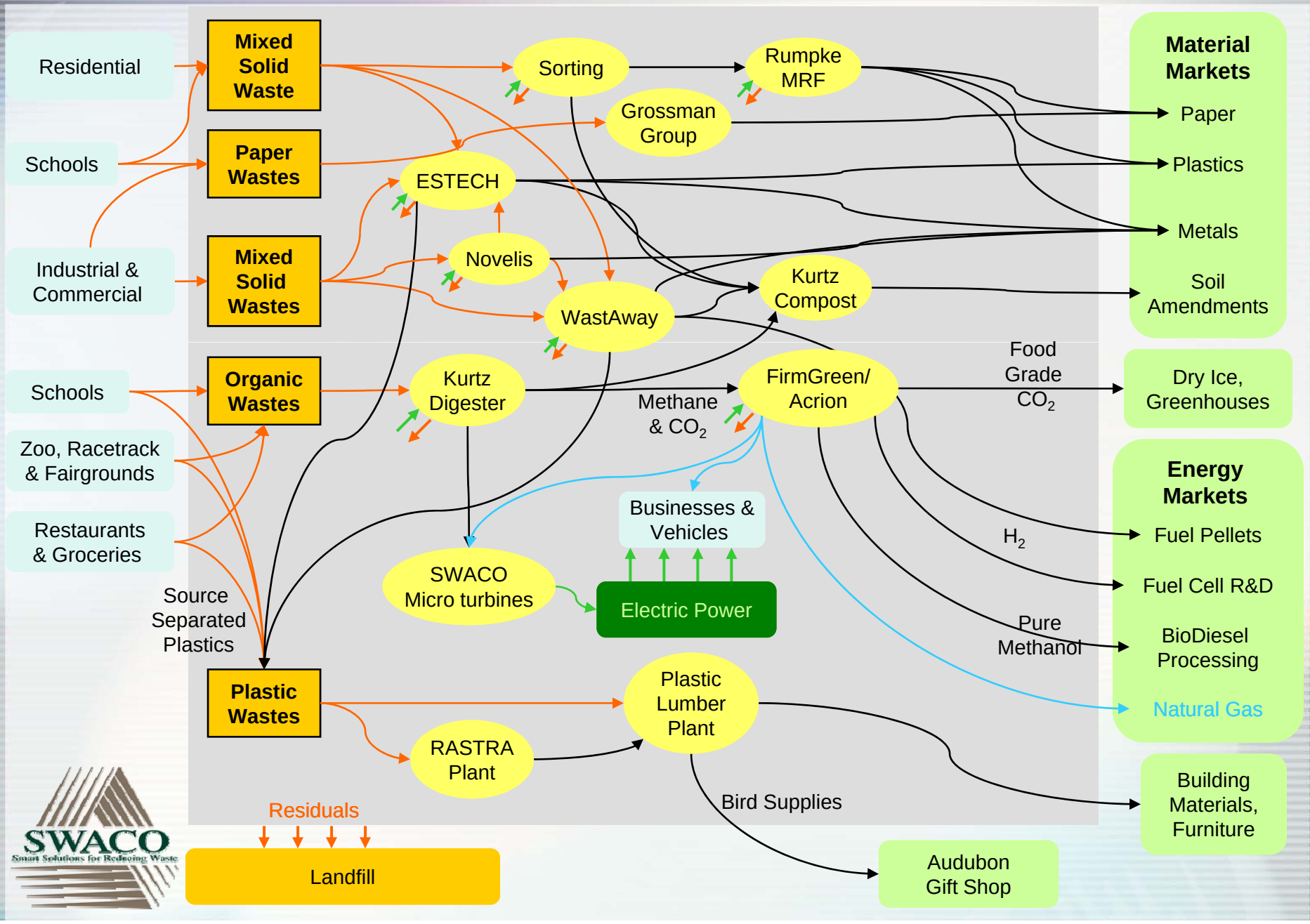
SWACO Smart Solutions for Reducing Waste

OhioEPA

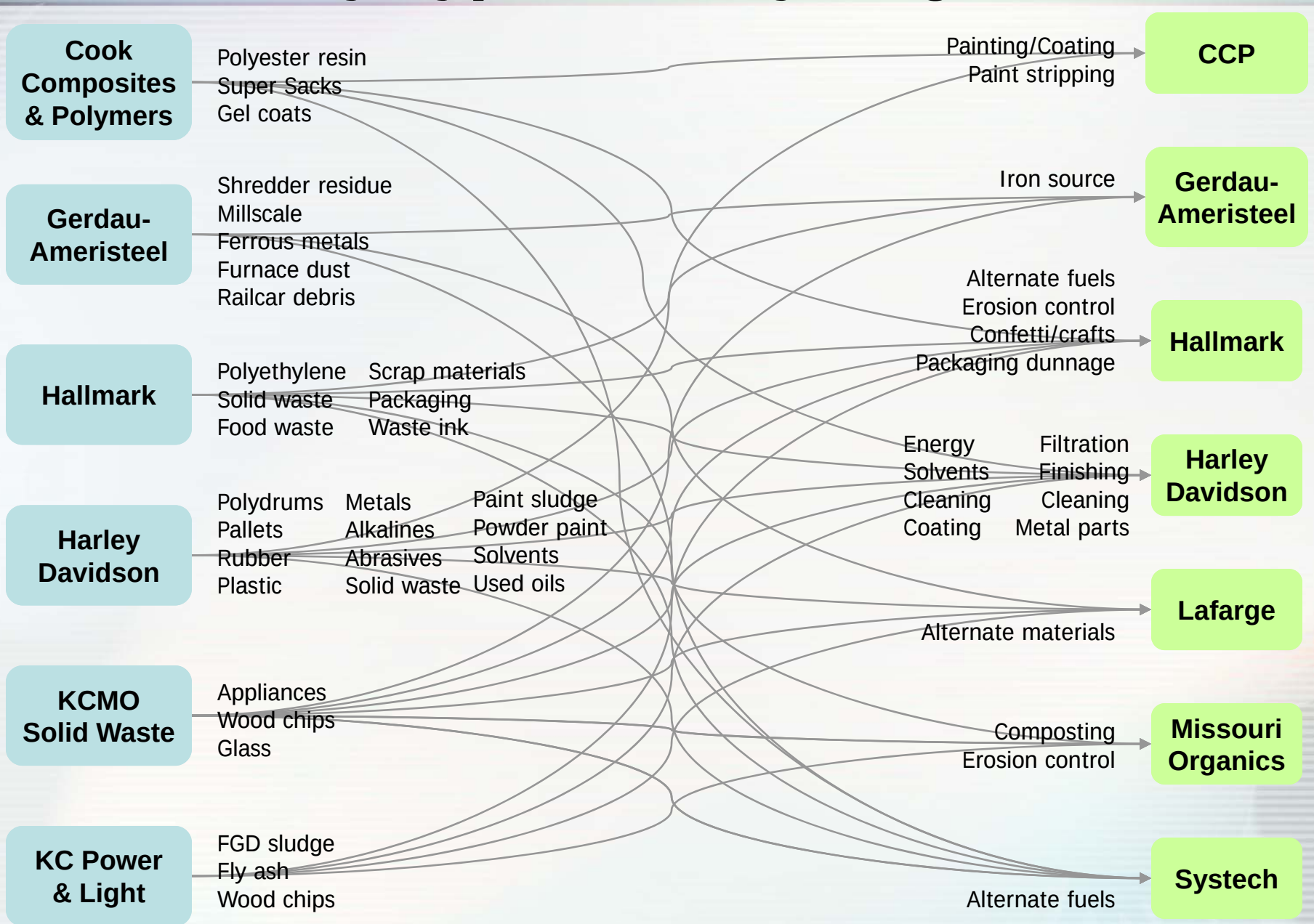
CENTER FOR RESILIENCE OHIO STATE

MILLENNIUM INSTITUTE

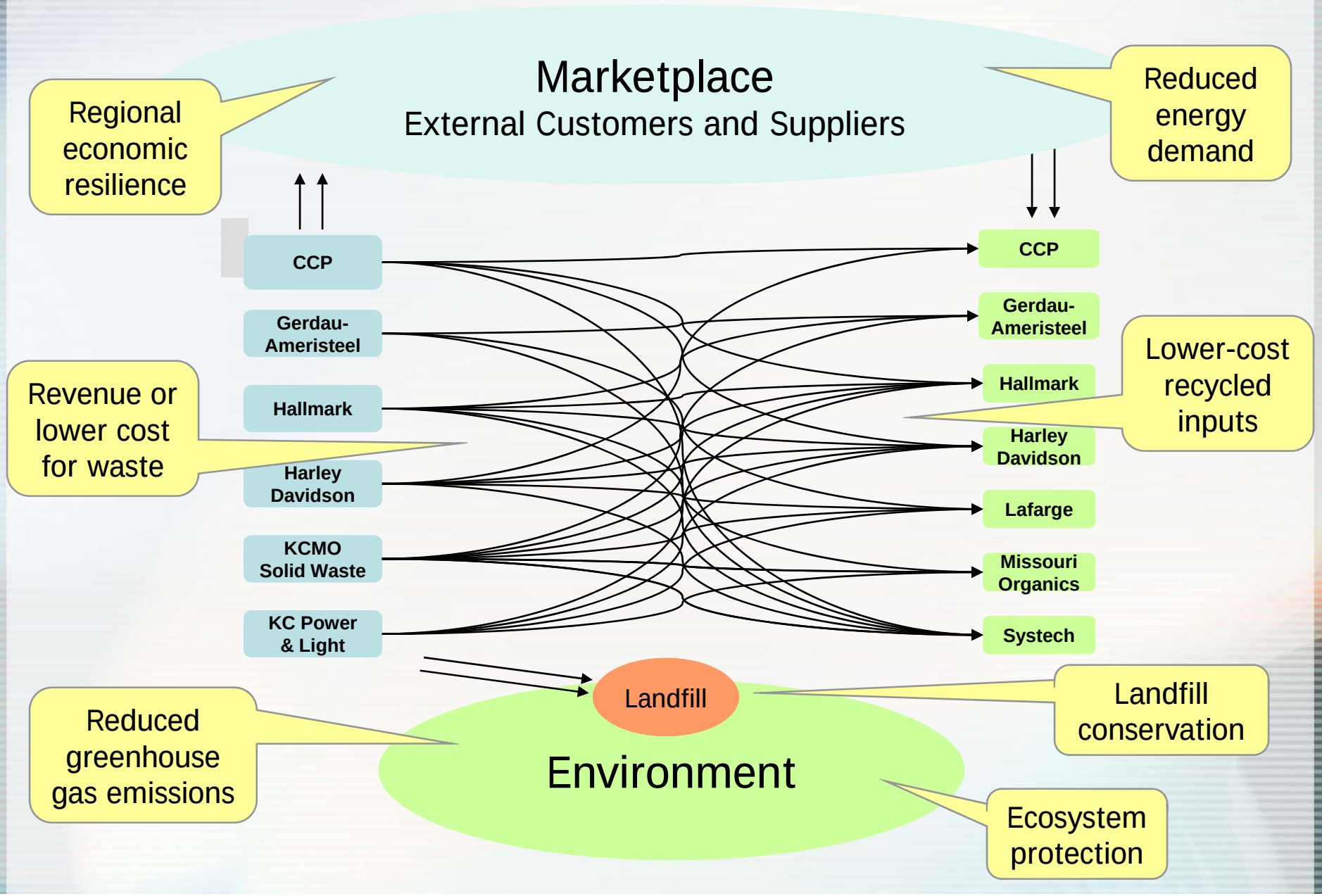
Central Ohio Resource Transformation Center



Kansas City Byproduct Synergies



Industrial Ecology Enhances Sustainability



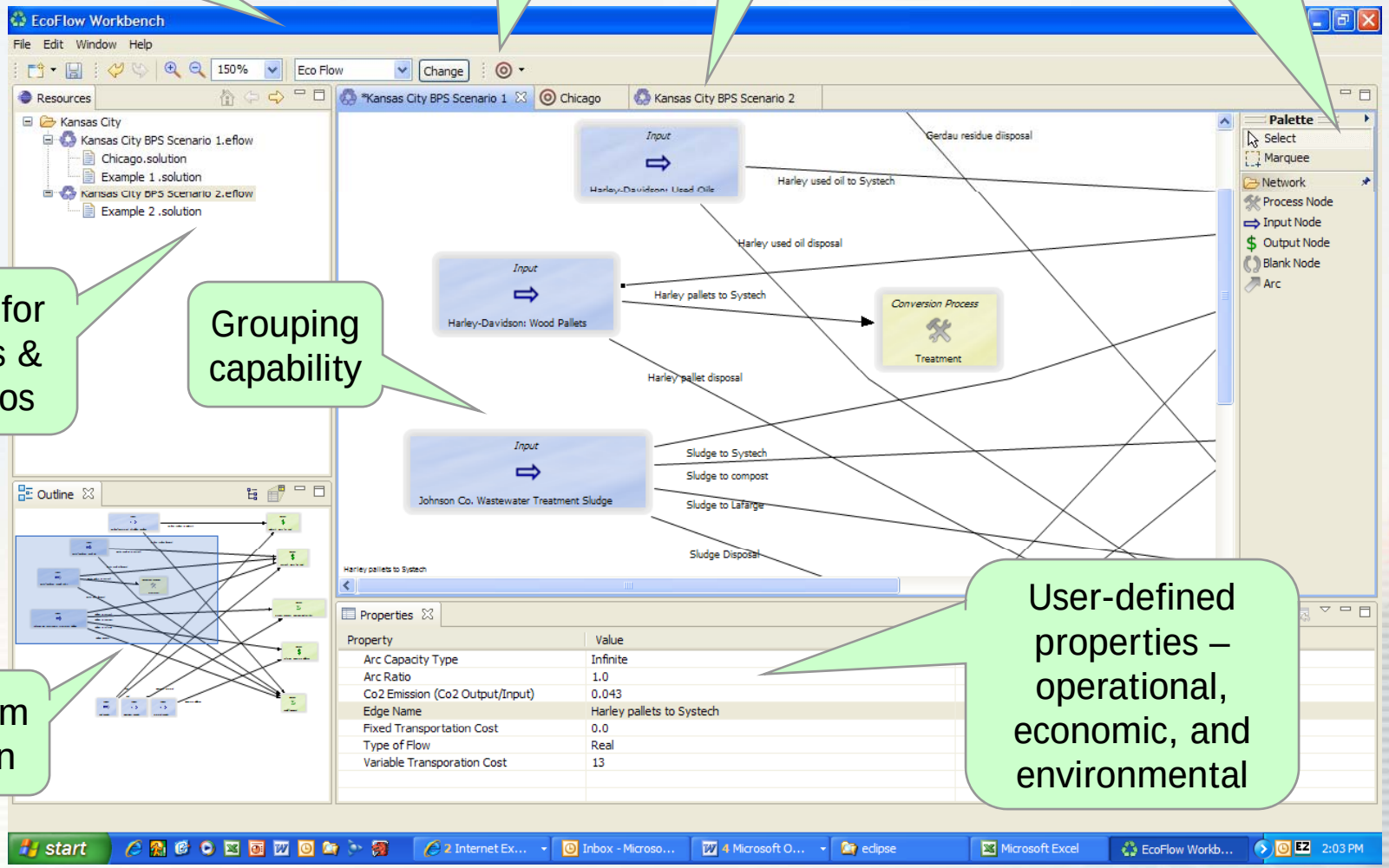
Principal Eco-Flow™ v0.1 Features

State-of-the-art graphical interface – Eclipse platform

Flexible optimization commands

Tab-style Multiple views

Real-time network modification & reconfiguration



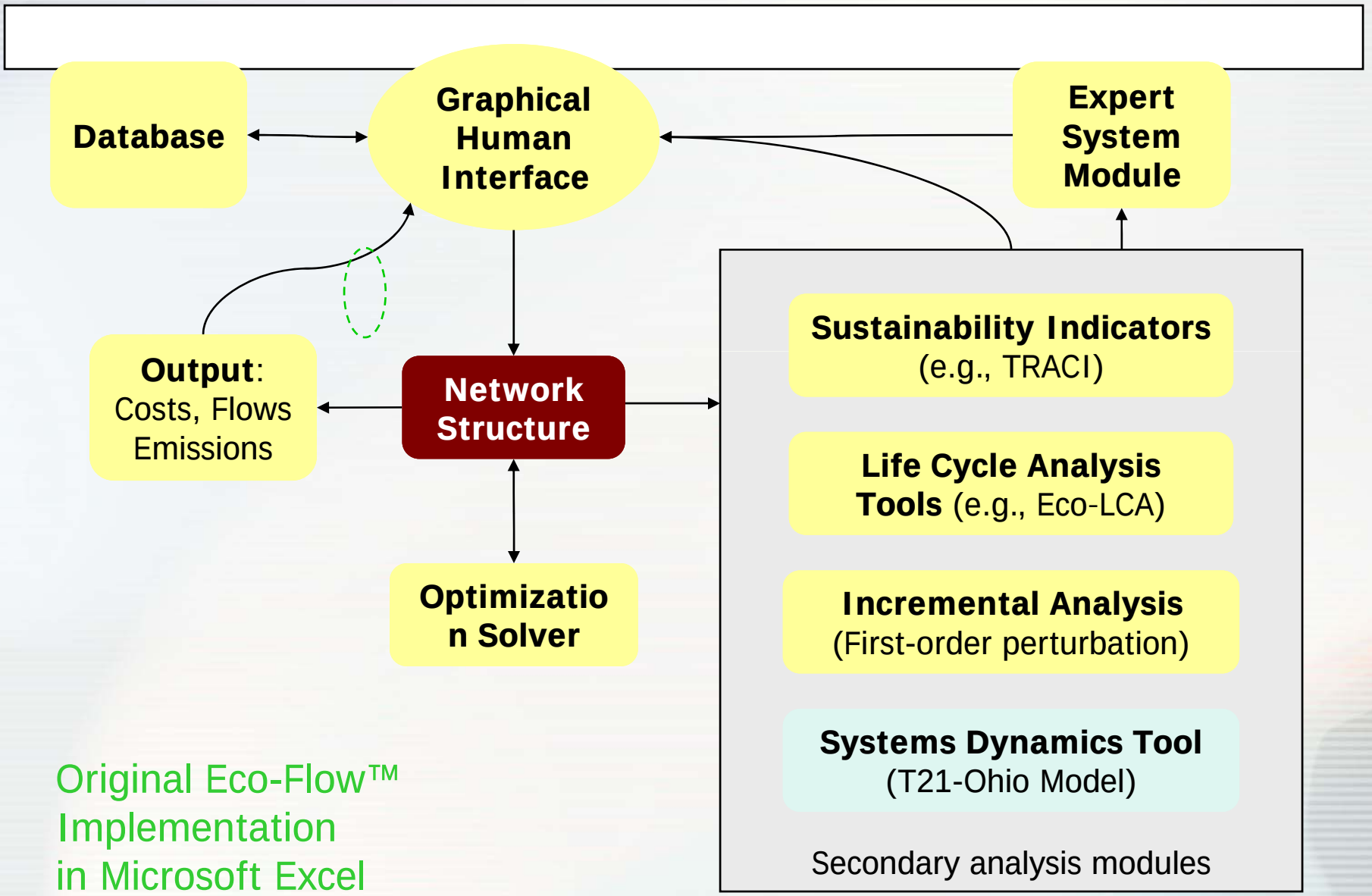
Folders for projects & scenarios

Grouping capability

Pan & zoom navigation

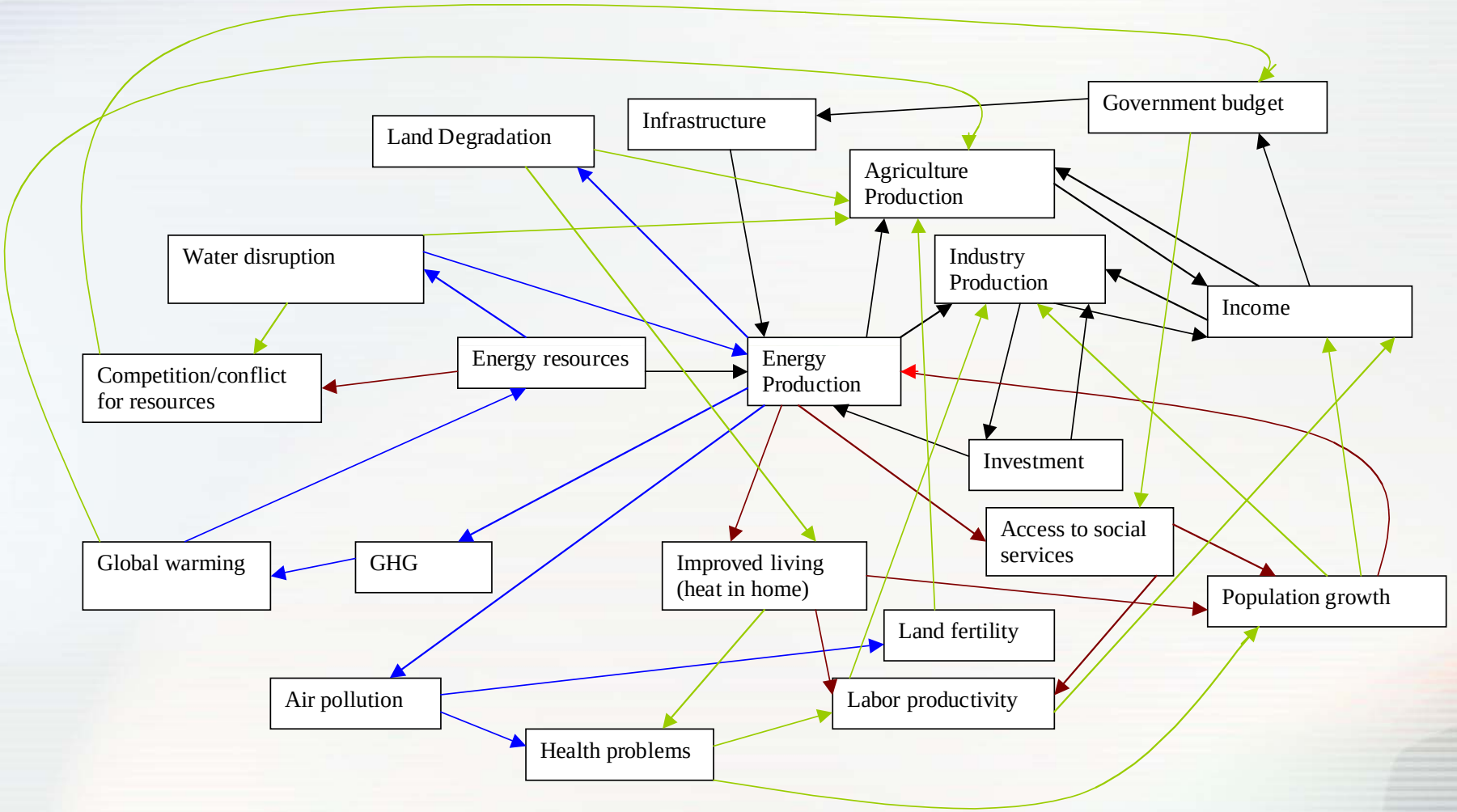
User-defined properties – operational, economic, and environmental

Industrial Ecosystem Toolkit Architecture



Original Eco-Flow™ Implementation in Microsoft Excel

The T21-Ohio Model



Findings and Lessons Learned

- Giving companies access to tools that help to visualize, quantify, and optimize material flows can help them discover opportunities and build confidence in industrial ecology
- The applicability of network analysis tools ranges from specific facility partnerships to broad, regional-scale modeling
- Preliminary results for Kansas City suggest that up to $15 million per year of savings are possible, with the benefits evenly divided
- As expected, environmental and financial benefits are closely correlated

Questions to be Explored

- **For an individual company**
  - How can we maximize profit by exploiting available byproduct synergies?
  - What are the total environmental benefits associated with these synergies?
- **For a collective regional network**
  - What is the maximum amount of solid waste that can be diverted from landfills?
  - What reductions in greenhouse gases or other emissions can thus be achieved?
  - How might new technologies benefit the region economically and environmentally?