



Convergent Innovations in Regional CirCULAR Economies (CIRCULAR)

PI: Tom Theis, University of Illinois Chicago

Co-PI: Weslyne Ashton, Illinois Tech

Co-PI: Don Fullerton, University of Illinois Urbana-Champaign

Co-PI: John T. Murphy, Northern Illinois University

Co-PI: Carolee Rigsbee, University of Illinois Springfield

NSF SRS RN
Workshop
June 7-8, 2023

NSF Grant No.
2115453



The Circular Economy has three aspirational principles

01 Reduce Waste

02 Retain or increase material value

03 Regenerate nature

Problem

What just, equitable, and sustainable pathways are available to transform waste into value, create economic opportunities and curtail pollution via increased circularity in a large-scale, regional, linked rural-urban landscape?

By the Numbers (to date):

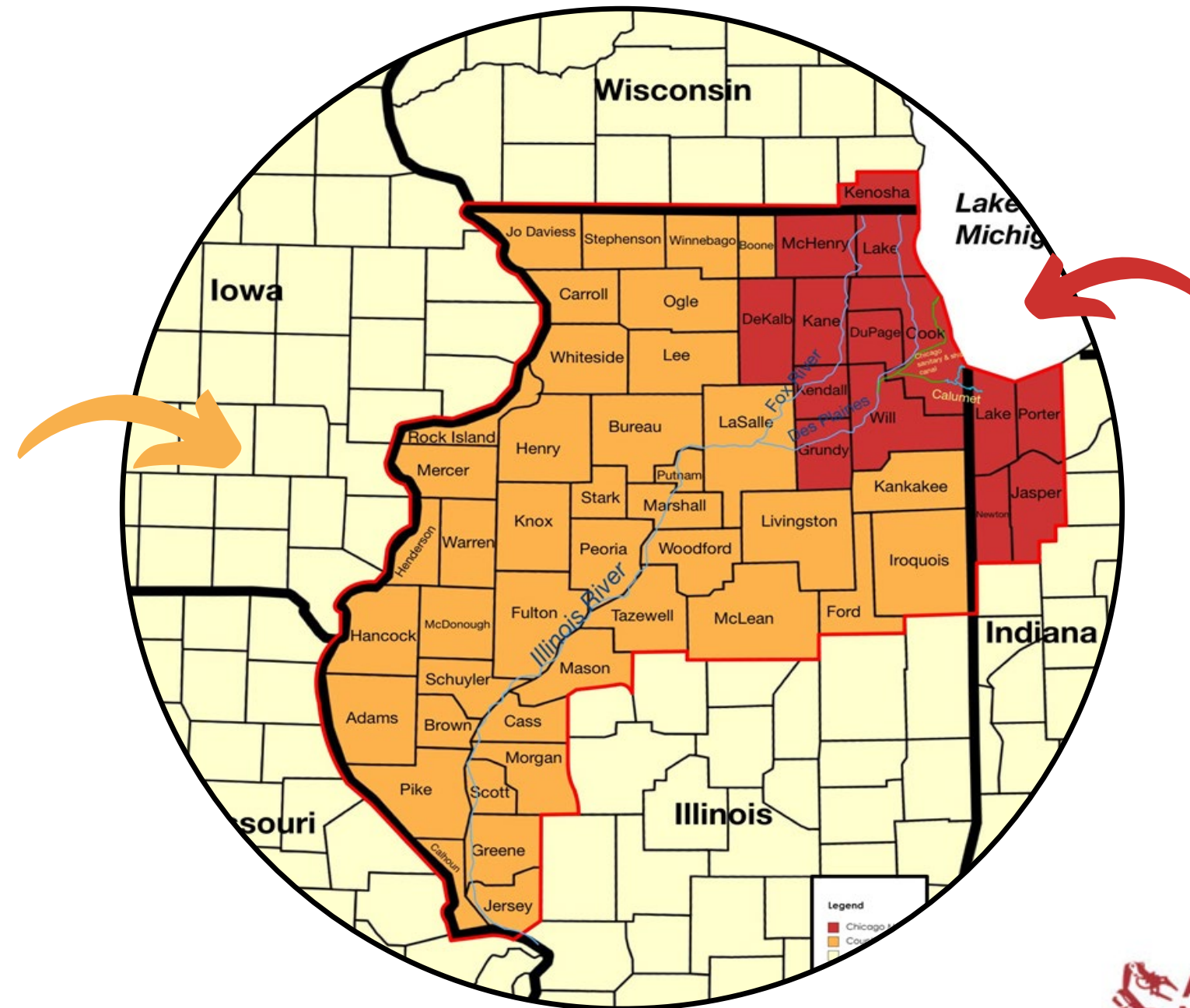
- 32 Investigators
- 14 Universities
- 19 Distinct disciplines
- 22 Community Partners
- 26 Monthly meetings (recorded)
 - 13 Meetings for research discussions
 - 13 Interviews with community partners
- 8 Convergent research clusters with 20+ biweekly meetings (recorded)
- 4 Crosscutting functions (recorded)
- 1 Face-to-face meeting (August '22) (Videographed)
- 3 Internal surveys
- 2 Papers (in prep)



Our Study Area: Chicago MSA + Northern and Central IL

Northern + Central Illinois

- 21,585 mi²
- Population ~1.2M
- GRP ~\$70B
- 94% White
- 5.0% Asian American
- 2.9% Hispanic
- 2.5% African American
- 0.2% Native American



Chicago MSA

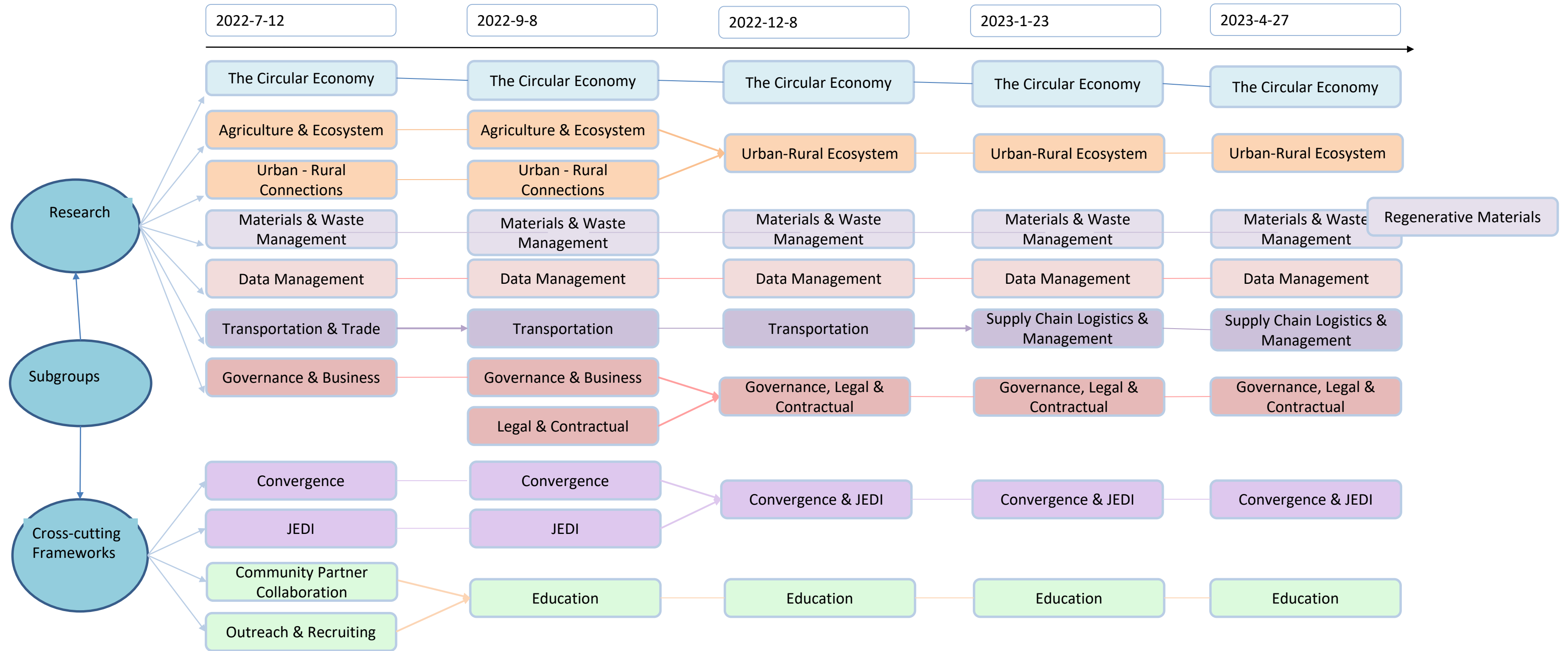
- 7,195 mi²
- Population 9.5M
- GRP ~\$700B
- 53% White
- 22% Hispanic
- 17% African American
- 6% Asian American
- 0.6% Native American



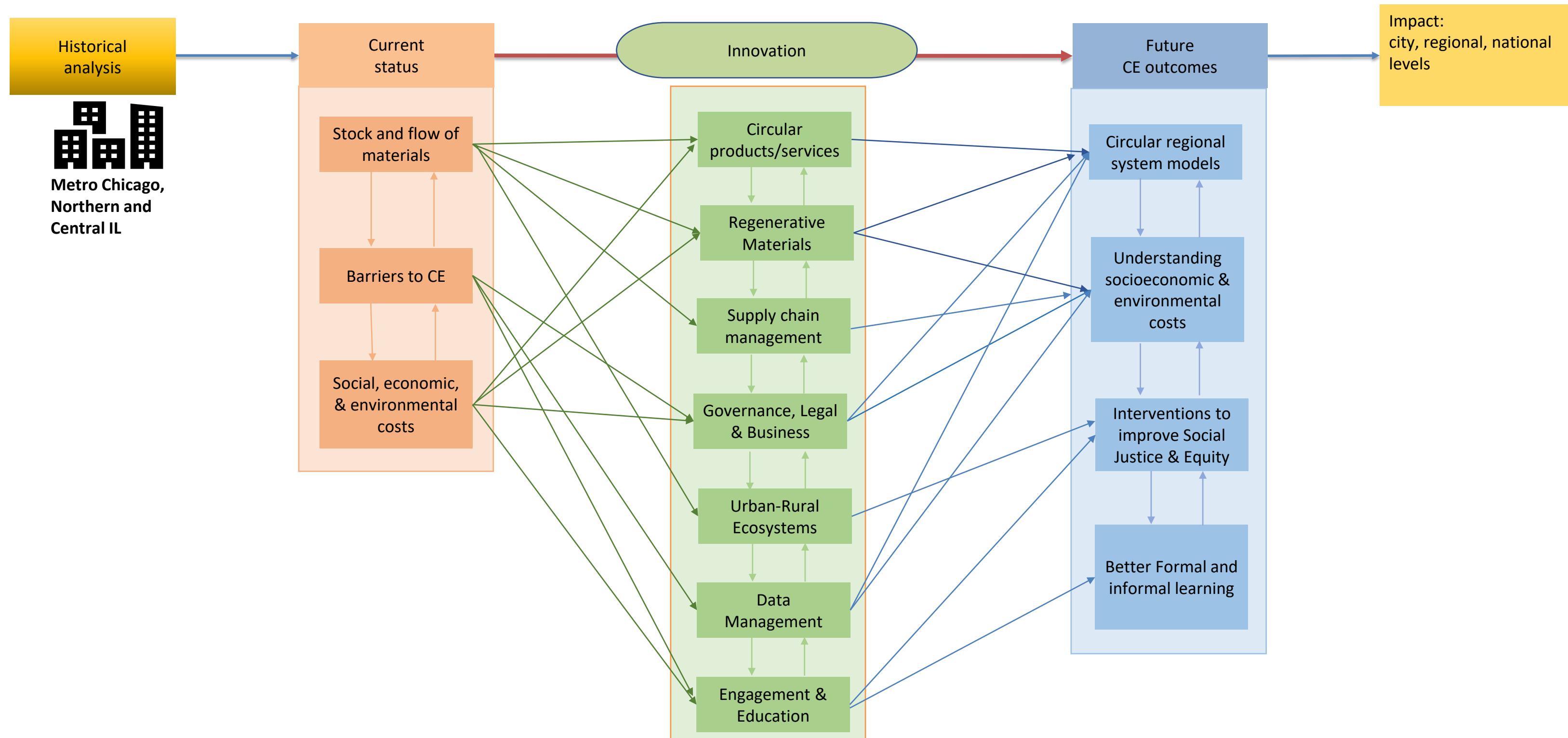
Top Industries in Illinois



Convergent Evolution of Subgroups in CIRCULAR



Pathways to Circularity



Cultivating local circular economies

- Adaptive Reuse + Decarbonization
- Supporting marginalized populations
 - Small business support
 - Local food access; Link/SNAP matching, sliding scale pricing
 - Partnerships
- Local Economic Activity
 - “Retail” featuring the local, small, and circular
- Education
- Shared use resources
 - Indoor Victory Garden
 - Flexible use spaces
- “Waste” diversion
 - Community composting
 - Swap events, repair workshops, collection events
- Small business support
 - Sourcing local + circular
 - Landfill diversion



Cyber-Enabled Pathways

Circular Business Models (CBM)



Resource Recovery

- Re-cycle
- Waste as Resource
- Returning By-Products



Provide Life Extension

- Re-manufacture
- Re-sale
- Repair
- Upgrade



Sharing Platforms

- Shared use
- Shared access
- Shared ownership



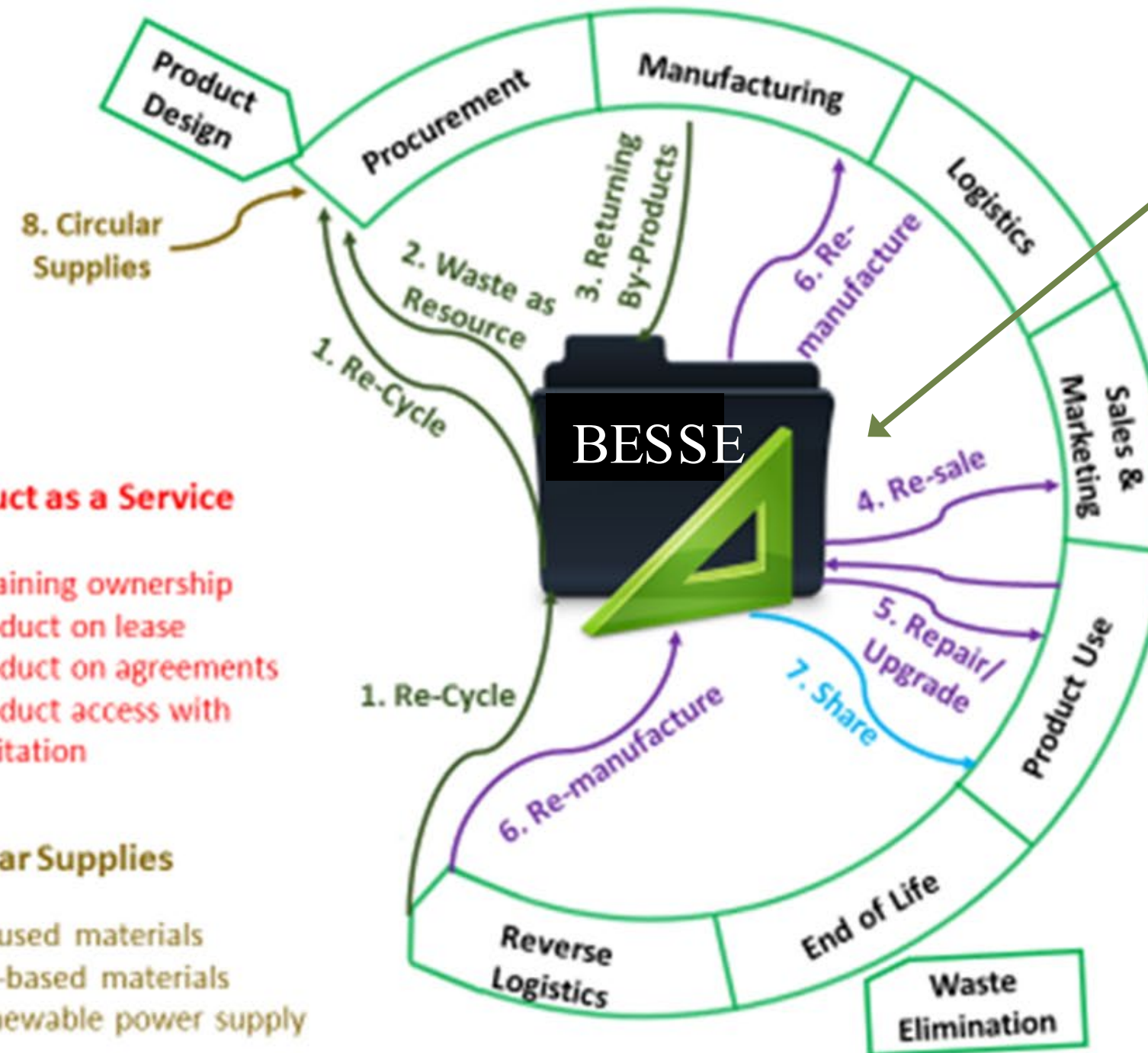
Product as a Service

- Attaining ownership
- Product on lease
- Product on agreements
- Product access with limitation



Circular Supplies

- Re-used materials
- Bio-based materials
- Renewable power supply



Blockchain Software to Facilitate Transactions

Circular Economy, Life Cycle, and Facilitation of Business Models that may be optimized based on the Blockchain Enabled System for a Sustainable Economy (BESSE) platform.

Material Recycling Pathways

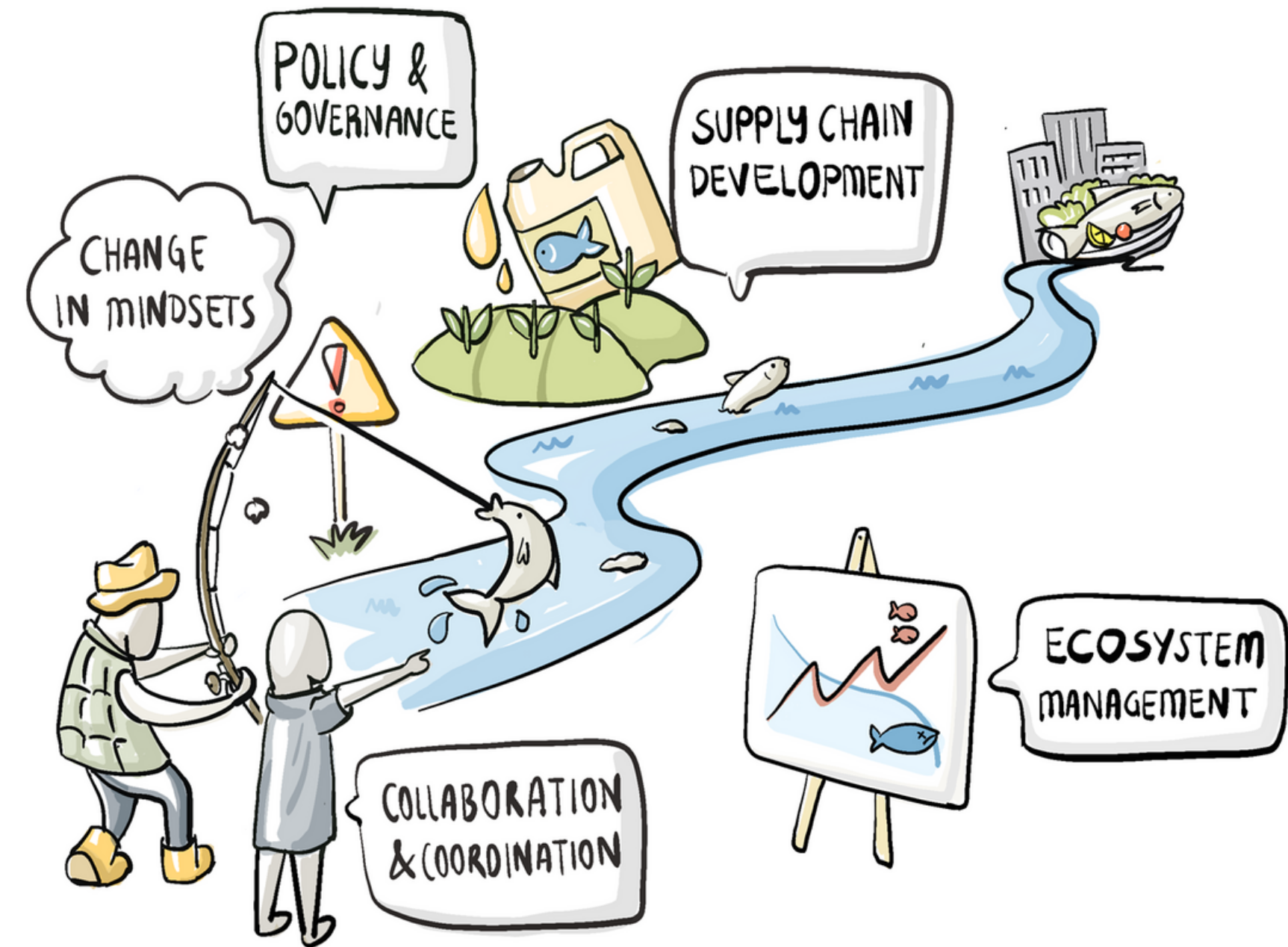
Randomized Control Trial Pilot Study of 200 households for 16 weeks, weighing 3200 garbage and recycling carts

- Eight weeks for baseline measures of weight and quality (garbage in the recycling cart & vice versa, identified by A.I.)
- Then a third of households receive recycling info and encouragement
- Another third gets that info plus an incentive: \$10 per good recycling cart
- A final third is the “control group”
- In Rantoul, only half of households had requested the free recycling cart
- We see how many more get carts, if others increase recycling, and how much garbage is reduced, all relative to the unaffected control group.



Ecosystem Services Pathways

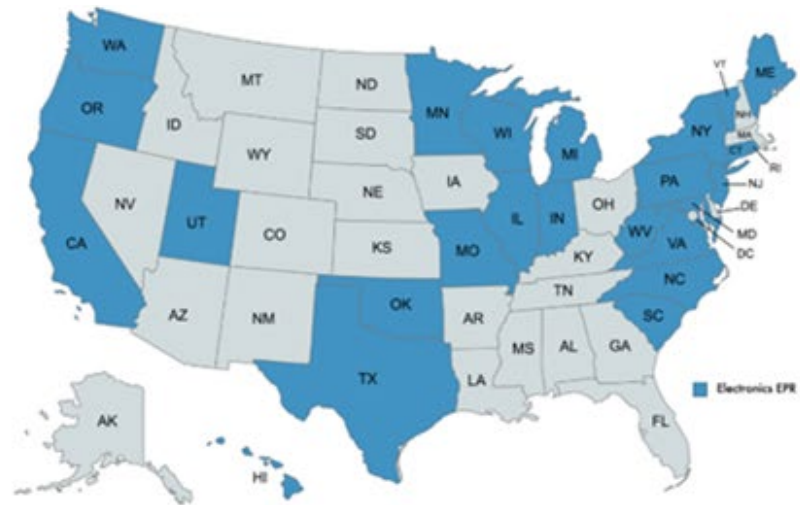
- “Asian Carp”: Invasive species in the Illinois River
 - Northern migration of fish population due to climate change and ag runoff
 - Negative effects on riverine biodiversity
- State program to incentivize local commercial fishermen and rebrand the fish (“Copi”)
 - Carp processing yields dozens of bio-based products (e.g., food, fertilizer)
 - Create jobs, reduce poverty, and help address hunger
 - Improves river health
- Tensions
 - Rural-Urban economic activity
 - Economic-Ecological objectives
 - Legal and governance



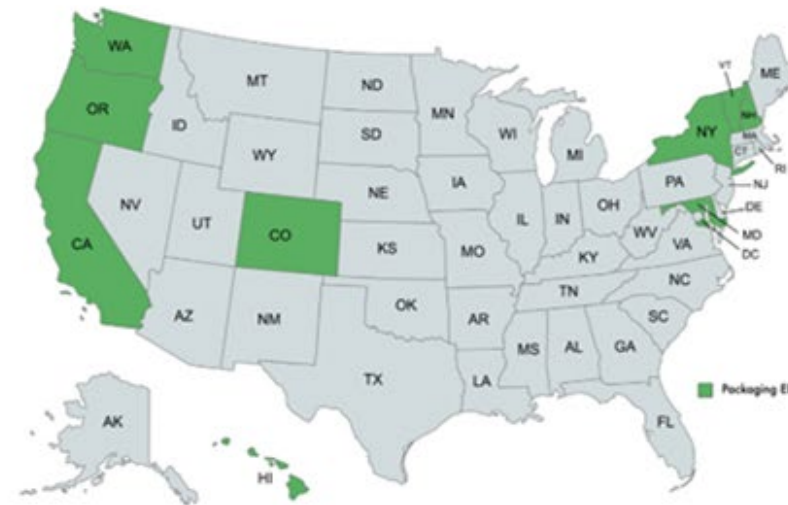
Governance and Policy Pathways

State initiatives for comprehensive waste management

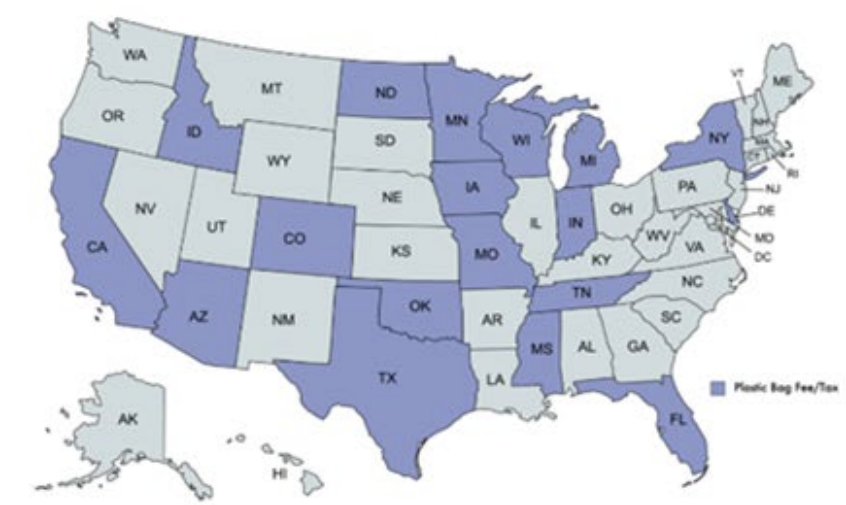
Panel A: Electronics EPR



Panel B: Packaging EPR



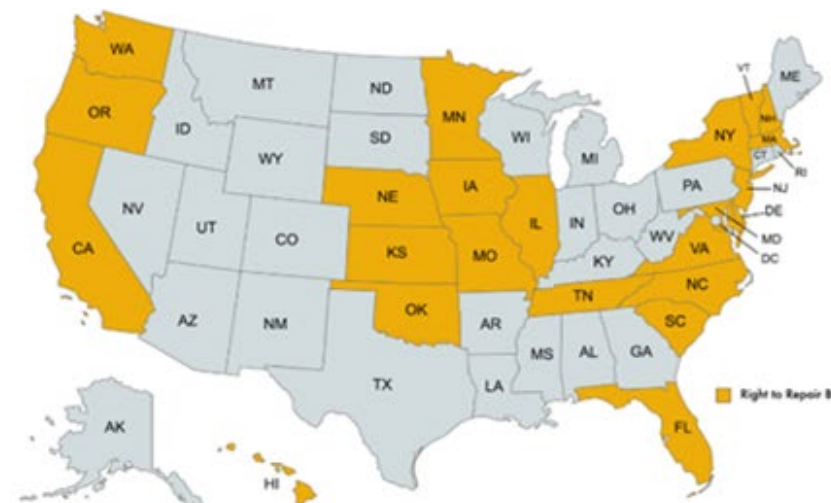
Panel C: Plastic Bag Fee/Tax



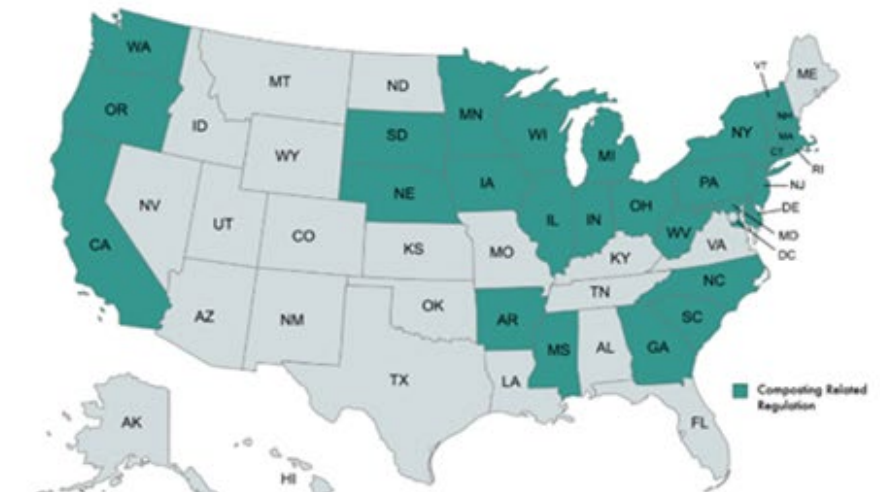
Panel D: Bottle Bill



Panel E: Right to Repair Bill



Panel F: Composting Regulation



(Source: 1) Panel A (blue): Electronics Recycling Coordination Clearinghouse 2) Panel B (light green): National Caucus of Environmental Legislation 3) Panel C (purple): American Progressive Plastic Alliance, the Colorado Sun, National Caucus of Environmental Legislation. 4) Panel D (red): National Conference of State Legislatures 5) Panel E (orange): The United States Public Interest Research Group 6) Panel F (dark green): US Composting Council).

Summary/Next Steps

Analysis of Baseline Data



Integration Across Projects

Comprehensive Data Management Plan



Multi-stakeholder Education Plan

Convergent Outcomes



Drafting of Final Proposal

Thank you

