SMART CITIES: BEYOND TECHNOLOGY

Webinar: July 1, 2019

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Intent of Webinar:

Expand Boundary for framing Smart Cities conversation

FROM: Current focus on Smart Technologies and the Internet of Things

TO: Cities as Smart Socio-ecological Systems that fully-regenerate interrelations, productive potential, resilience, quality of life, and ability of people to thrive

Smart Cities$^{2.0}$ conversation shift

In 2017, the Smart City conversation began to shift from infrastructure (especially core infrastructure like broadband, sensors, actuators & IoT Centers) to a **Smart Cities$^{2.0}$** focus on people.

> *“At its very core, a smart city is a city that has been able to look inside and identify what its challenges are — what its people and residents need to have the quality of life they want to have — and to craft unique solutions that enable the city and the community to deal with those challenges," he said. "That truly is what a smart city is.” (Steve Adler, Mayor of Austin, 2017 Smart Cities Connect Conference)*

Smart Cities$^{2.0}$ as Complex Systems

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Context for Smart Cities$^{2.0}$ conversation

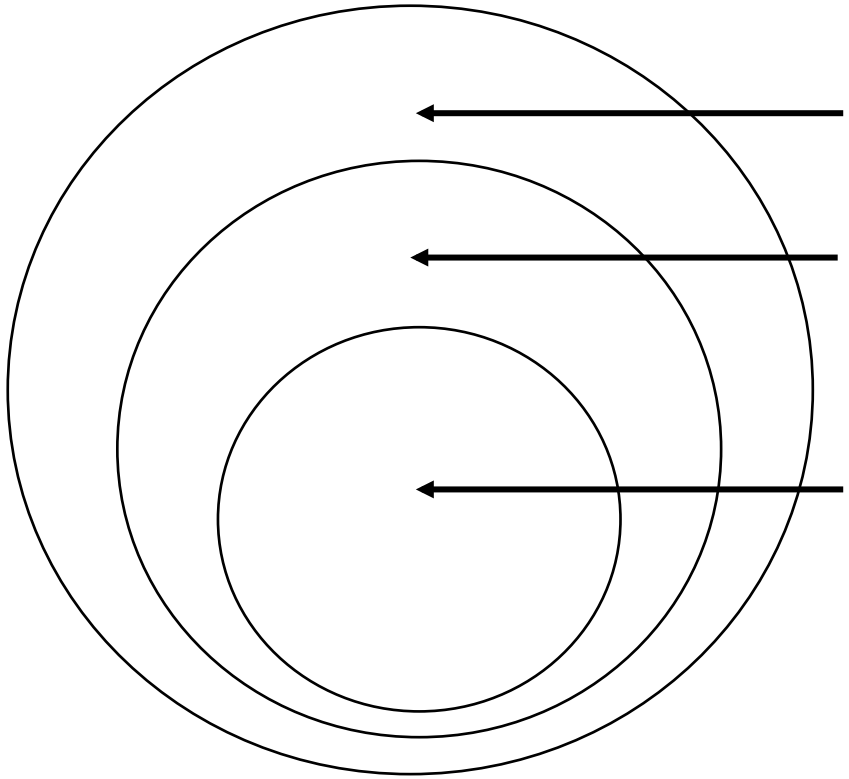
Growing complexity science understanding of socio-ecological systems as complex adaptive systems (regenerative systems).

Current and escalating inability to address the basic needs of all people within the regenerative capacity of planetary systems

Myriad of complex, inter-related, and escalating local and global challenges

Profound need to re-provision cities so people can address their needs while living within the regenerative capacity of the complex socio-ecological system upon which they depend

Nested nature of the Smart Cities$^{2.0}$ context



Smart Systems$^{2.0}$: Complex adaptive systems (regenerative systems)

Smart Socio-ecological Systems$^{2.0}$: Complex adaptive systems that address needs of all within system regeneration

SMART CITIES$^{2.0}$: Smart socio-ecological systems that optimize urban quality of life, resilience and ability to thrive

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Smart Systems$^{2.0}$

To understand Smart Systems$^{2.0}$ it helps to consider the:

- Unfolding complexity that, through 13.7 billion years of Big History, has built and sustained the regenerative capability of today's socio-ecological systems
- Three major leaps in complexity (see *Journey of the Universe,* by Swimme & Tucker)
  - Physically-complex systems
  - Ecologically-complex systems (Ecological Smartness)
  - Consciously-complex systems (Socio-ecological Smartness)

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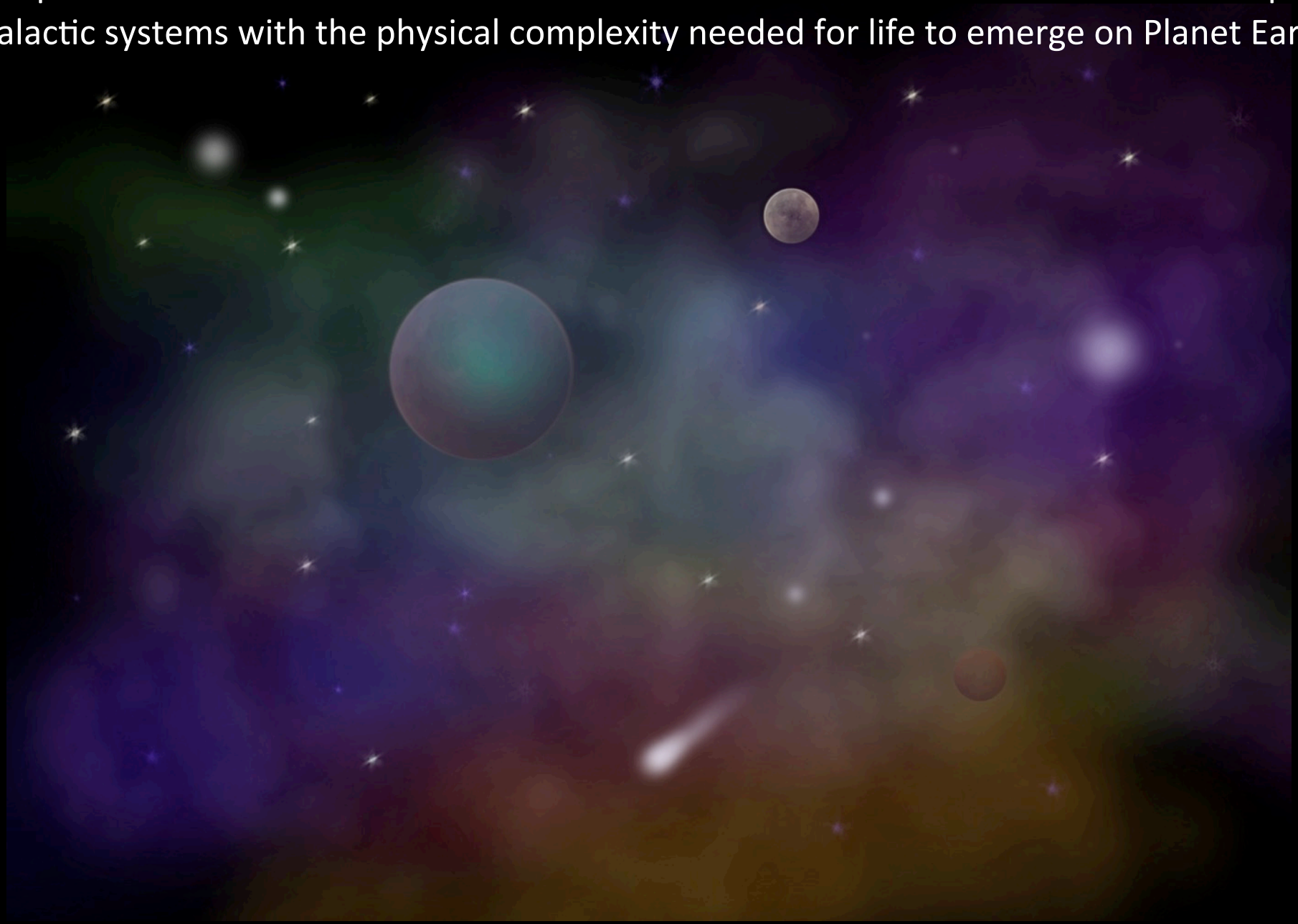
Leap #1- PHYSICAL COMPLEXITY: Transformation of the Universe from cosmic soup to galactic systems with the physical complexity needed for life to emerge on Planet Earth



Leap #2- ECOLOGICAL COMPLEXITY: Living systems with the coordinated behavior needed to use low energy photons of light to convert Earth from a gray planet into a global web of life

Leap #3- CONSCIOUS COMPLEXITY: In-progress shift to the consciousness needed for humanity to appreciatively participate in fully-regenerating living systems

On-going shift to Anthropocene$^{2.0}$ consciousness

Growing understanding of today's growing problems as legacy of unsustainable development within an **anthropocentric** * (people-centered) Anthropocene$^{1.0}$ consciousness

Realization of the on-going emergence of a **complexity-centric** * (complex systems-centered) Anthropocene$^{2.0}$ consciousness

* For an expanded discussion, see my 3 entries in the *Encyclopedia of Sustainability in Higher Education* as trilogy that interrelate co-design, complex systems, sustainable development and a whole systems approach

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The term “Smart Cities” reflects this on-going shift

In a mature consciously-complex world, there will be no need for terms like Smart Cities, just like there is now no need for the term Smart Ecological systems

Like regenerative ecosystems, complexity-centric co-designed cities will, by definition, be Smart.

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Smart Cities and Smart Cities$^{2.0}$

Smart Cities: Cities that use technology to collect data; and use this data to manage the city efficiently, to avoid conflicts, and to enhance the function of urban systems and networks.

Smart Cities$^{2.0}$: Cities where decisions are made with the insight that comes from integrating the full-spectrum of intelligences within an appreciation of the socio-ecological complexity and coordinated behavior needed for the city to function as a fully-regenerating consciously-complex system

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Smart Cities$^{2.0}$ will leverage diverse intelligences

Ecologically-augmented intelligence will:

- Inform human action (e.g., how to optimize potential of EWF Nexus)
- Provide insight about system regeneration models, strategies, limits and metrics

Socially-augmented intelligence will use the full diversity of the community to:

- Identify analogical robust strategies that build resilience and ability to thrive
- Build shared commitment through transparency that increases trust

Technology-augmented intelligence will integrate the full range of technologies to:

- Interconnect diverse metabolic flows (technology, policy, etc.)
- Enhance logical thinking (e.g., digitally-enhanced mathematics)
- Enhance analogical thinking (full-spectrum consciousness)

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Smart Cities are in early stage of becoming Smart Cities$^{2.0}$

- Smart enough to increase efficiency and unsustainable yield; but NOT smart enough to optimize whole-system performance and regeneration

- Smart enough to use IoT centers & actuators to connect components; But NOT smart enough to integrate ecologically-, socially-, and technology- augmented intelligences to make robust and resilient decisions

Transition to Smart Cities$^{2.0}$ will include major shifts to:

- Analogically-robust understanding
- Complexity-appreciative decisions
- Local asset leveraging and regeneration
- Whole-system co-management and co-design
- Optimization and regeneration as metrics

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Smart City$^{2.0}$ as complex system co-design

Ability to co-design Smart Cities$^{2.0}$ is emerging from a 60-year planning and design shift from 1st-generation prescriptive approaches to 5th-generation approaches that dance with complexity

1st Generation: Expert-driven > 2nd Generation: Expert-centric > 3rd Generation: User –centric > **4th Generation: Anthropocentric Co-design** > **5th Generation: Complexity-centric co-design**

Anthropocene$^{1.0}$ consciousness
(Informed by network conversation among people)

Anthropocene$^{2.0}$ consciousness
(Informed by network conversation among the diversity of human & non-human components of complex system)

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Smart Cities$^{2.0}$ will be consciously-complex systems that:

- Leverage the diversity of knowledge systems into resilience-building decisions
- Function as intelligent agents in fully-regenerating socio-ecological systems
- Optimize potential of nested natural, infrastructural & built-site systems
- Integrate the metabolic flows of key urban systems (water, energy, food, materials)

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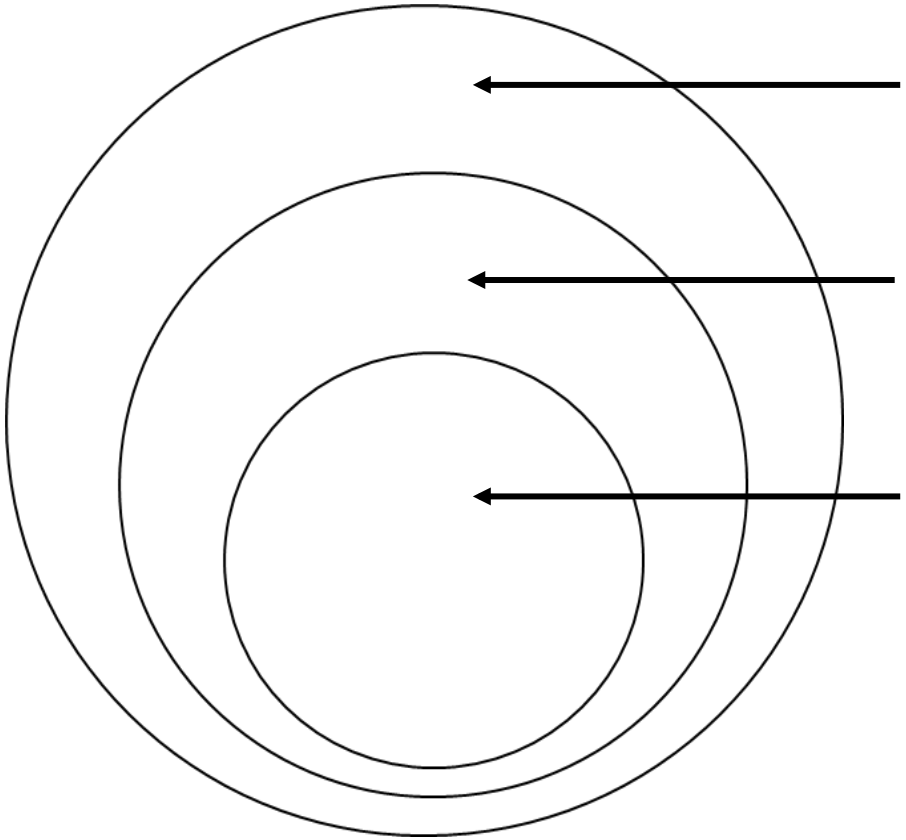
Smart Cities $^{2.0}$ will be co-designed as "nested" living-system supports



Ecological Systems (primary supports):
Provide clean air, pure water, productive soils and ability to thrive

Infrastructural Systems (secondary supports)
Enhance supports to people w/i regenerative capacity of local and planetary systems

Built Environments (tertiary supports)
Further increase supports to people, access infrastructure, & optimize system regeneration

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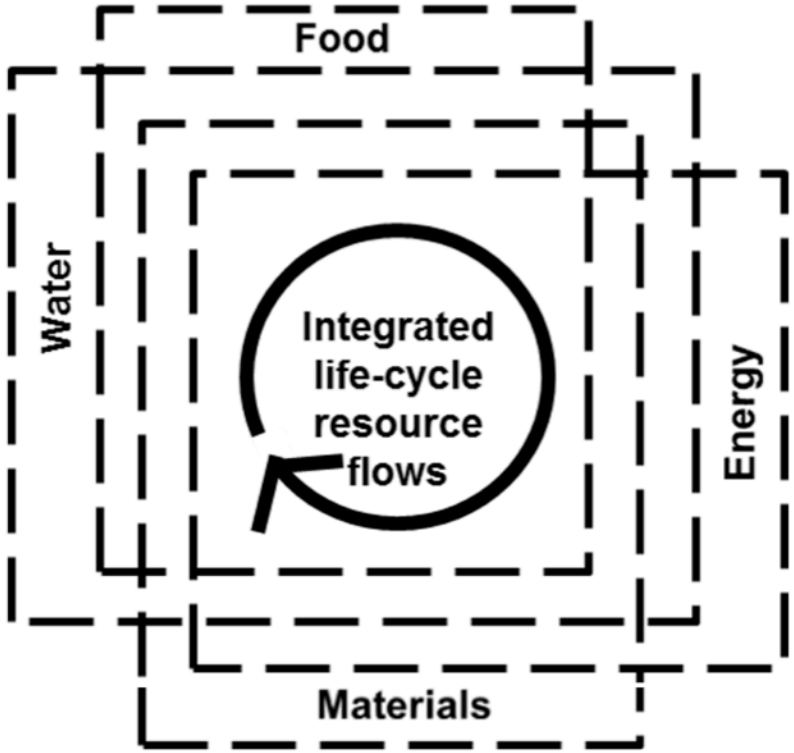
Smart Cities $^{2.0}$ will integrate the life-cycle flows of key systems



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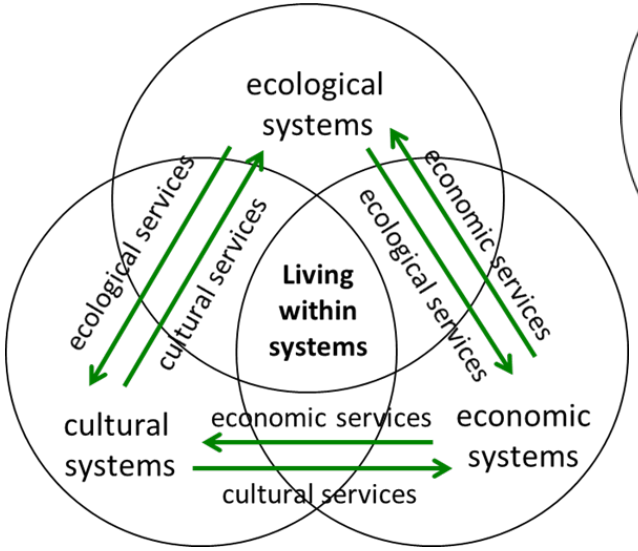
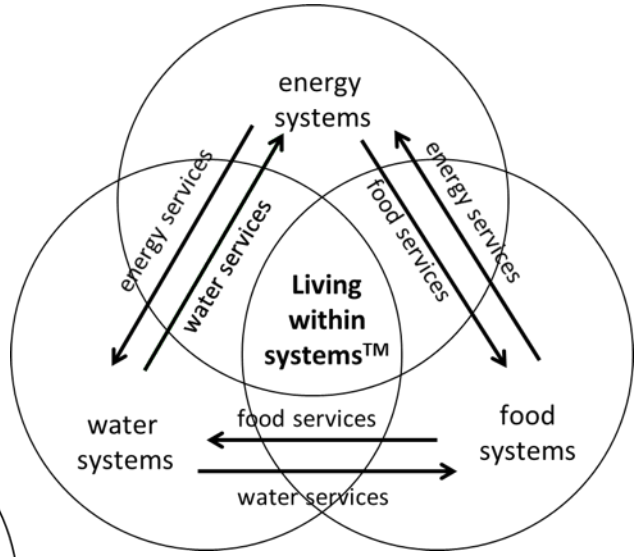
Smart Cities$^{2.0}$ will optimize their performance thru inter-system services





Smart Cities$^{2.0}$ will co-adapt their key energy, water and food systems to optimize potential of the EWF Nexus

	Ecological System	Energy System	Water System	Food System	Comm./Info. System	Cultural / Exper. System	Transportation System	Manufacturing System	Governance System	Economic System	Solid Waste System	Social Support System	Educational System
Ecological System													
Energy System													
Water System													
Food System													
Communication/Information System													
Cultural / Experiential System													
Transportation System													
Manufacturing System													
Governance System													
Economic System													
Solid Waste System													
Social Support System													
Educational System													

Smart Cities$^{2.0}$ co-adapt their ecological, social and economic systems to build resilience

Smart Cities$^{2.0}$ will co-management, co-plan & co-design all urban systems to optimize the ability of people to thrive

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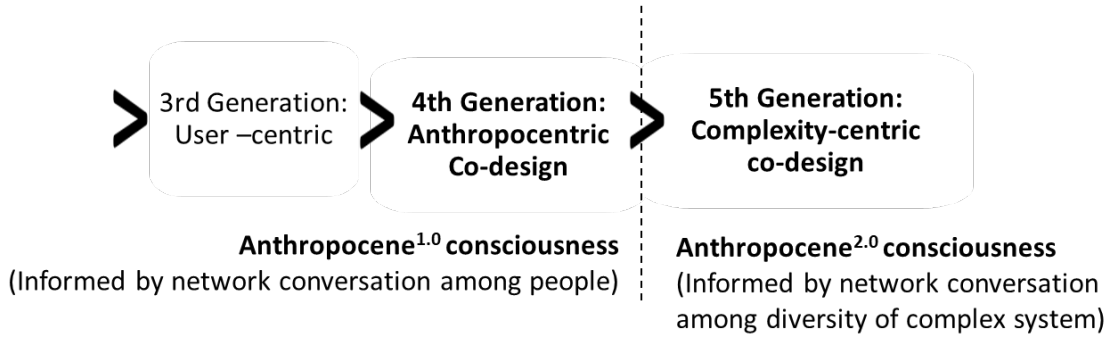
Current JMC-SCI collaboration to help build Smart Cities $^{2.0}$ knowledge

Facilitate the Smart Cities $^{2.0}$ shift to 5th generation methods



SOCIOLOGICAL: Help make smart decisions informed by the diversity of consciousness in a city-region.

ECOLOGICAL: Help make smart decisions informed by metabolic relationships within local ecosystem

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Help communities optimize their SOCIAL complexity

Created and played the Living-in-Systems™ community engagement boardgame as a tool for building analogically-rich insight about place and opportunities

Evolved boardgame from community engagement tool into sustainability teaching game with four cycles of play:

1: Decisions based on market (Initial Cost/Benefit)
2: Decisions based on Market + EWF Factor
3: Decisions based on market + EWF Factor + green infrastr.
4: Decisions based on market + EWF Factor + green infrastructure + green built environments

Tested teaching game in diverse international & US contexts.

Plan to use game as knowledge- & community- building tool in online course to facilitate shift to complexity-centric co-design.

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Help communities optimize ECOLOGICAL complexity:

- Build understanding of city-regions as complex, inter-dependent and regenerative ecological system that build resilience and the ability to thrive
- Propose strategies inspired by ecological models; informed by the complex and coordinated behaviors of ecological systems, and sensitive to the need to regenerate sustainable city-region metabolic relationships

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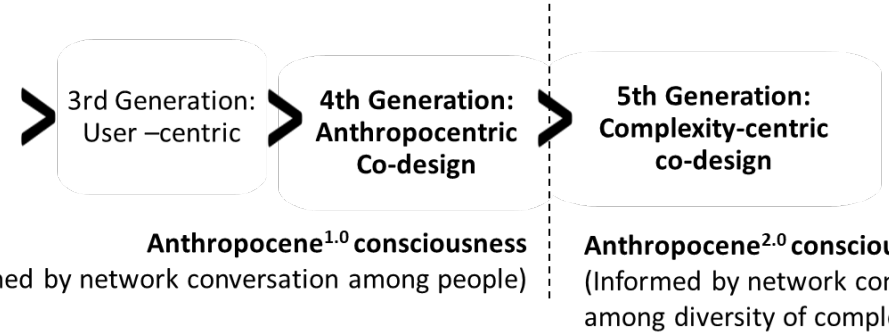
Lead shift to complexity-centric co-design education & training



PROFESSIONAL CONSULTING

GLOBAL CONSULTING TO HIGHER EDUCATION

- Build 5th- Generation co-design & Smart Cities$^{2.0}$ content into universities globally as a Fulbright Scholar
- Facilitate shift to 5th- Generation co-design & Smart Cities$^{2.0}$ processes in US universities and communities

INTRODUCTION TO COMPLEXITY-CENTRIC CO-DESIGN (Planned Fall 2020 online course)

- Fall 2018 course development and training to use Visionmaker.NYC to make complexity-informed decisions
- Spring 2019 beta-testing via BSU-LA471 Sustainable Land Systems class

TEACHING BALL STATE UNIVERSITY COURSES (ONLINE)

- Increase 5th generation content in LA471 Sustainable Land Systems course (3 credits)
- Build 5th gen. content into 3 new courses of BSU Graduate Certificate in Sustainability (SUST 520 Environmental Ethics; SUST 524 Social/Environmental Justice; SUST 529 Business Ethics/Environment)

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Enough theory; Let's look at projects!

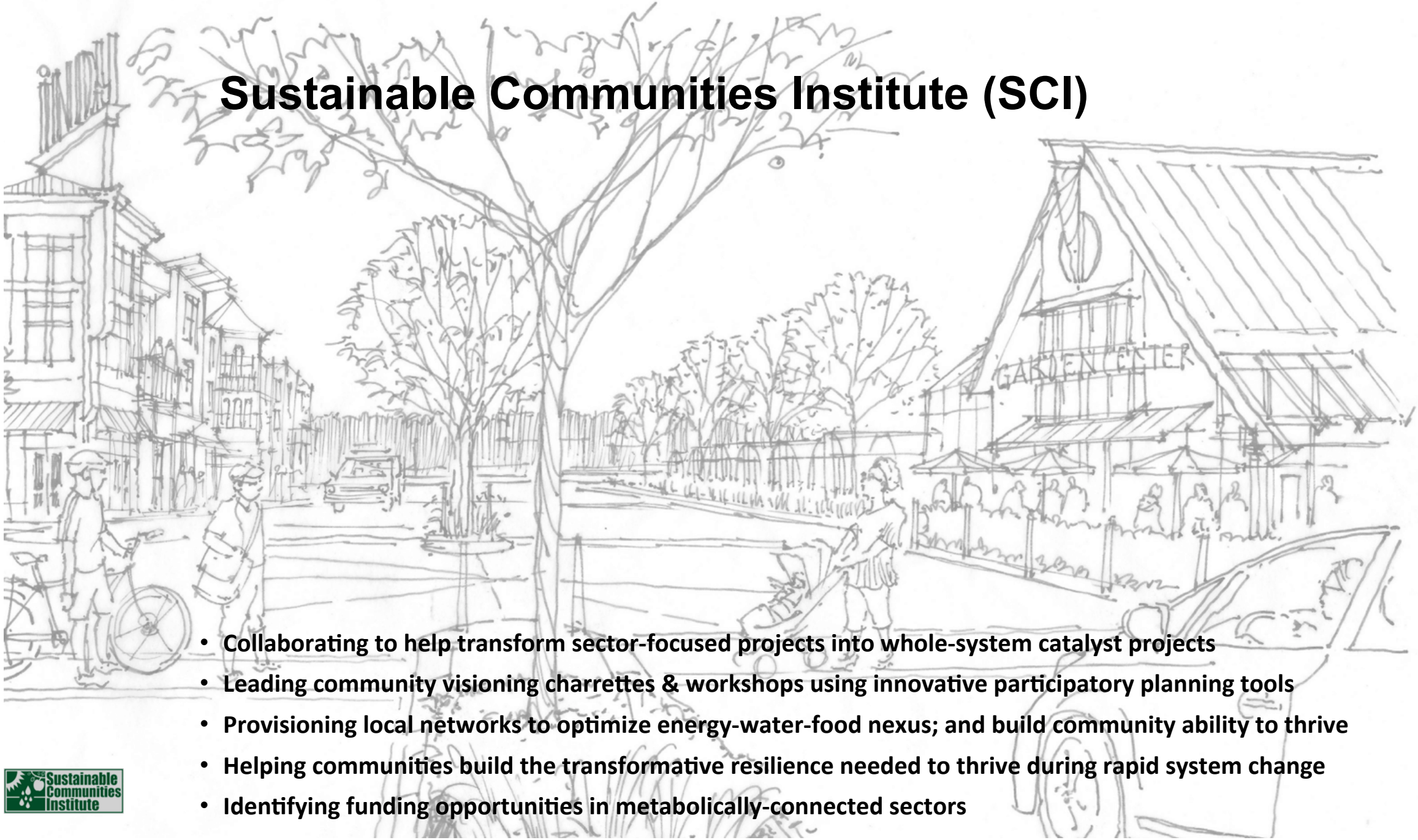
SCI projects that help build the Smart Cities$^{2.0}$ story

Scott Truex

Director, Sustainable Communities Institute

Chair, Department of Urban Planning, Ball State University

Sustainable Communities Institute (SCI)



- Collaborating to help transform sector-focused projects into whole-system catalyst projects
- Leading community visioning charrettes & workshops using innovative participatory planning tools
- Provisioning local networks to optimize energy-water-food nexus; and build community ability to thrive
- Helping communities build the transformative resilience needed to thrive during rapid system change
- Identifying funding opportunities in metabolically-connected sectors

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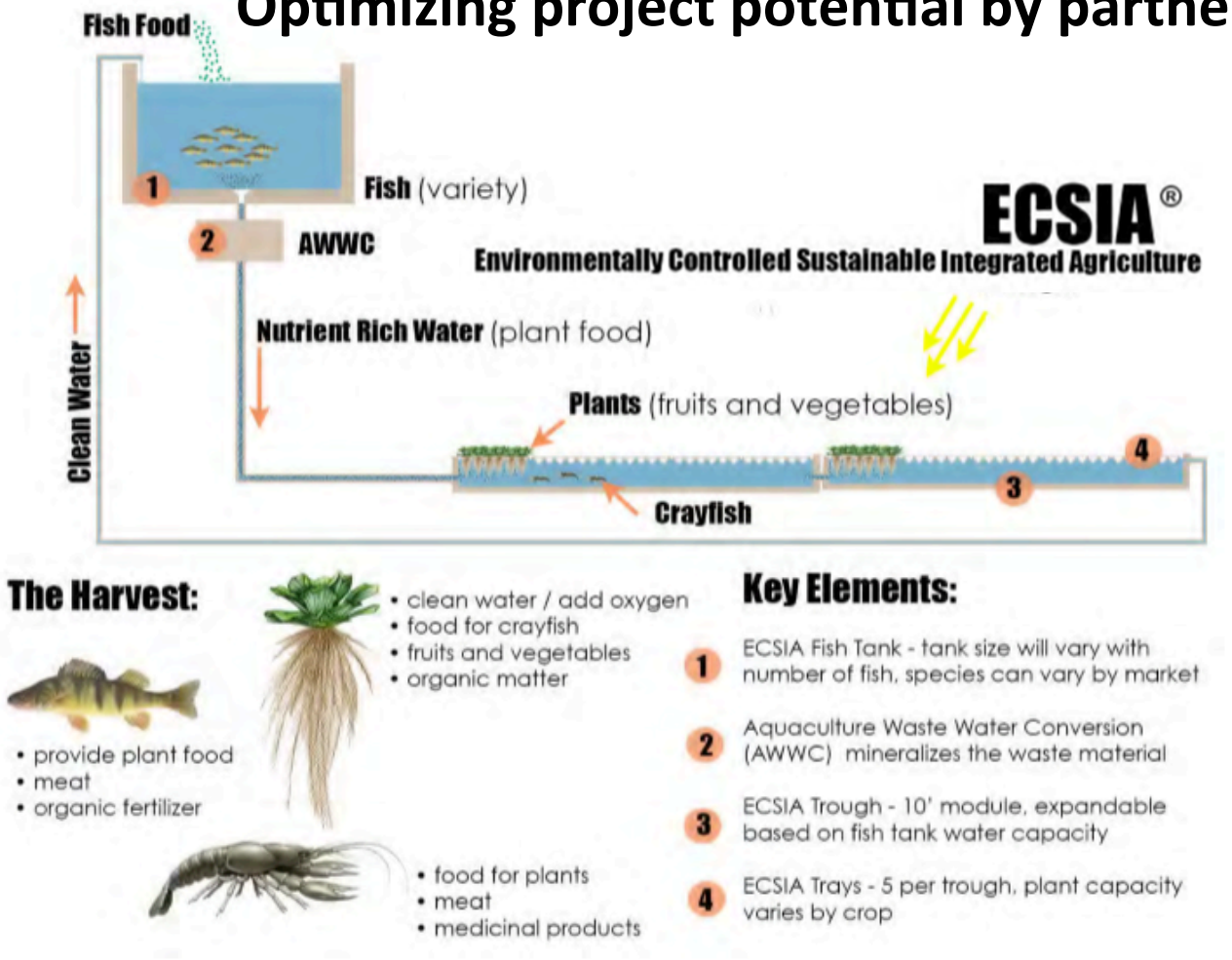
Optimizing project potential by partnering with ECOLOGICAL complexity



ECSIA® (Environmentally Controlled Sustainable Integrated Agriculture)

Several SCI projects use ECSIA food production systems to collaborate with the metabolic behaviors of plants, fish and crayfish to optimize food produced w/i local EWF Nexus.

Sustainable Living & Growing Centers (SLGC)™

SCI is promoting a network of regional (SLGC)™ to train people to optimize food production w/i their local EWF Nexus through a 4 step process:

- **Train** (to live within systems)
- **Seed** (production & value-adding system)
- **Build** (eco-homestead & production system)
- **Live** (thrive by living within system)

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SLGC™- Orleans as catalyst for economic development & food justice

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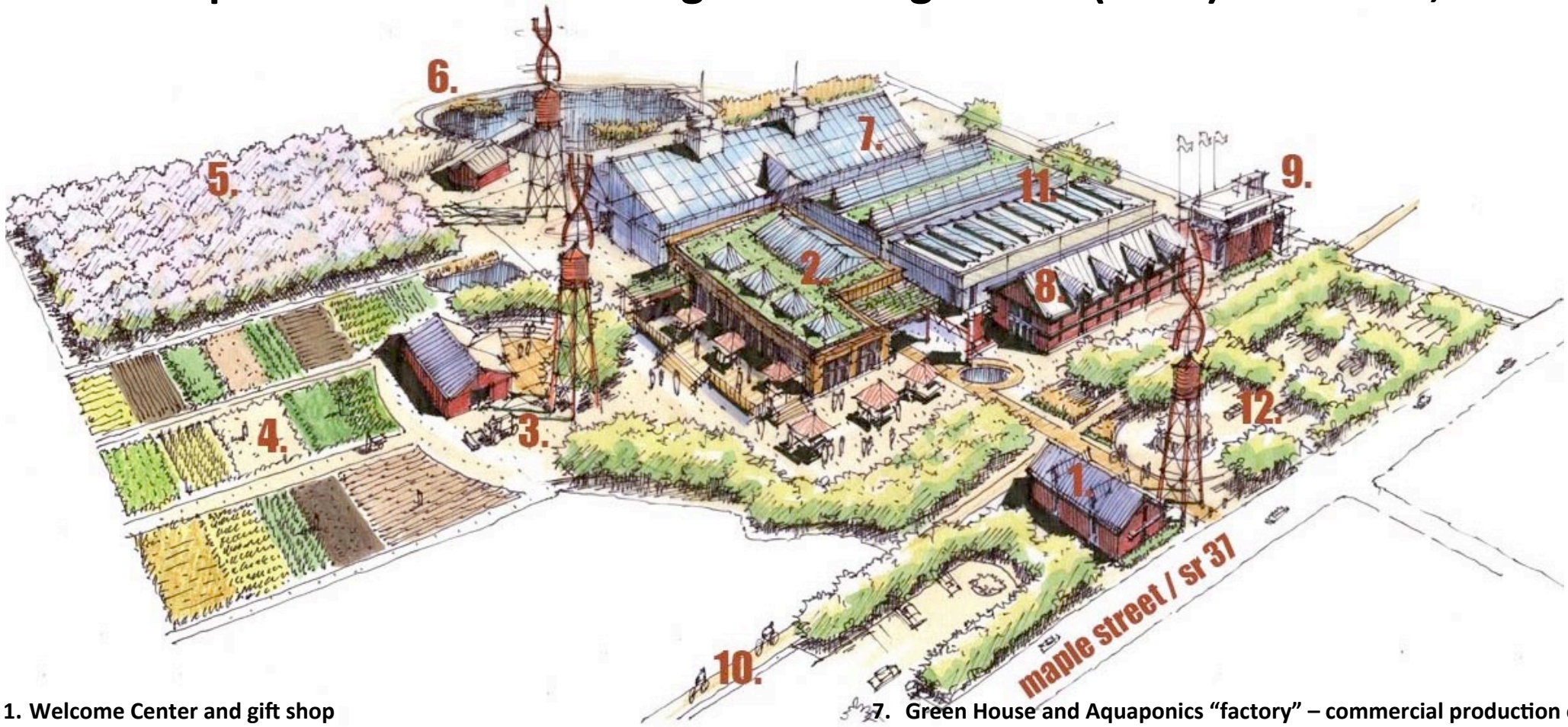
Proposed Sustainable Living & Growing Center (SLGC)™ Orleans, IN



1. Welcome Center and gift shop
2. Food Center (restaurant, coffee shop, micro brewery, retail foods)
3. Farm Garden Center (classrooms, garden sales, demonstration area, etc.)
4. Permaculture Plots (container gardening to micro farms
5. Orchard/Fruit Trees and Plants
6. Aquaponics Center (classrooms, water based sales, demonstration area, etc.)
7. Green House and Aquaponics “factory” – commercial production center
8. Lodging (rooms for visitors, researchers and visiting speakers)
9. Administration / Offices / Classrooms
10. Orleans Rails to Trails line (Bloomington/ French Lick / Louisville)
11. Green Roofs and Alternative Energy Systems
12. Visitor Parking (Electric Car stations)

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Urban project as Smart Systems$^{2.0}$ for thriving

The project site we proposed was very near to Martha's Place that provides transitional housing for women recovering from substance abuse. We submitted in the Urban Agriculture category, where projects were encouraged to include an element of stormwater treatment from the site through practices such as bioretention, water retention and storage through above-ground or below-ground cisterns, or other practices.

Site and project type- Baltimore Urban Farmstead Initiative

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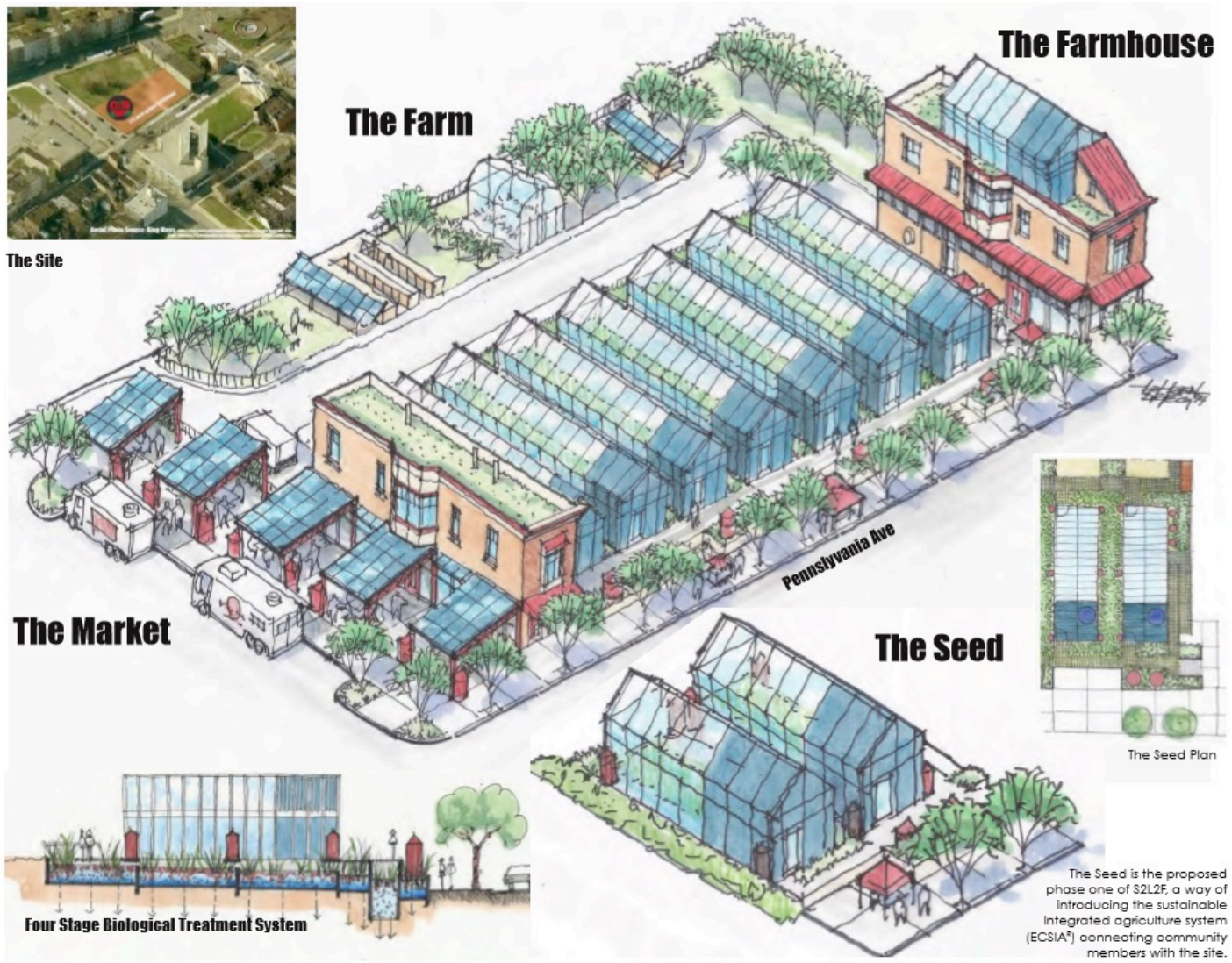
Urban Farmstead as Smart Systems$^{2.0}$

The Site



Honor Award: 2015 International Making Cities Livable Design Competition

Jury's comment:

This is a small project but extremely ambitious, given the context, and provides an excellent model for troubled and poverty stricken areas of cities around the world. The aspects of integrating urban agriculture, employment training, and life skills, to regenerate a neighborhood is inspiring.

Baltimore Urban Farmstead Initiative

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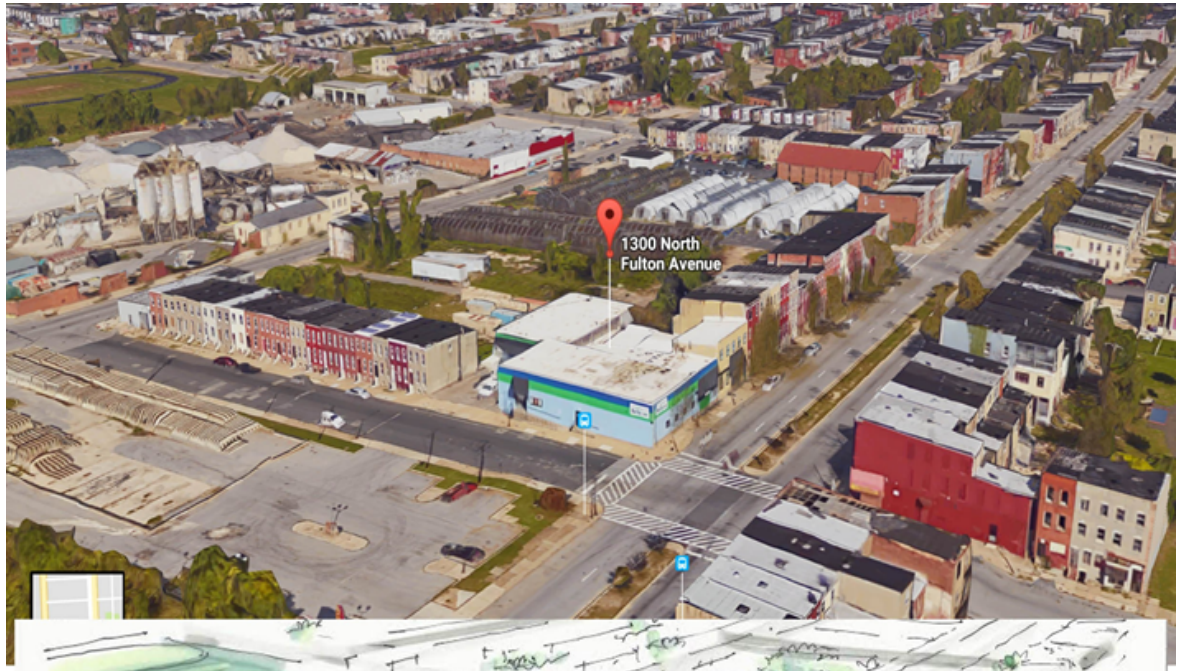

Project evolution- Baltimore Urban Farmstead Initiative

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Leveraging full spectrum of social diversity to inform co-design

Northwest Area Food Hub, Indianapolis

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Optimizing network conversation as co-design tool

Northwest Area Food Hub, Indianapolis

Sustainable Communities Institute

Northwest Area Food Hub, Indianapolis

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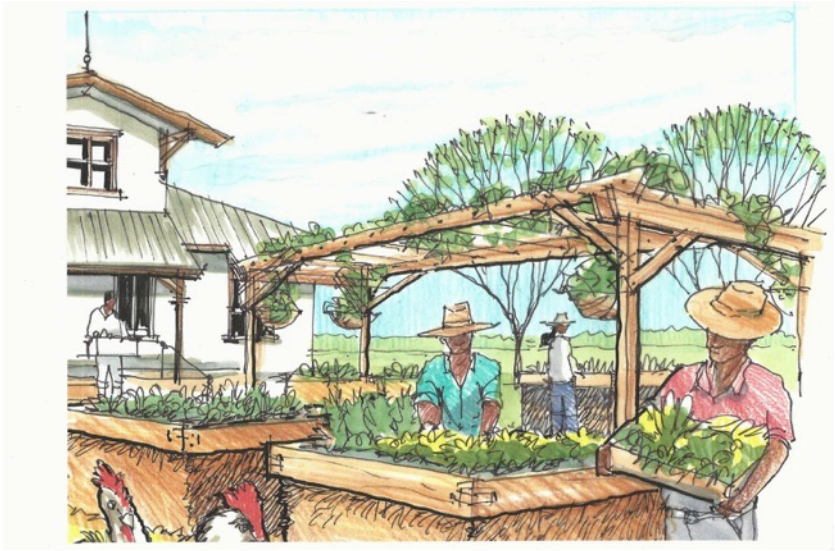
Optimizing potential of key systems (e.g., food) to enhance quality of life



ESCIA system will provide healthy organic food, intense Ag training, value adding opportunities and jobs. Food is the catalyst for change! Every community needs to create a community economic development strategy to get healthy, create jobs and build community!

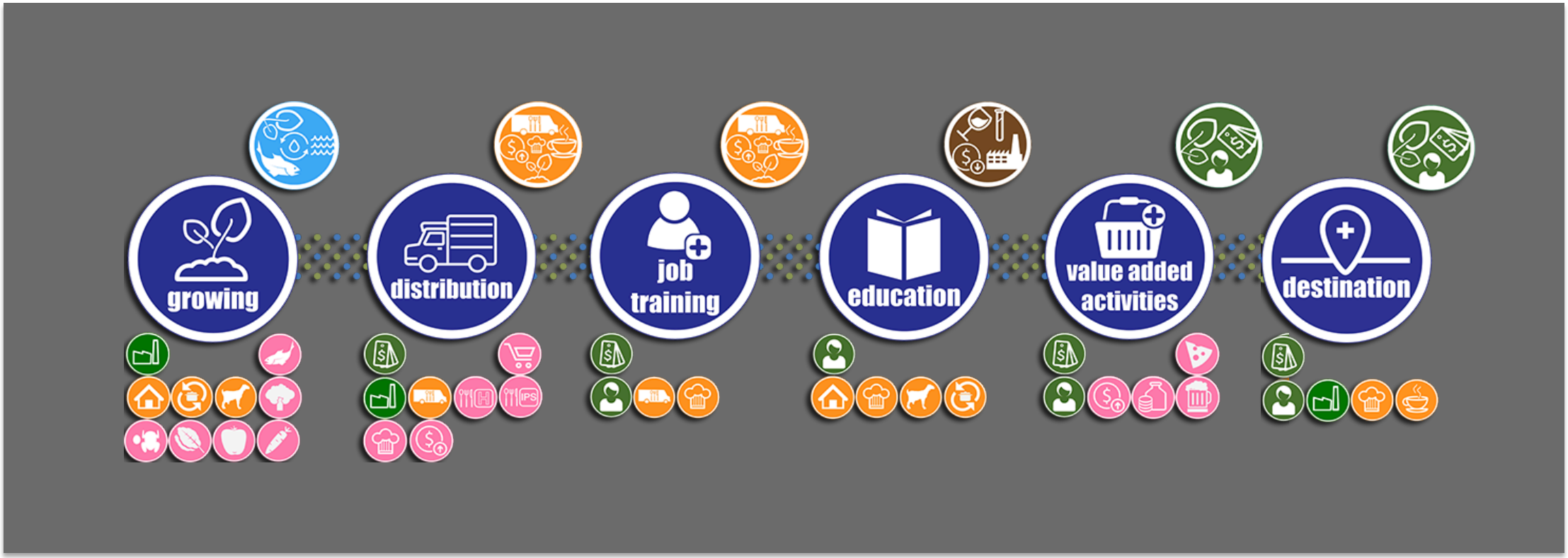
TRANSFORMING HEALTH - CREATING JOBS

- **Food hub for challenged Northwest Area, Indianapolis**
- **Aging population, health issues, underemployment**
- **Employment centers, anchor businesses and community investment had left the area**
- **SCI partnered to develop vision to implement Quality of Life Plan recommendations**
- **Food system co-designed to provide healthy food, value-adding, jobs and enhanced NW neighborhood quality.**

Northwest Area Food Hub, Indianapolis

Sustainable Communities Institute

Building local appreciation of food system as Smart Cities$^{2.0}$ catalyst



Community-based Food System Visioning

Northwest Area Food Hub, Indianapolis

Sustainable Communities Institute

Engaging in charrettes and games to build stronger local systems

FOOD

PRIORITY

○ ○ ○ ○ ○ ○ ○

LOW HIGH

JOBS

PRIORITY

○ ○ ○ ○ ○ ○ ○

LOW HIGH

COMMUNITY

PRIORITY

○ ○ ○ ○ ○ ○ ○

LOW HIGH

Job Training

PRIORITY

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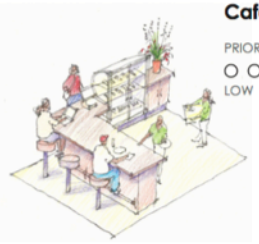
LOW HIGH



Cafe

PRIORITY

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LOW HIGH

Community Garden

PRIORITY

○ ○ ○ ○ ○ ○ ○

LOW HIGH

Urban Animals

PRIORITY

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LOW HIGH

Co-op Grocery

PRIORITY

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LOW HIGH

Processing

PRIORITY

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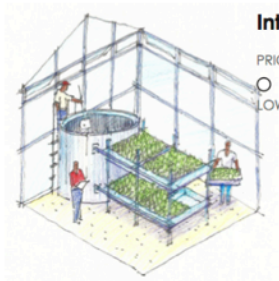

Intense Agriculture

PRIORITY

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LOW HIGH

Composting

PRIORITY

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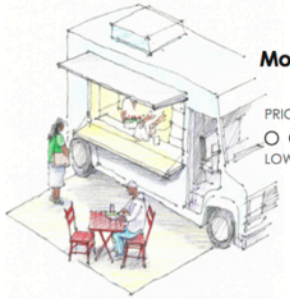

Mobile Markets

PRIORITY

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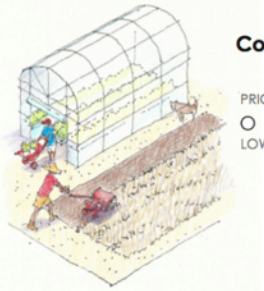

Commercial Farm

PRIORITY

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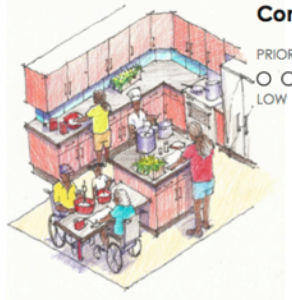

Community Kitchen

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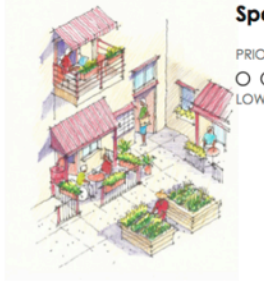

Specialty Housing

PRIORITY

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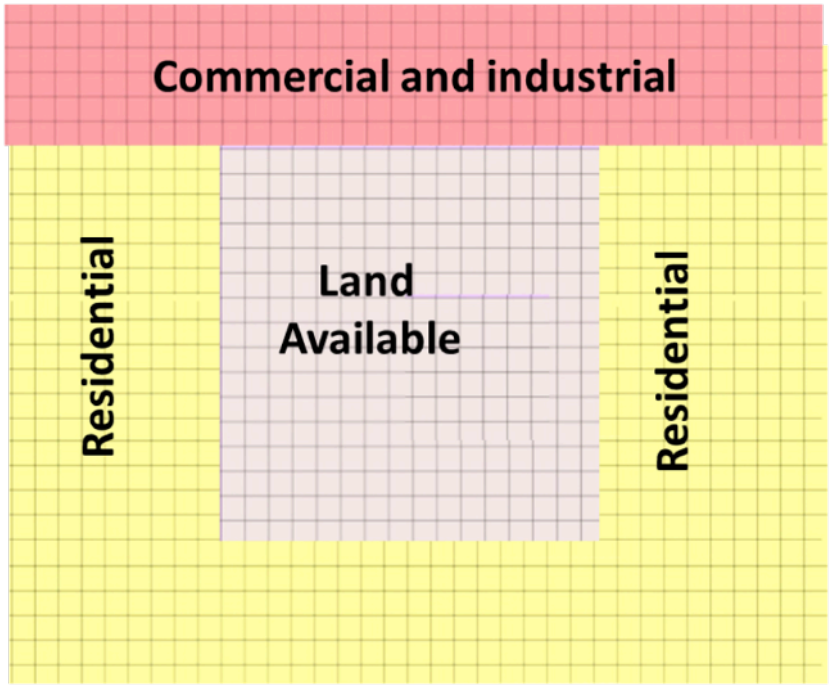
LOW HIGH

Comments

Helping full range of social groups create, score & evolve land allocations to build analogically-robust scenarios



Game Board and Squares

Northwest Area Food Hub, Indianapolis

Sustainable Communities Institute

Diverse participants self-declared into teams of shared goals:

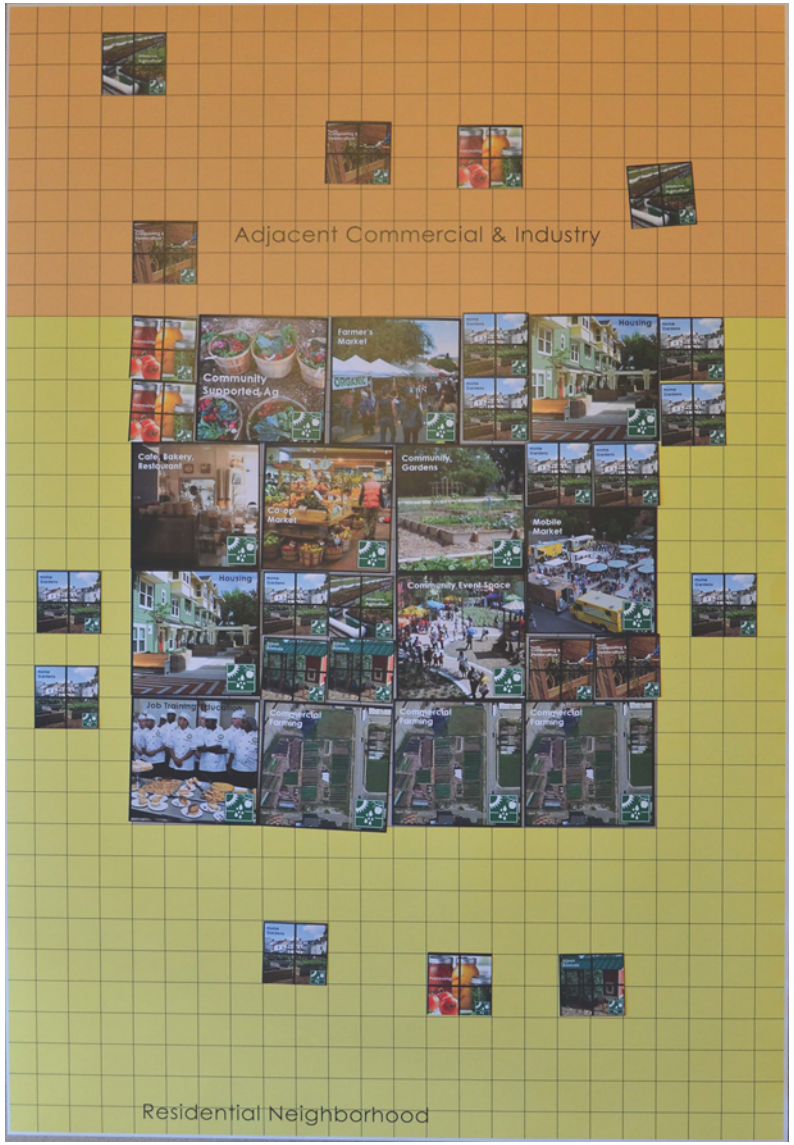
- Maximize food production
- Maximize job generation
- Maximize community benefits

Each team

- Engaged in intense discussion to generate land allocations
- Used scoresheet to evaluate solution scenario
- Evolved solution to enhance score

Reconvene as single group

- Each team presents and explains their scenario
- Robust discussion to better understand scenarios and to build shared consciousness



Northwest Area Food Hub, Indianapolis

Sustainable Communities Institute

FOOD HUB: IMPACT MATRIX	FOOD				JOBS				Social				IMPACTS
		1"	2"	4"		1"	2"	4"		1"	2"	4"	
GROWING													
Community Gardens	1			16	0.1			2	4			64	LC/LR
Commercial Farming	1.5			24	0.1	·		2	0			0	MC/HR
Home Gardens	1	1 x 4			0.1	0	·	·	0.5	0	·	·	N/A
Intense Ag (aquaculture, hydroponics, aquaponics, permaculture)	4	4 x 4	16	64	0.2	0	1	3	0	0	0	0	MC/HR
Urban Animals	0.25	0.25 x 4	1	4	0.1	0	0	2	0	0	0	0	MC/MR
VALUE-ADDING ACTIVITIES													
Composting/Vermiculture	0	0	0	0	0.1	0	0	2	0	0	0	0	LC/MR
Community Kitchen	0			0	0.1			1.6	0			0	MC/LR
Packaging/Aggregating	0			0	0.5			8	0			0	HC/HR
Processing	0	0	0	0	0.5	1	2	8	0	0	0	0	HC/HR
DISTRIBUTION													
Community Support Agriculture (CSA)	0			0	0.1			2	0			0	LC/MR
Co-op Grocery	0			0	0.5			8	4			64	HC/LR
Mobile Market	0		0	0	0.1		0	2	1		4	16	LC?MR
Farmers' Market	0			0	0.125			2	6			36	LC/LR
Café/Restaurant/Bakery	0			0	0.5			8	3			48	HC/HR
Direct & Specialty (hotels, hospitals, schools, supermarkets, etc.)	0			0	0.1			2	0			0	LC/HR
JOB TRAINING & EDUCATION													
Classes & Workshops (nutrition, wellness, growing, value adding, etc.)	0			0	0			0	1			16	LC/LR
DESTINATION & AMENITIES													
Celebration/Community Event Space	0			0	0.125			2	6			36	LC/LR
Speciality Housing (veterans, exoffenders, ARC, etc.)	0			0	0.125	·	·	2	0.5			8	HC/LR

FOOD HUB: SCORE CARD	PHASE 1	Market Driven	Summary Total	Grand Total
GROWING				
Community Gardens	# of 4" tiles	3	# of 4" tiles	=
Commercial Farming	# of 4" tiles	5	# of 4" tiles	=
Home Gardens	# of 1" tiles	8	# of 1" tiles	=
Intense Ag (droponics, aquaponics, permaculture)	# of 1" tiles # of 4" tiles	3	# of 1" tiles # of 4" tiles	=
Urban Animals	# of 1" tiles # of 4" tiles	2	# of 1" tiles # of 4" tiles	=
VALUE-ADDING ACTIVITIES				
Composting/Vermiculture	# of 1" tiles # of 4" tiles	0.1	# of 1" tiles # of 4" tiles	=
Processing	# of 1" tiles # of 4" tiles	0.2	# of 1" tiles # of 4" tiles	=
DISTRIBUTION				
Community Support Agriculture (CSA)	# of 4" tiles	0.1	# of 4" tiles	=
Co-op Grocery	# of 4" tiles	0.3	# of 4" tiles	=
Mobile Market	# of 4" tiles	1	# of 4" tiles	=
Farmers' Market	# of 4" tiles	1	# of 4" tiles	=
Café/Restaurant/Bakery	# of 4" tiles	4	# of 4" tiles	=
JOB TRAINING & EDUCATION				
Job Training	# of 4" tiles	1	# of 4" tiles	=
DESTINATION & AMENITIES				
Celebration/Community Event Space	# of 4" tiles	2	# of 4" tiles	=
Housing	# of 4" tiles	1	# of 4" tiles	=

Impact assessment

Scoring of scenarios

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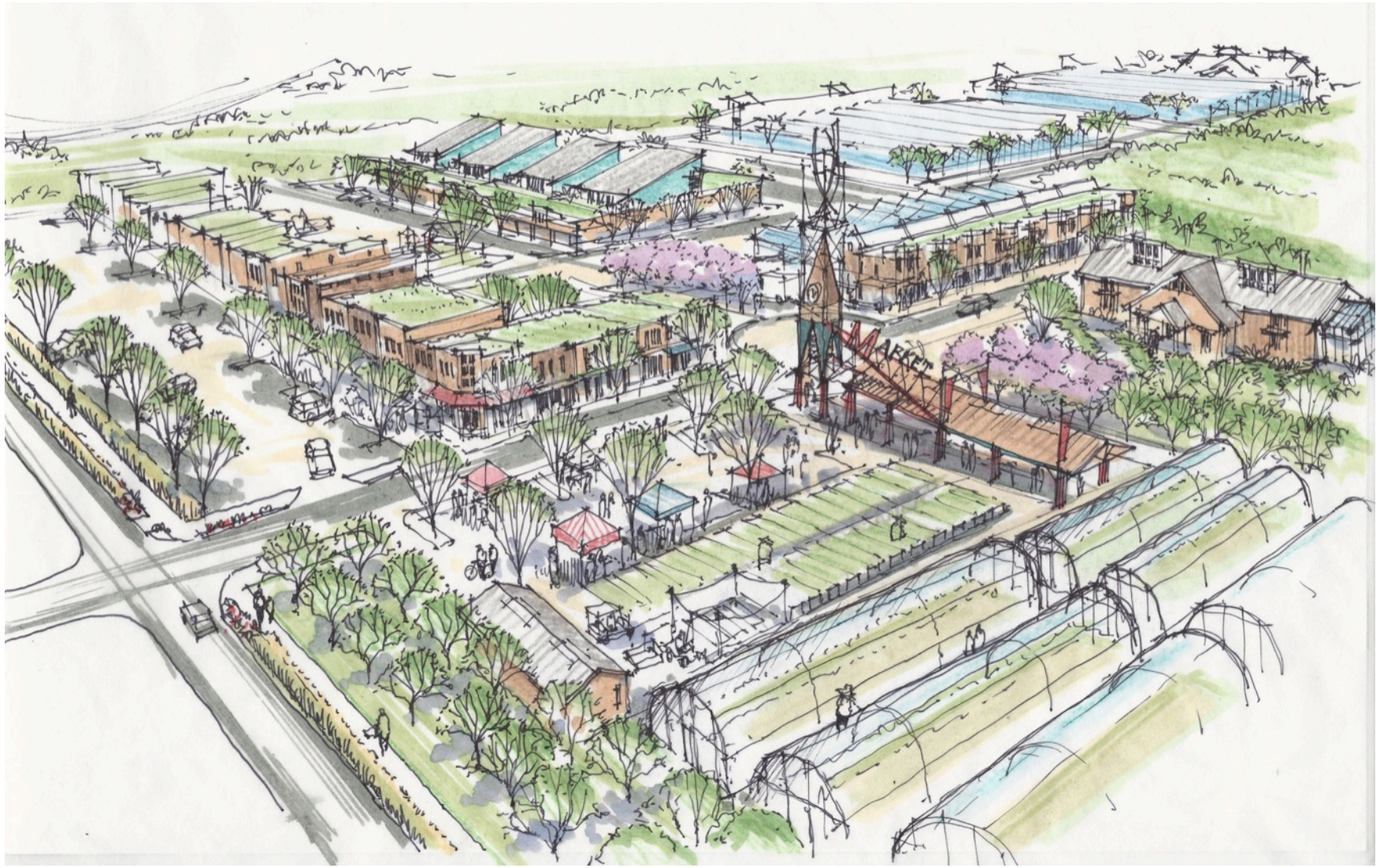
Scheme A



NORTHWEST AREA FOOD HUB

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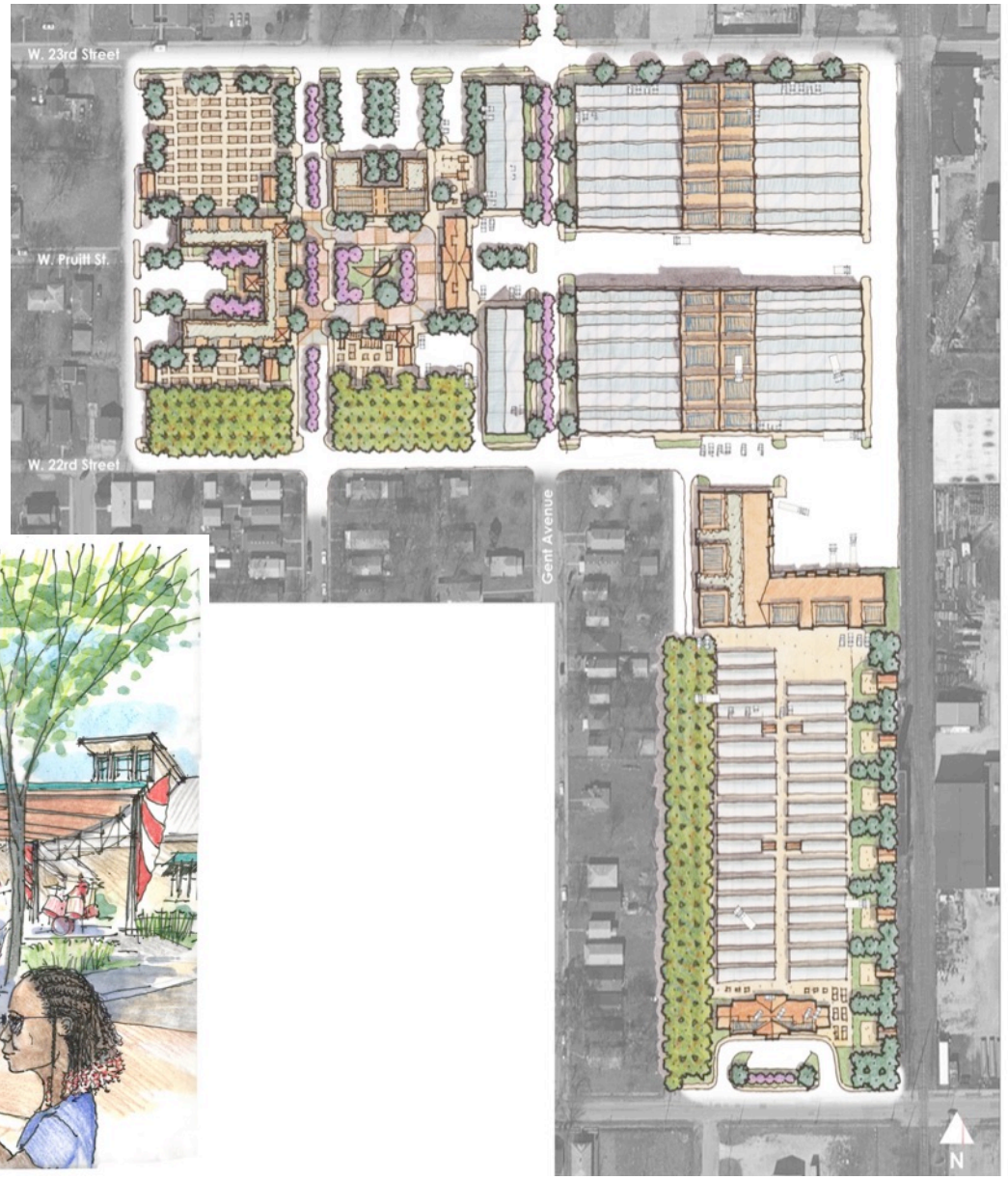
Scheme B



Scheme B

NORTHWEST AREA FOOD HUB

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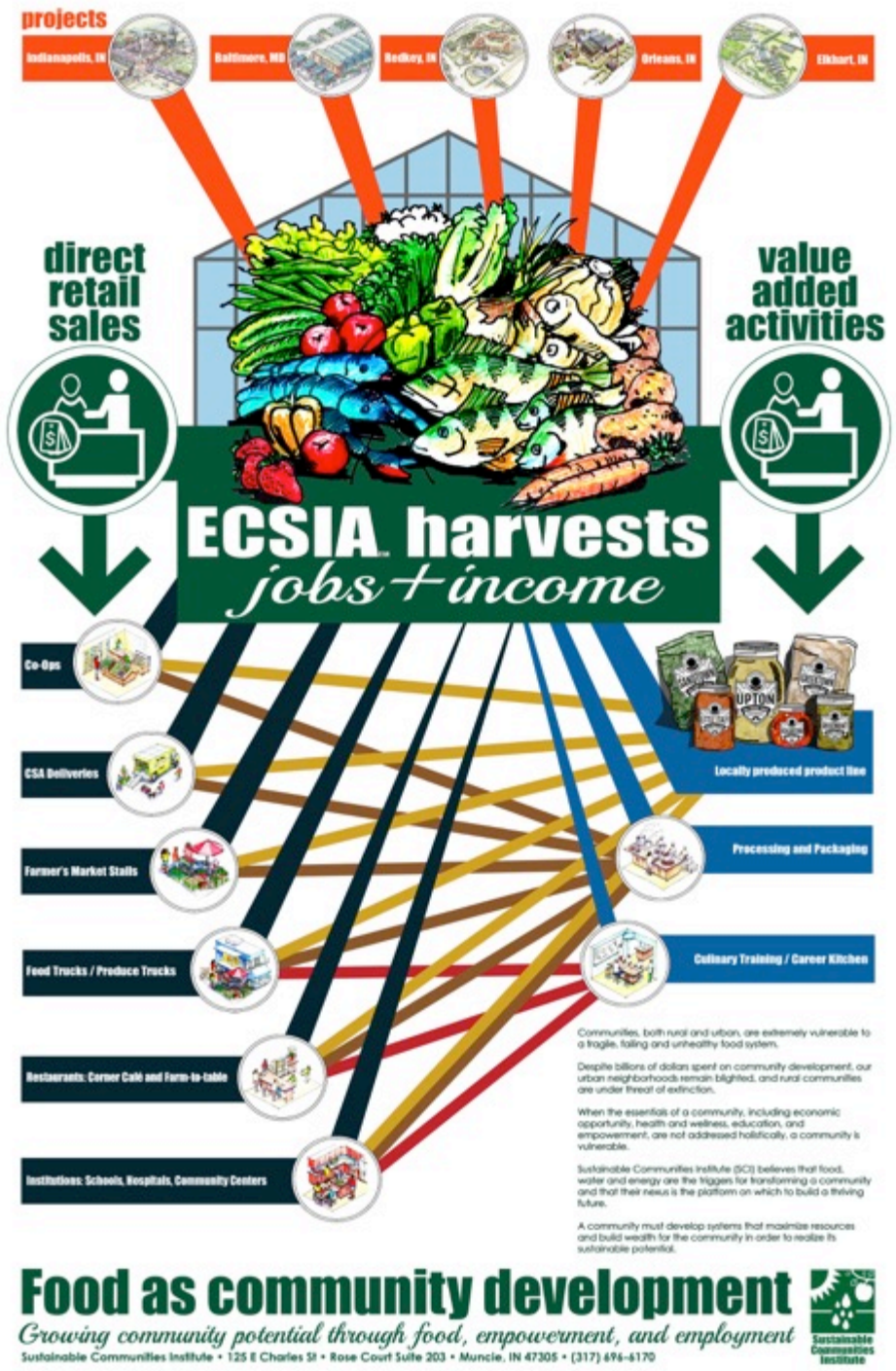
Scheme C

GARDEN CENTER

W. 23rd Street
W. Pruitt St.
W. 22rd Street
Genf Avenue
N

Scheme C

Urban Ag


projects
Indianapolis, IN
Baltimore, MD
Redkey, IN
Orleans, IN
Elkhart, IN
direct retail sales
value added activities
ECSIA harvests
jobs + income
Co-Ops
CSA Deliveries
Farmer's Market Stalls
Food Trucks / Produce Trucks
Restaurants: Corner Café and Farm-to-table
Institutions: Schools, Hospitals, Community Centers
Locally produced product line
Processing and Packaging
Culinary Training / Career Kitchen
Communities, both rural and urban, are extremely vulnerable to a fragile, failing and unhealthy food system.
Despite billions of dollars spent on community development, our urban neighborhoods remain blighted, and rural communities are under threat of extinction.
When the essentials of a community, including economic opportunity, health and wellness, education, and empowerment, are not addressed holistically, a community is vulnerable.
Sustainable Communities Institute (SCI) believes that food, water and energy are the triggers for transforming a community and that their nexus is the platform on which to build a thriving future.
A community must develop systems that maximize resources and build wealth for the community in order to realize its sustainable potential.
Food as community development
Growing community potential through food, empowerment, and employment
Sustainable Communities Institute • 125 E Charles St • Rose Court Suite 203 • Muncie, IN 47305 • (317) 696-6170
Sustainable Communities Institute

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