

URBAN AGRICULTURE, AQUAPONICS, and the 'POST-INDUSTRIAL' CITY

prepared for the NSF *"Challenges in Vertical Farming Workshop"*; September 26th, 2012

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MSAUD; Columbia University

Doctoral Candidate in Urban Planning ; Columbia University

husband | father | educator | farmer | global citizen

lifelong learner

ar·chi·tec·ture

noun \ 'är-kə-,tek-chər\

1

:the art or science of building; *specifically* : the art or practice of designing and building structures and especially habitable ones

2

a : formation or construction resulting from or as if from a conscious act <i.e. *the architecture* of the garden>

b : a unifying or coherent form or structure <i.e. the novel lacks *architecture*>

3

:architectural product or work

4

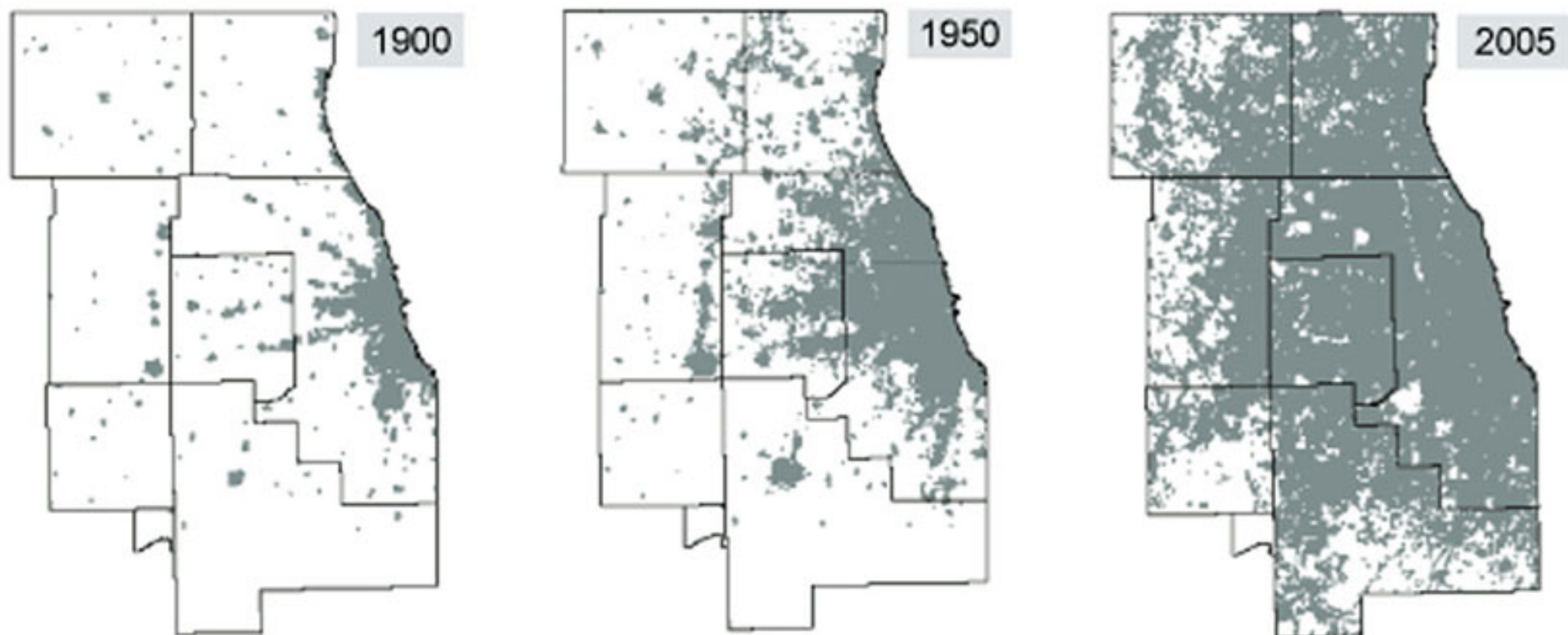
: a method or style of building

urban planning:

the design and regulation of the uses of space that focus on the physical form, economic functions, and social impacts of the urban environment and on the location of different activities within it. Because urban planning draws upon engineering, architectural, and social and political concerns, it is variously a technical profession, an endeavour involving political will and public participation, and an academic discipline. Urban planning concerns itself with both the development of open land (“greenfields sites”) and the revitalization of existing parts of the city, thereby involving goal setting, data collection and analysis, forecasting, design, strategic thinking, and public consultation.

the “CITY”

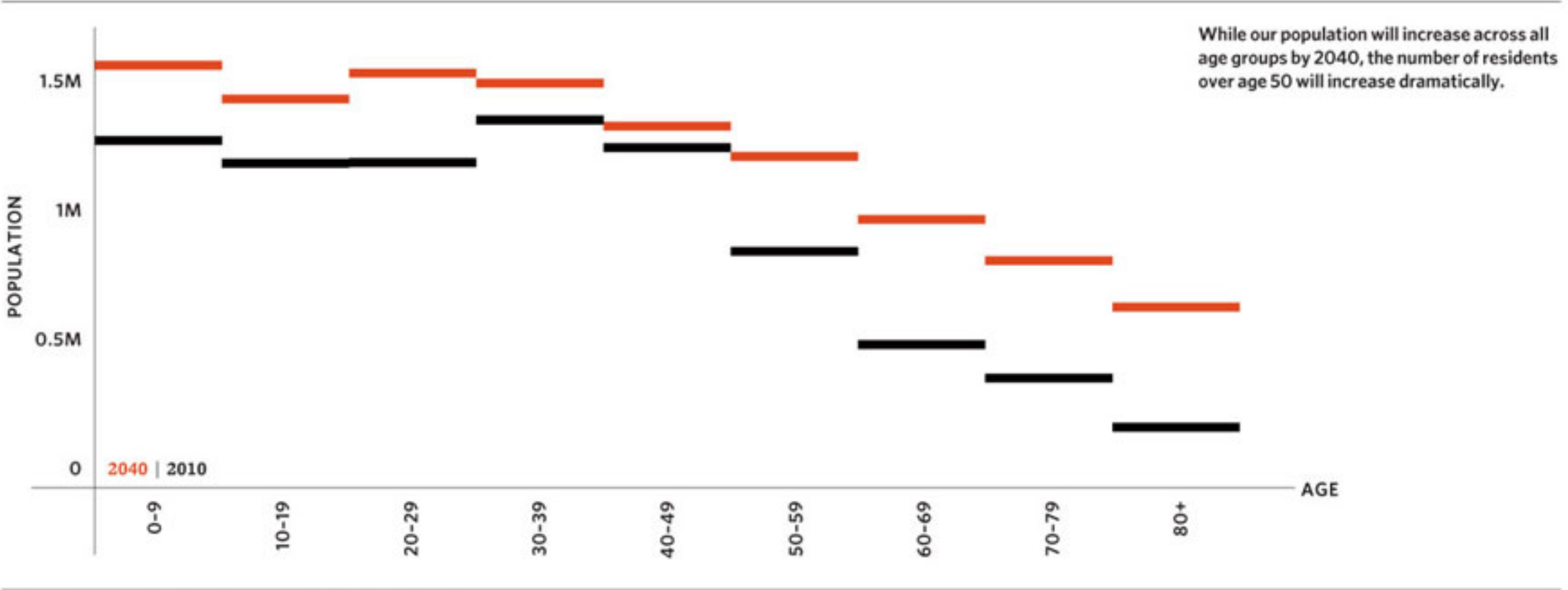




Developed Area, 1900–2005

Source: U.S. Environmental Protection Agency and CMAP

Figure 3. Expected population growth, 2010 and 2040



Source: Chicago Metropolitan Agency for Planning, 2010

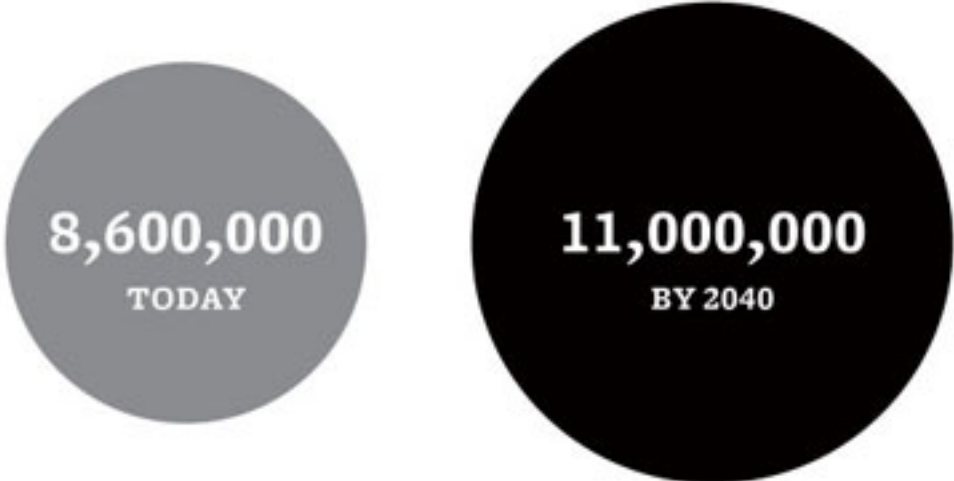
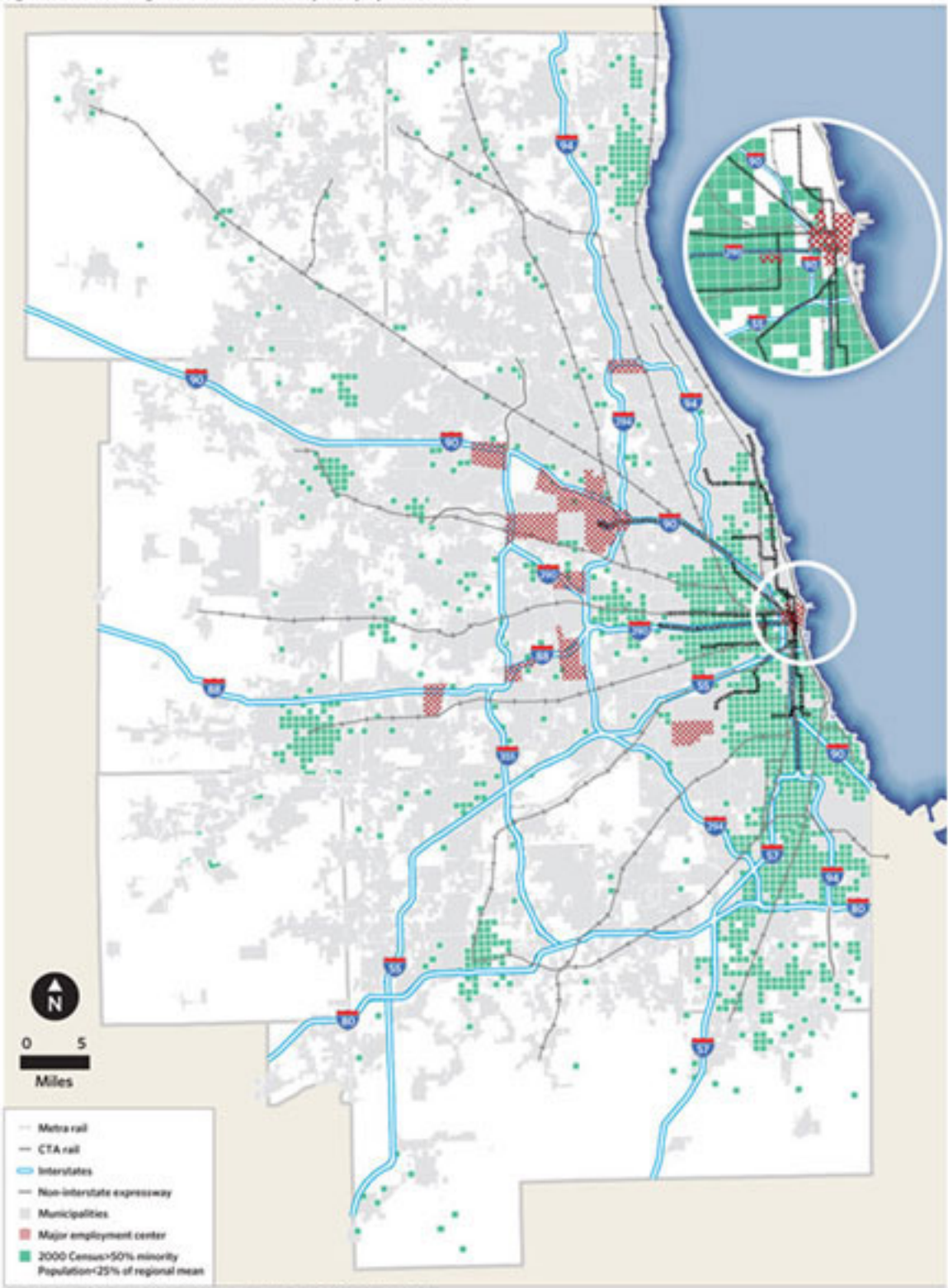


Figure 2. Population projections for northeastern Illinois

By 2040, our region will need to accommodate over 25% more residents

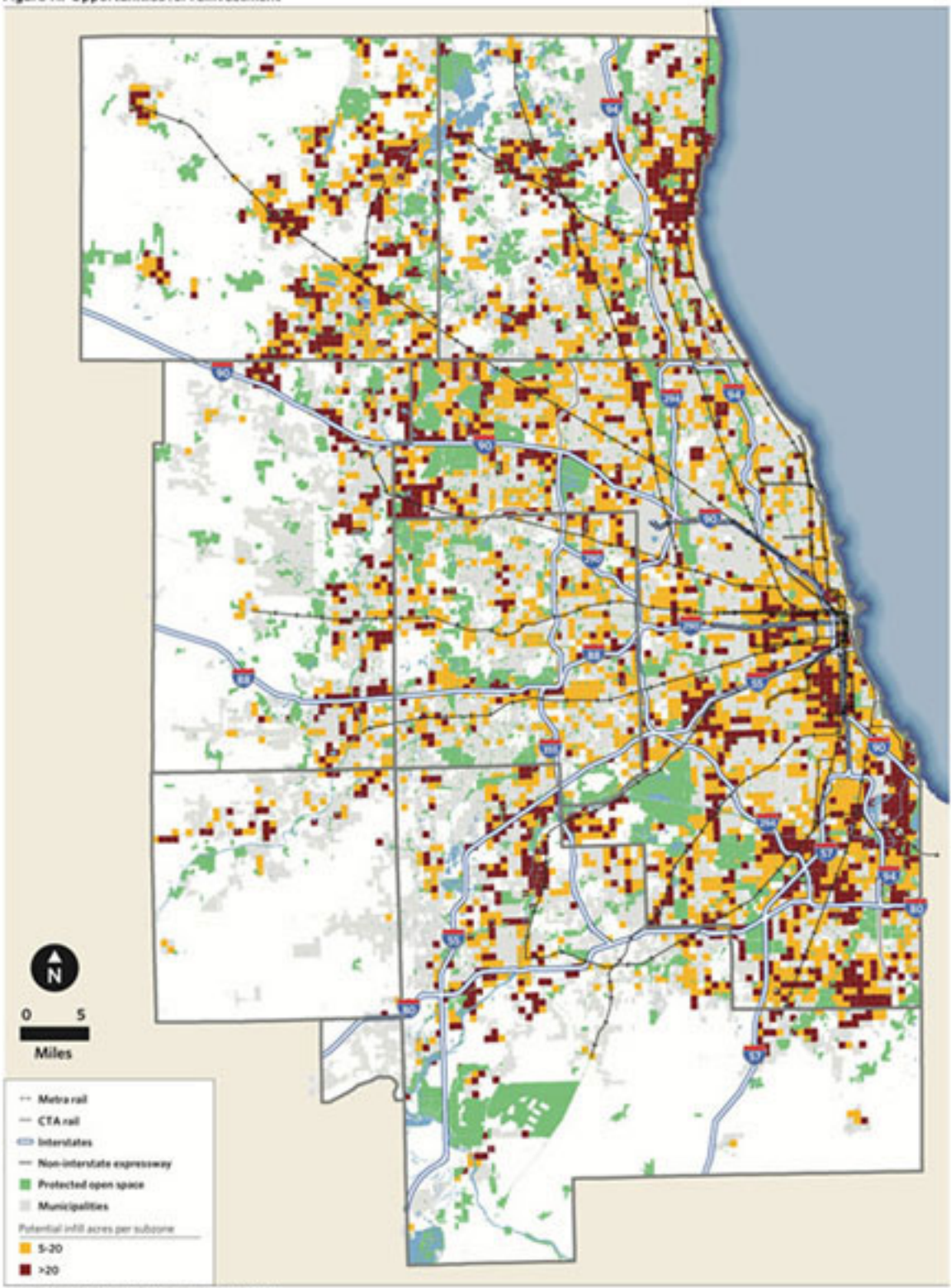
Figure 8. Disadvantaged communities and major employment centers



Sources: Data from Census, 2000, and Northeastern Illinois Planning Commission, 2000

Source: Chicago Metropolitan Agency for Planning, 2010

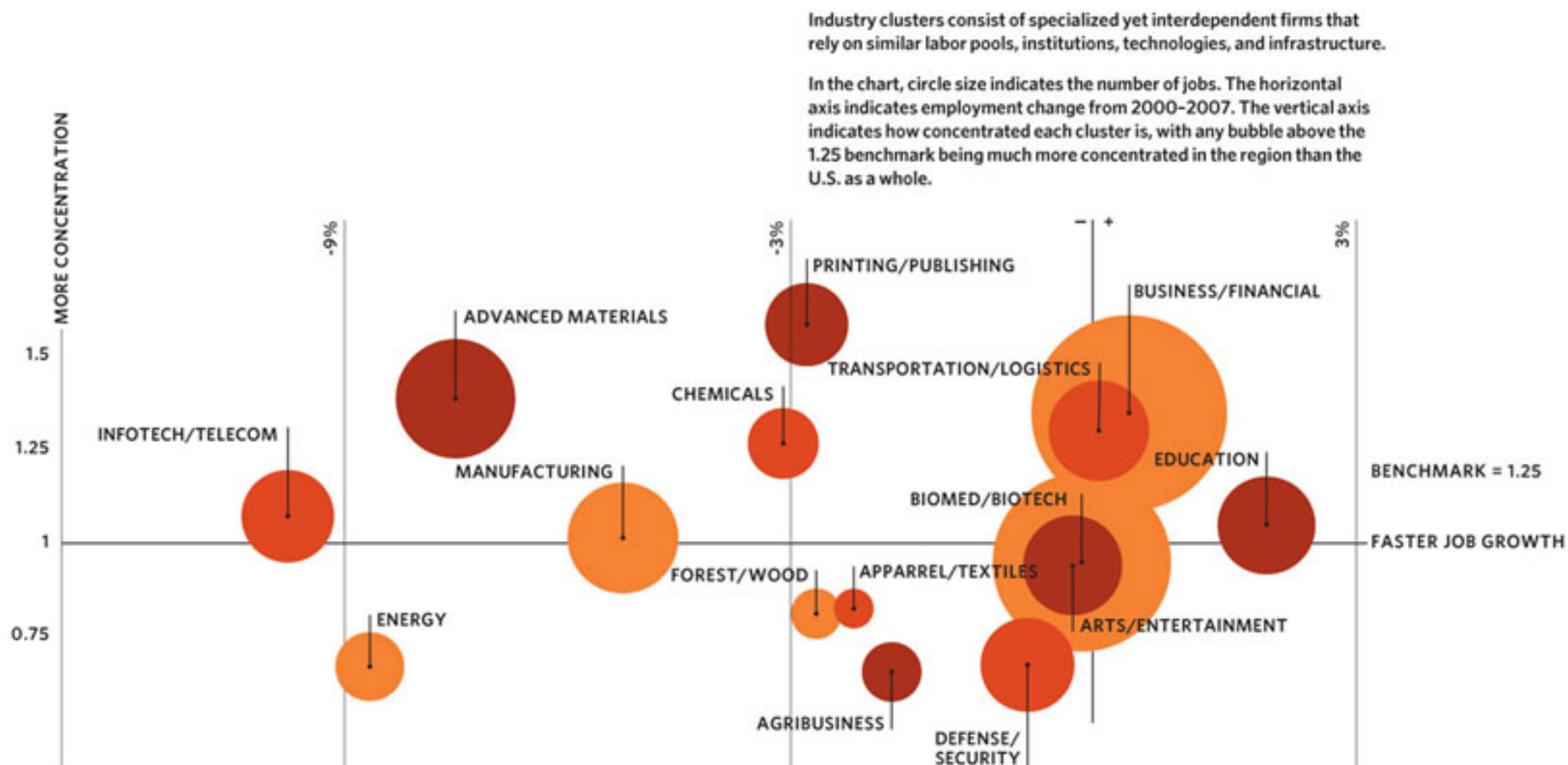
Figure 11. Opportunities for reinvestment



Source: Chicago Metropolitan Agency for Planning, 2010

Source: Chicago Metropolitan Agency for Planning, 2010

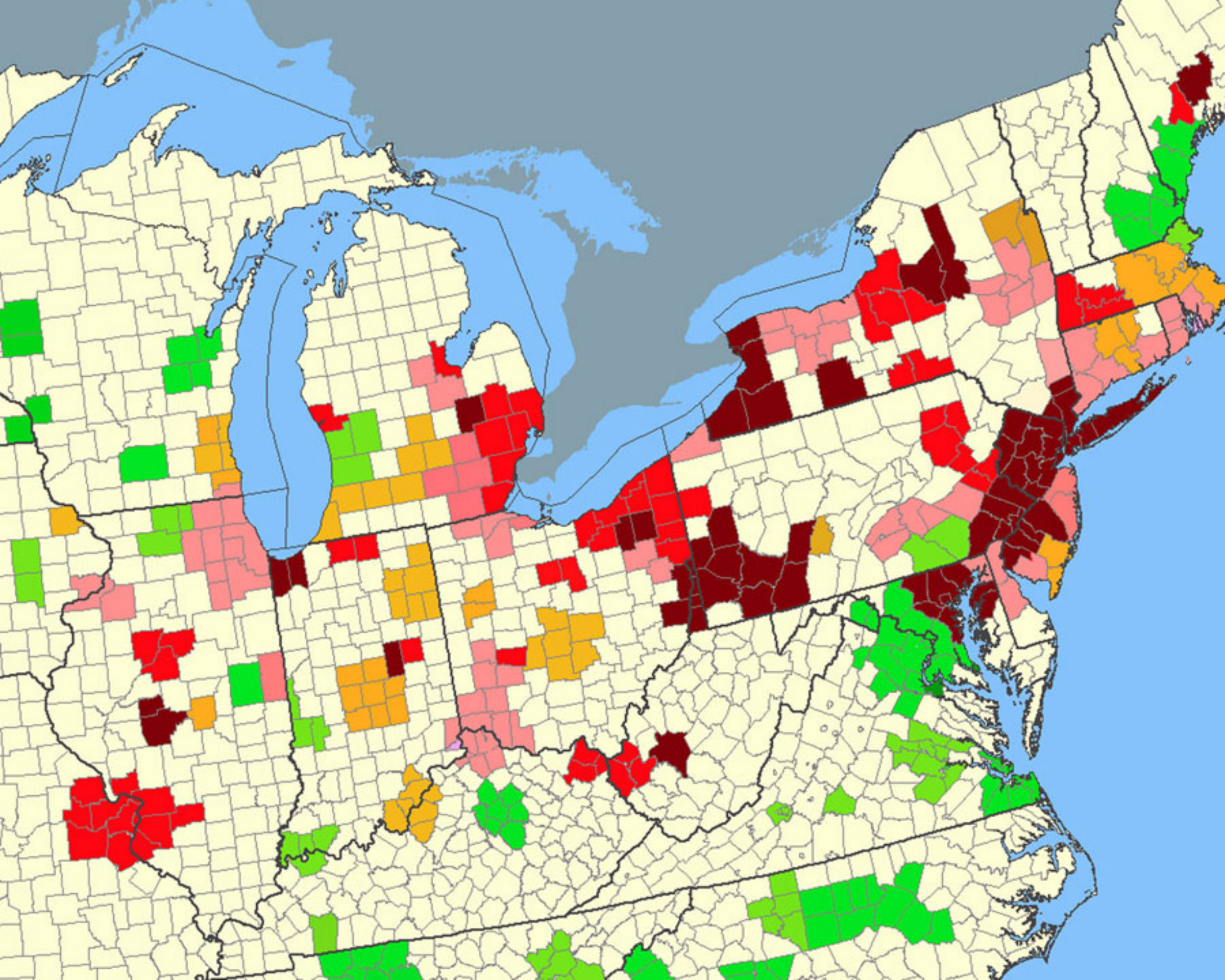
Figure 4. Concentration and employment growth of clusters



Sources: CMAP, Illinois Department of Employment Security, Purdue Center of Regional Development

1 CMAP Industry Clusters Regional Snapshot, 2009.

See <http://www.cmap.illinois.gov/cmap-regional-snapshots#Industry>.



SCALE



photo: Emmanuel Pratt



photo credit: Emmanuel Pratt



photo credit: Emmanuel Pratt



photo credit: Emmanuel Pratt

chronic '**urban problems**':

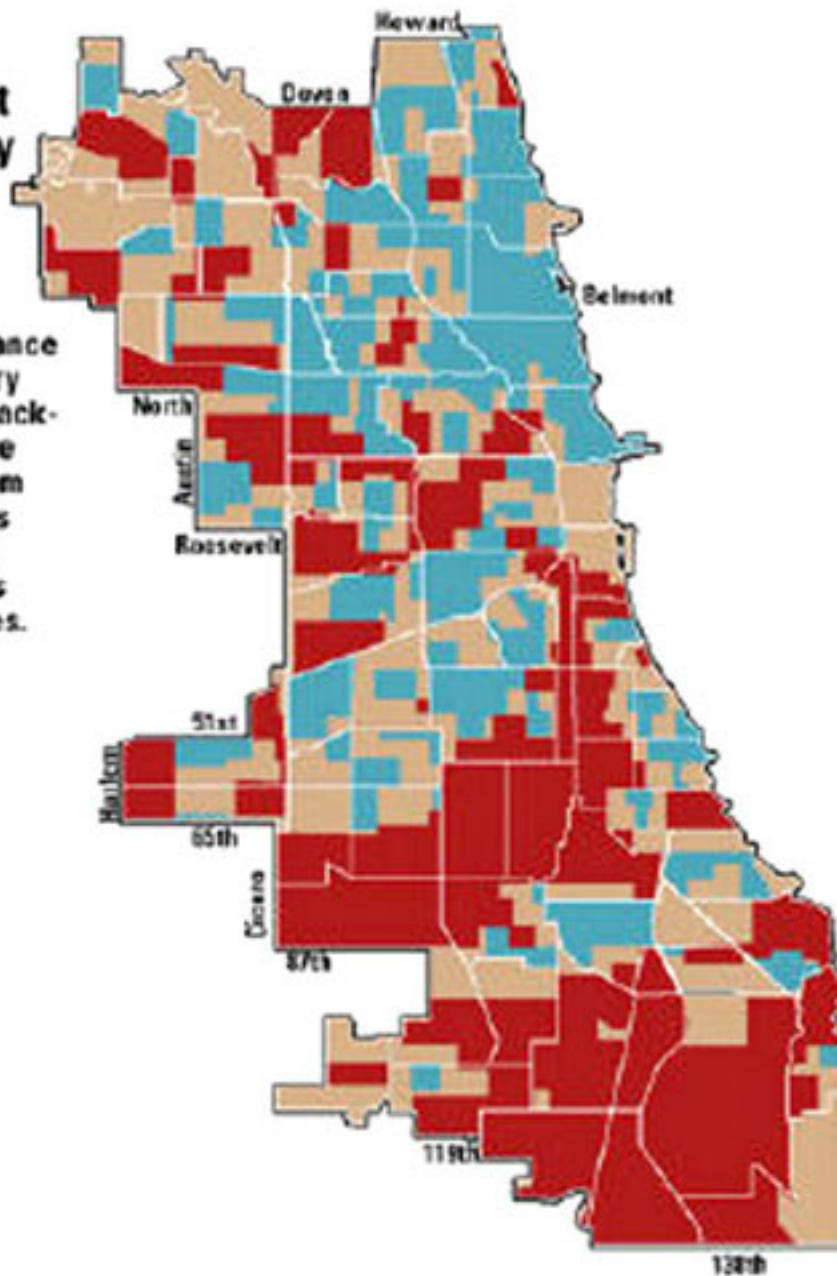
- 1) physical deterioration of housing, factories, shops
- 2) poverty and unemployment
- 3) health issues
- 4) environment

FOOD DESERTS IN CHICAGO

Distance to grocers by tract with community boundaries

The map shows distance to all types of grocery stores in Chicago. Black-colored areas are the farthest distance from grocers. These areas form three key food deserts on Chicago's West and South sides.

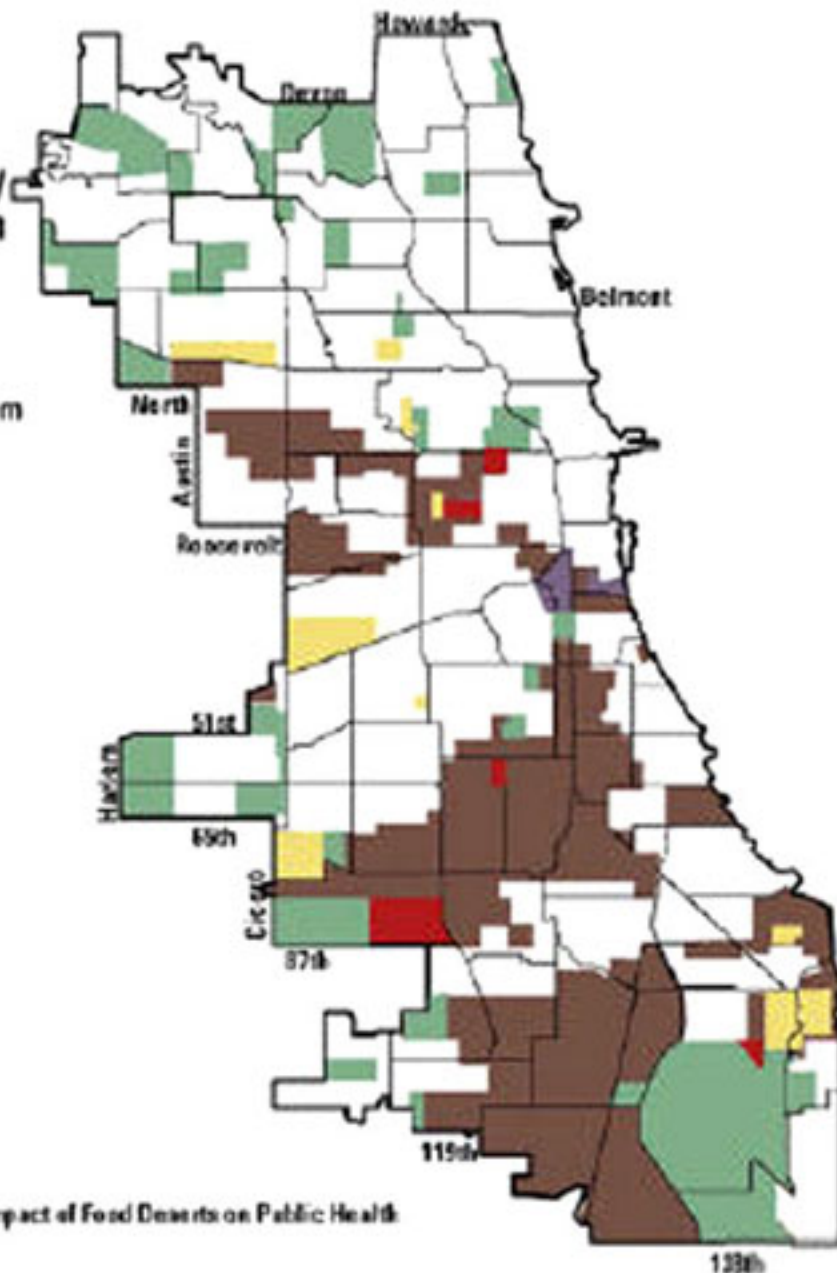
CLOSEST DISTANCE
AVERAGE DISTANCE
FARTHEST DISTANCE



Food deserts are nearly exclusively African-American

The map shows only tracts that are in the farthest distance to grocers and shades them by race.

WHITE
BLACK
HISPANIC
ASIAN
DIVERSE



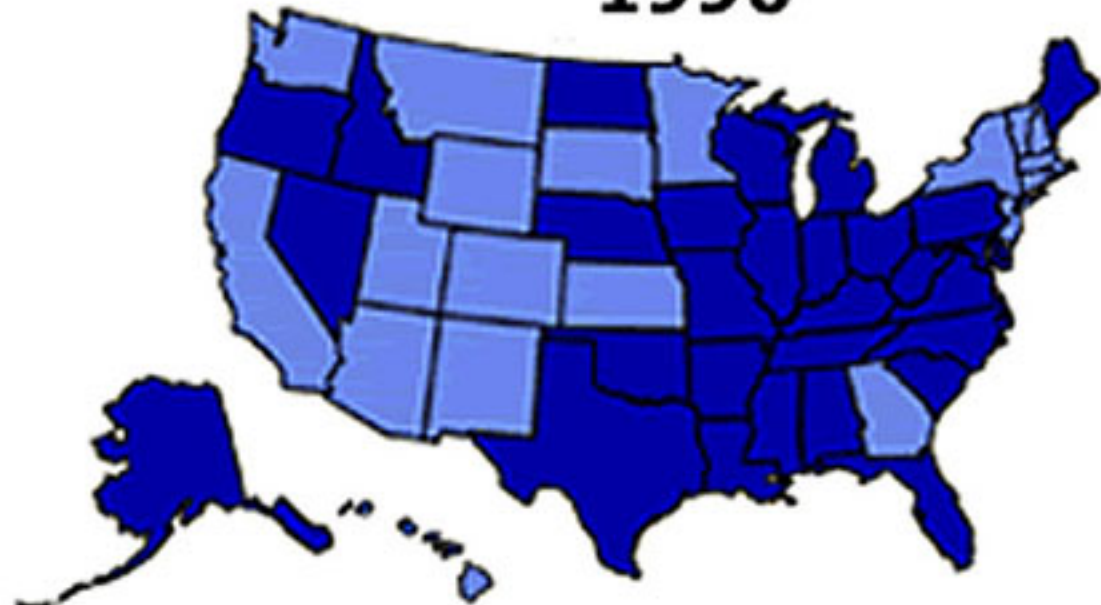
SOURCE: Examining the Impact of Food Deserts on Public Health in Chicago

Obesity Trends Among US Adults 1991-2010
(BMI ≥ 30 lbs, or 30 lbs overweight for 5'4" women)

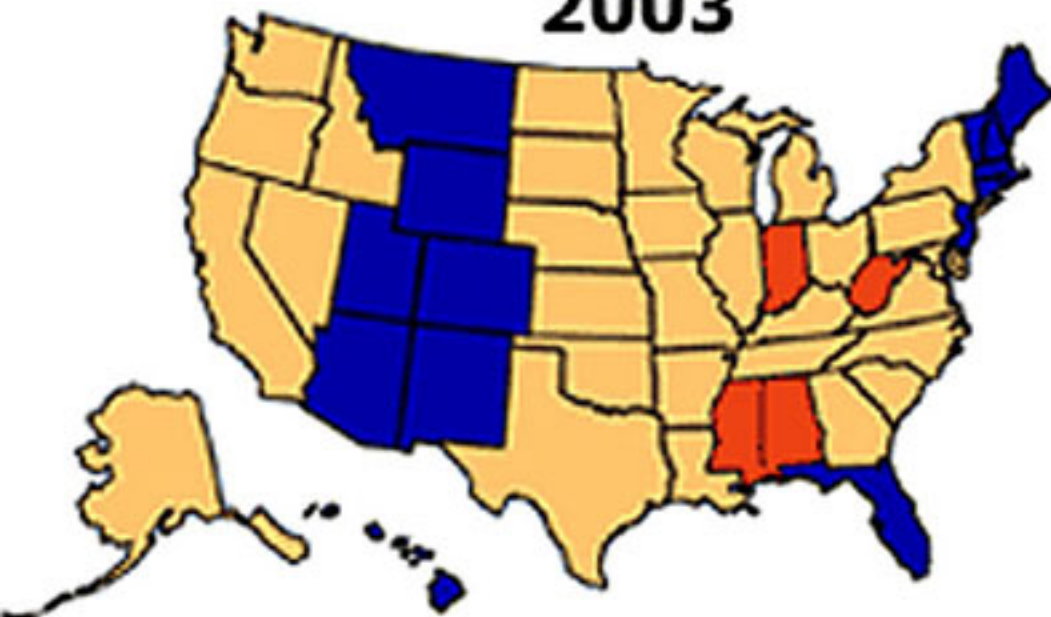
1991



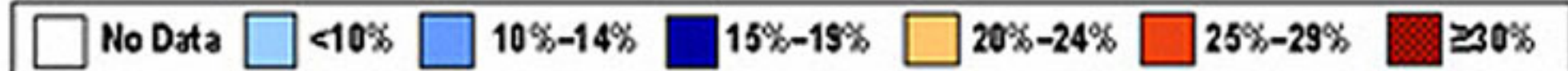
1996



2003



2010



par·a·digm

noun \ˈper-ə-,dīm, ˈpa-rə- also -,dīm\

1

: example, pattern; *especially* : an outstandingly clear or typical example or archetype

2

: an example of a conjugation or declension showing a word in all its inflectional forms

3

: a philosophical and theoretical framework of a scientific school or discipline within which theories, laws, and generalizations and the experiments performed in support of them are formulated; *broadly* : a philosophical or theoretical framework of any kind

Agricultural Revolution
Industrialization Revolution
De-Industrialization
Globalization
Age of Information
Meta City
Age of Transition

uto·pia

noun \yu-'tō-pē-ə\
/

1

: an imaginary and indefinitely remote place

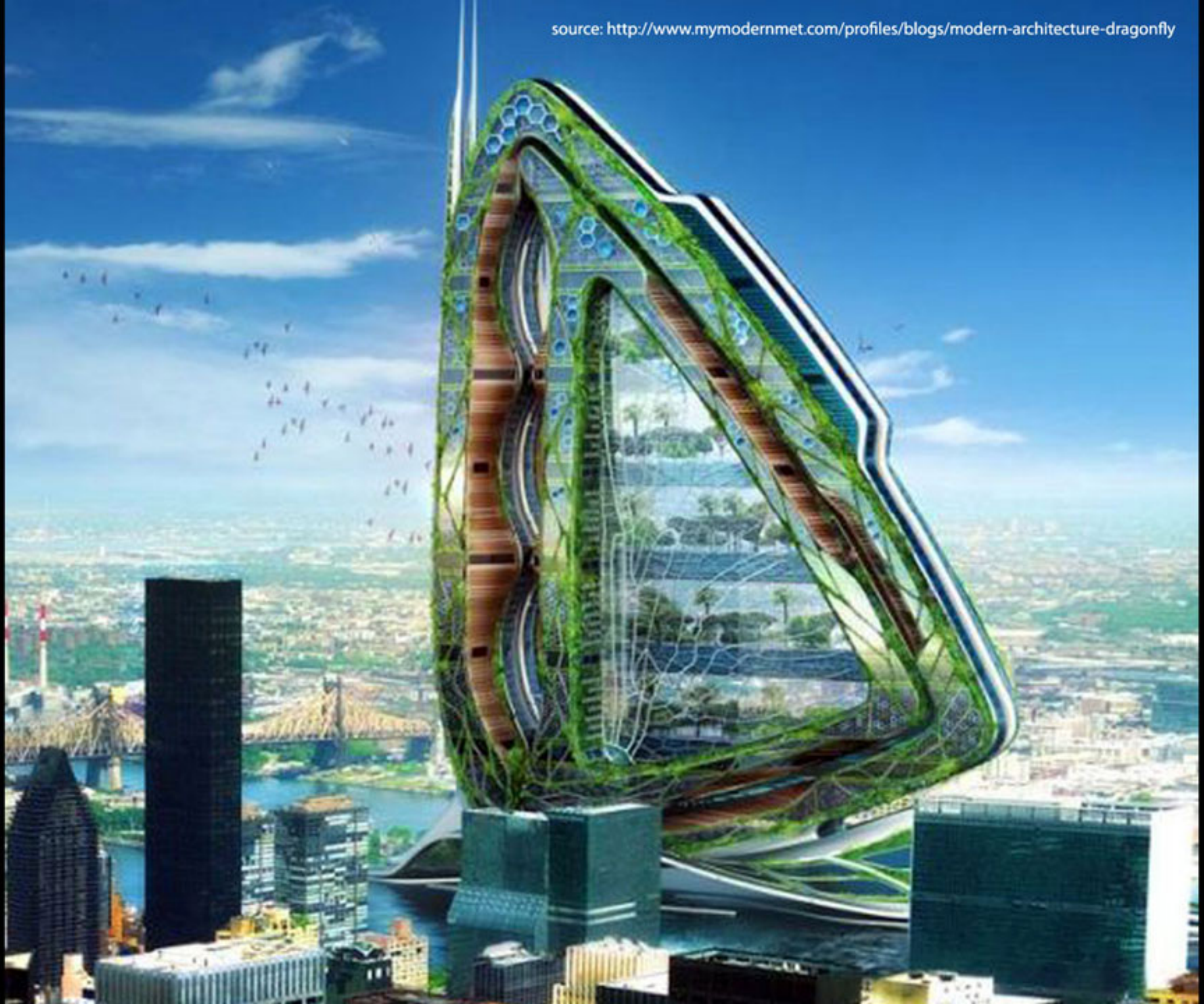
2

: a place of ideal perfection especially in laws, government, and social conditions

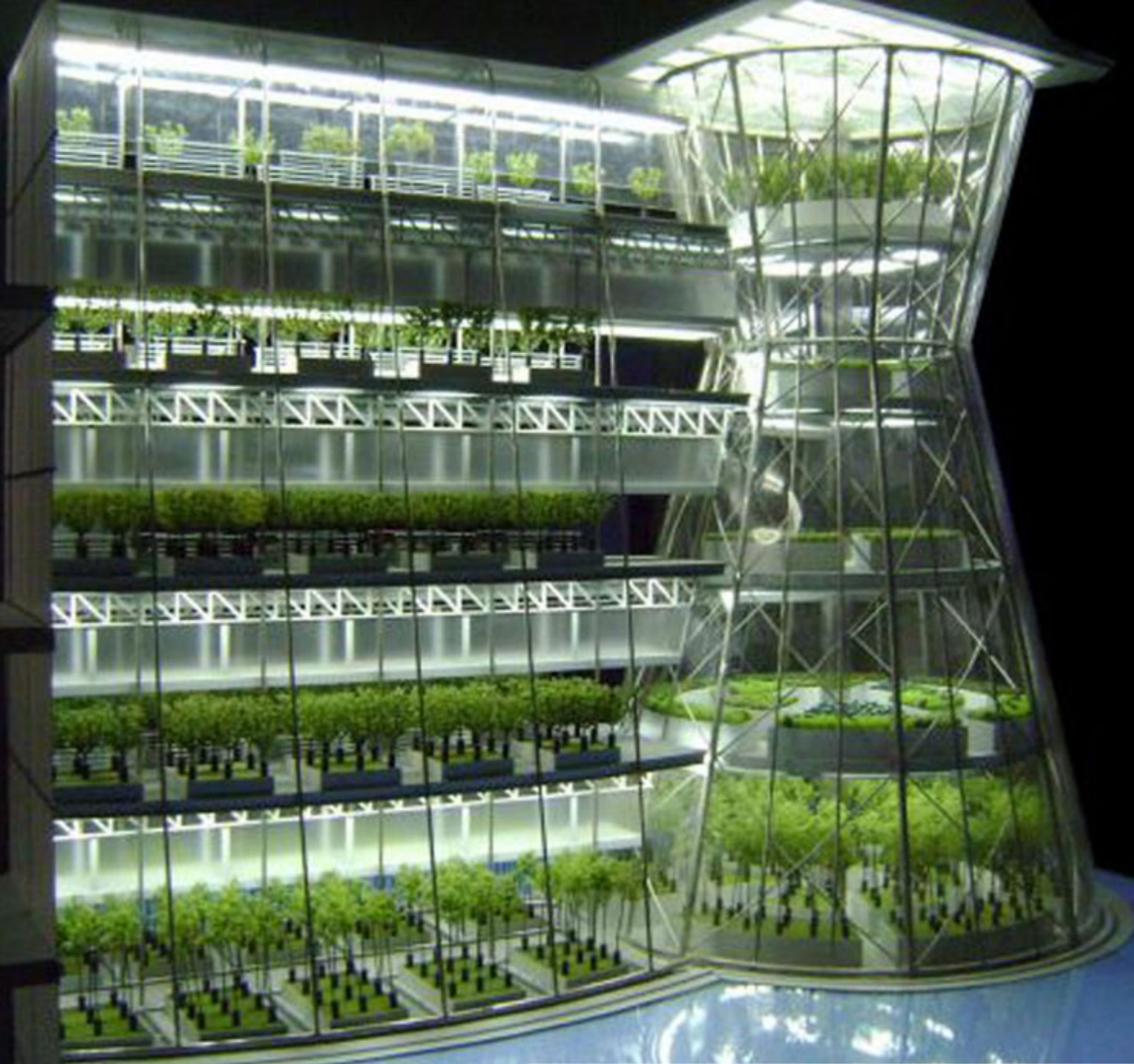
3

: an impractical scheme for social improvement

VERTICAL FARM







social science:

1.

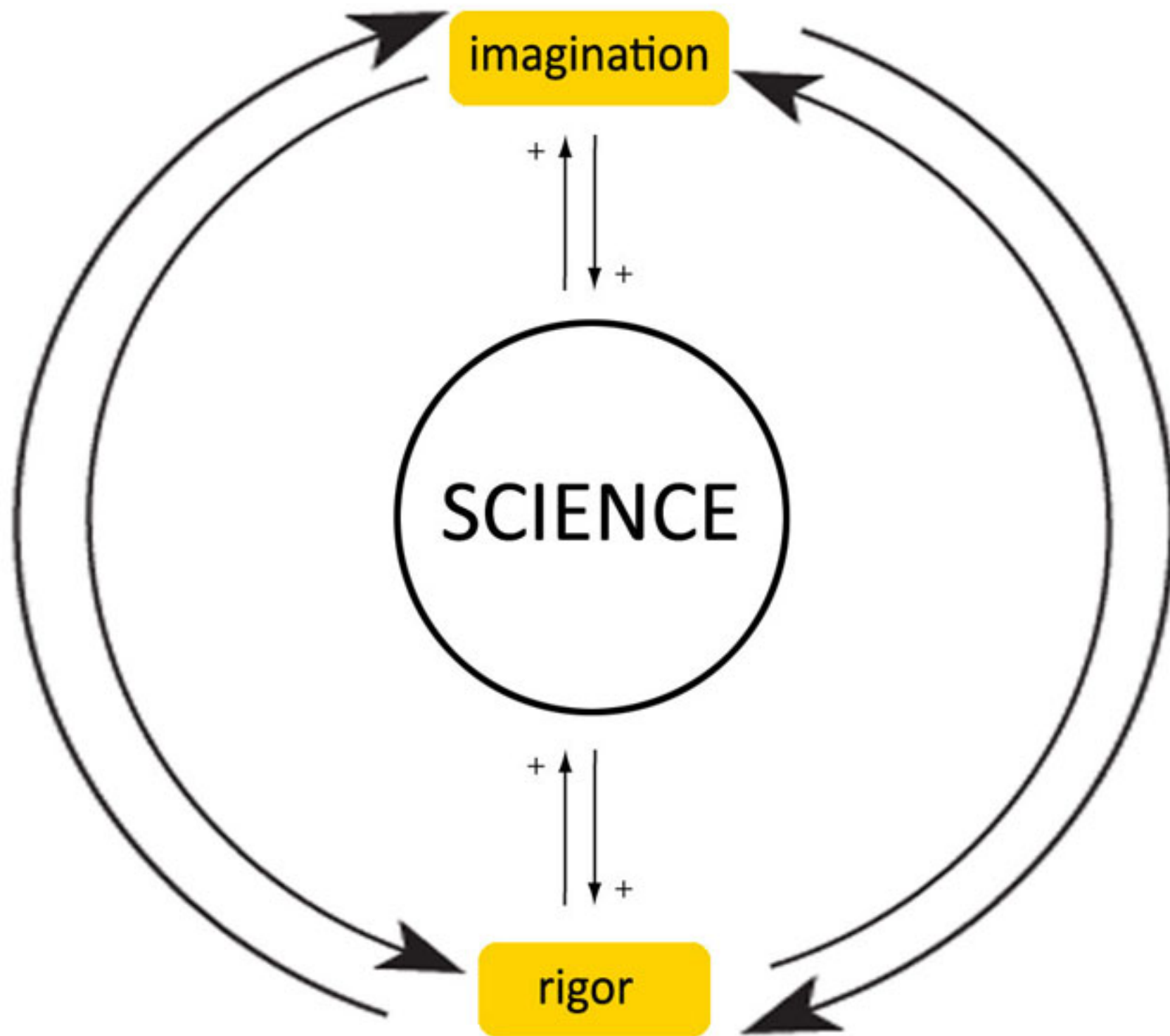
: a branch of science that deals with the institutions and functioning of human society and with the interpersonal relationships of individuals as members of society

2.

: a science (as economics or political science) dealing with a particular phase or aspect of human society

natural science:

: any of the sciences (as physics, chemistry, or biology) that deal with matter, energy, and their interrelations and transformations or with objectively measurable phenomena



intuition \rightleftharpoons method

urban agriculture:

: the growing of plants and the raising of animals within and around cities; it is integrated into the urban economic and ecological system: urban agriculture is embedded in and interacting with the urban ecosystem.

source:<http://www.ruaf.org/node/512>

aquaponics:

: the combined culture of fish and plants in recirculating systems. Nutrients generated by the fish, either by direct excretion or the microbial breakdown of organic wastes, are absorbed by plants cultured hydroponically. Fish provide most of the nutrients required for plant growth. As the aquaculture effluent flows through the hydroponic component of the recirculating system, fish waste metabolites are removed by nitrification and direct uptake by the plants, thereby treating the water, which flows back to the fish-rearing component for reuse.

source: <http://aquaponicsglobal.com/wp-content/uploads/2012/>

heuristic:

1.

: involving or serving as an aid to learning, discovery, or problem-solving by experimental and especially trial-and-error methods;

2.

: of or relating to exploratory problem-solving techniques that utilize self-educating techniques (as the evaluation of feedback) to improve performance



photo credit: Growing Power

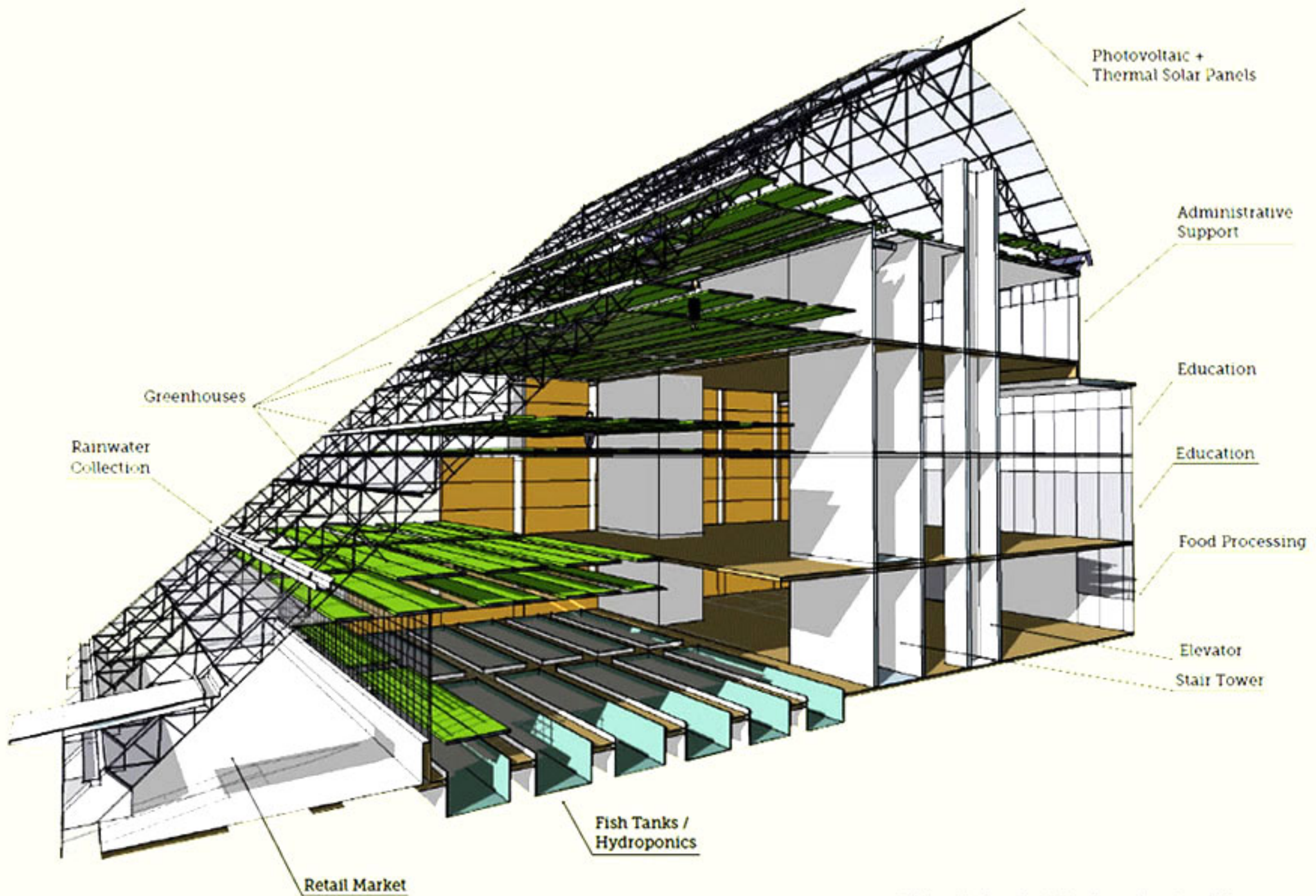












source: The Kubala Washatko Architects



SWEET WATER

THERE GROWS THE NEIGHBORHOOD



SWEET WATER FOUNDATION

501(c)(3) Non-profit

CONTACT US

web: sweetwaterfoundation.com

email: info@sweetwaterfoundation.com

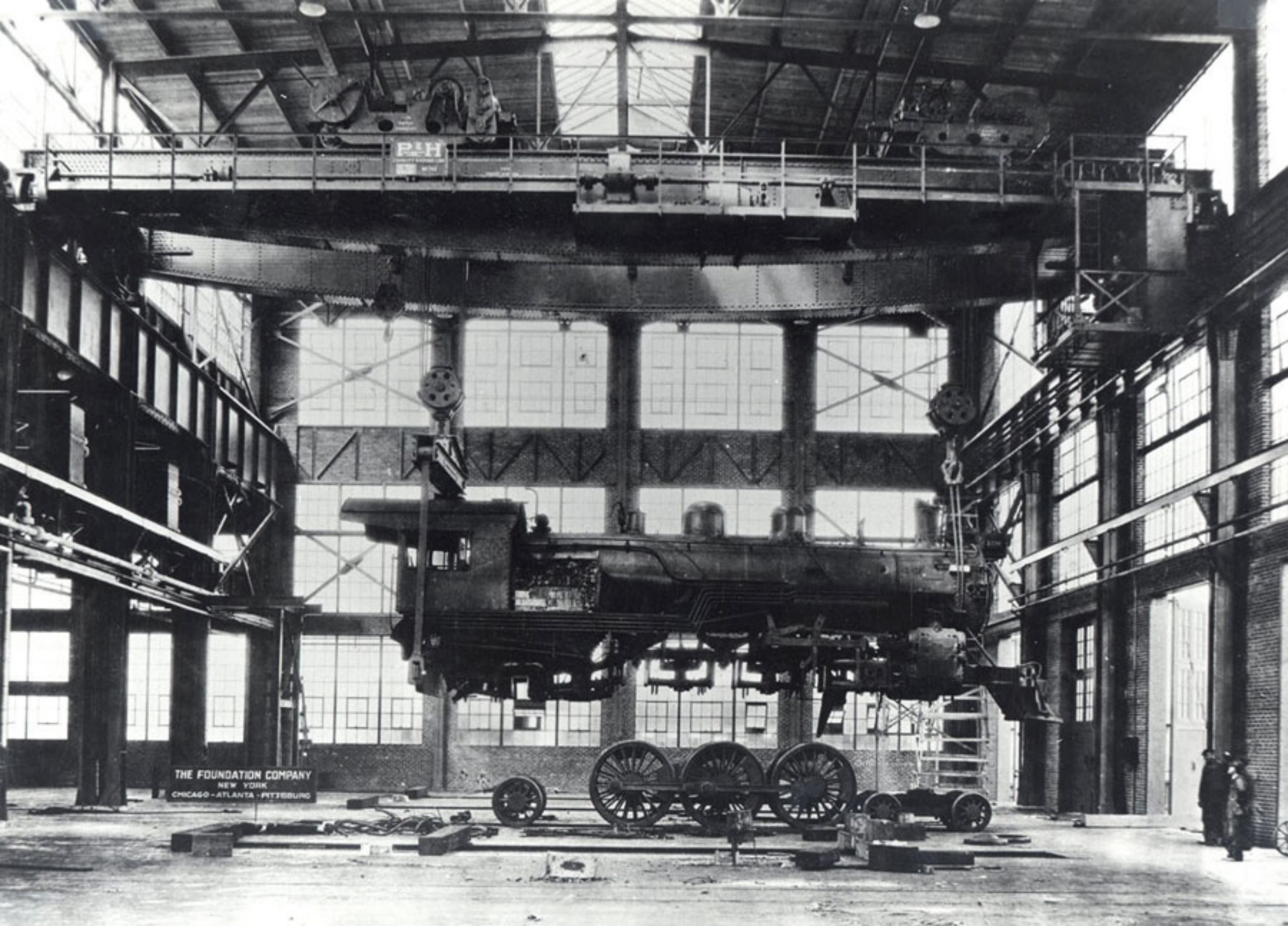
phone: 347-880-0305

TURNING WASTE INTO COMMUNITY RESOURCE

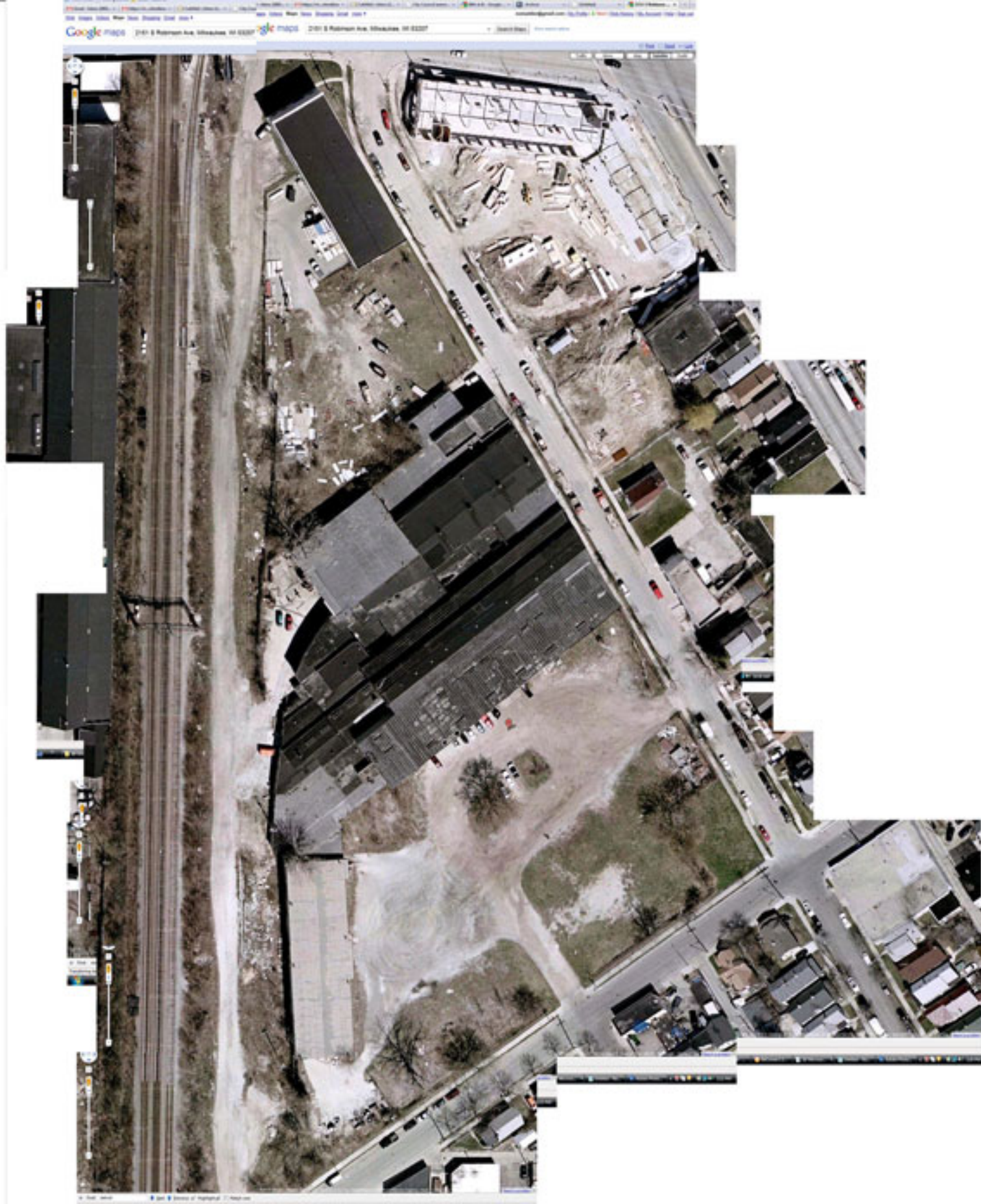


The Sweet Water Foundation engages with a host of educational institutions, community groups and affiliated organizations to develop academic and community programming based upon concepts of community and equity. This work has evolved as a direct response to fundamentally unsustainable models of food production and consumption. With a focus on the potential of urban agriculture as a vehicle for community development, Sweet Water Foundation's programming is grounded upon the central theme of turning waste into community resource.





THE FOUNDATION COMPANY
NEW YORK
CHICAGO - ATLANTA - PITTSBURG



































▼ Undergraduate

[General](#)

[Environmental](#)

[Microbial/Molecular](#)

[Pre-Medical/Pre-Dental](#)

[Secondary Teaching](#)

▼ Graduate Program

[General](#)

[Graduate Assistantship](#)

▼ Facilities & Gardens

[Aquaponics](#)

[Flow Cytometry](#)

[Herbarium](#)

Aquaponics Facility

In the summer of 2010, Chicago State University opened the Aquaponics Facility. The project consists of raising tilapia fish in a controlled continuously circulating water system. The effluent of the fish holding tanks are circulated through growbeds, providing nourishment where plants will be grown hydroponically. This integrative process between aquaculture and hydroponics is known as aquaponics.

The facility provides a hands-on learning environment supporting the development of our Urban Agriculture/Ecology track option for CSU students. Benefitting those matriculating at the university, area high school students, and the community at large, the Aquaponics Center serves as a resource and training center addressing nutrition and health issues facing inner city communities and green workforce preparedness.

Some of the plants you can find growing in the Aquaponics facility are basil, strawberries, chives, mustard











Grow Bed





Tank #1





































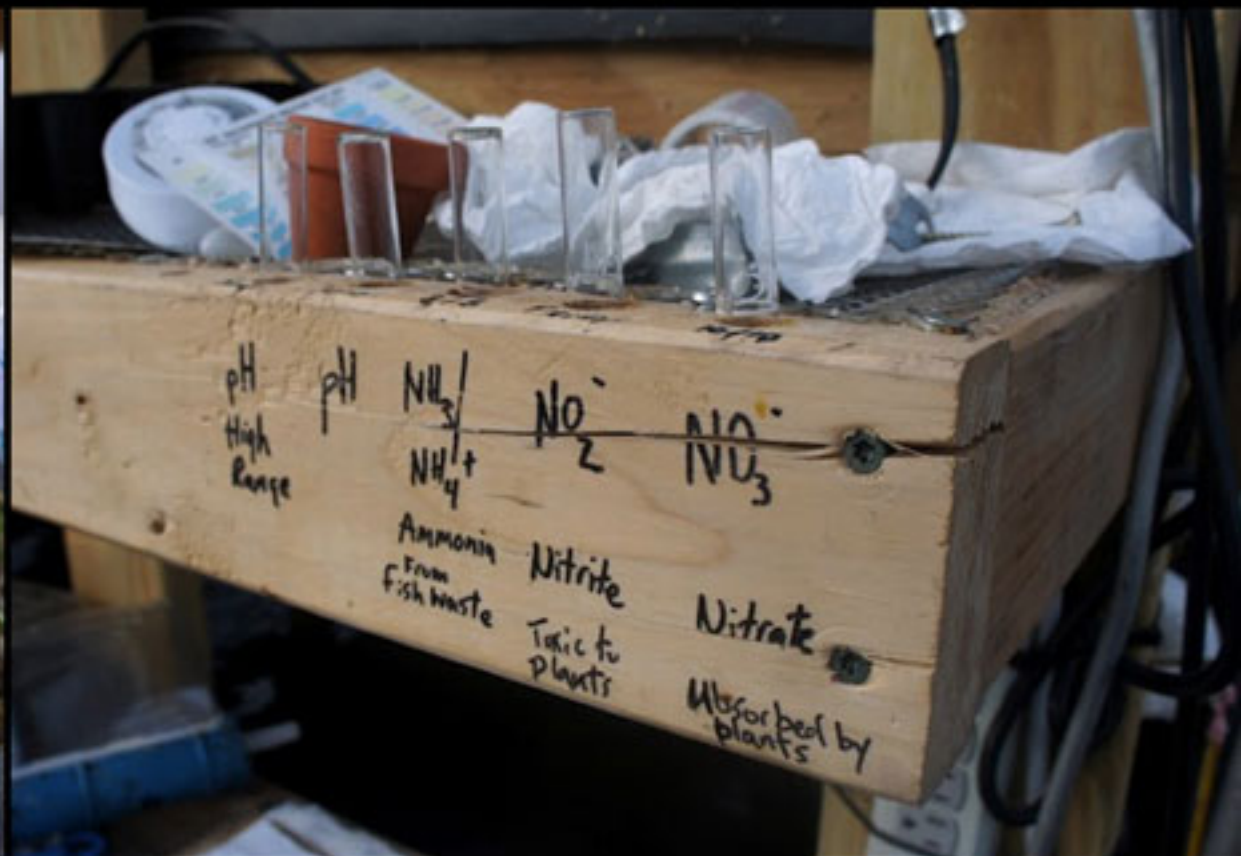














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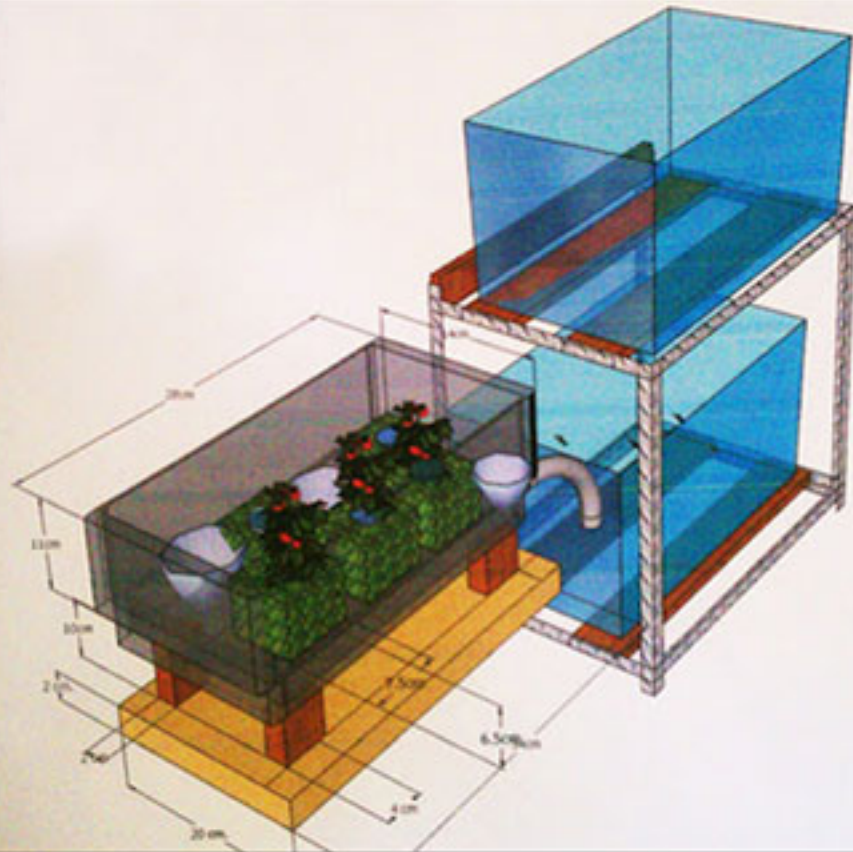
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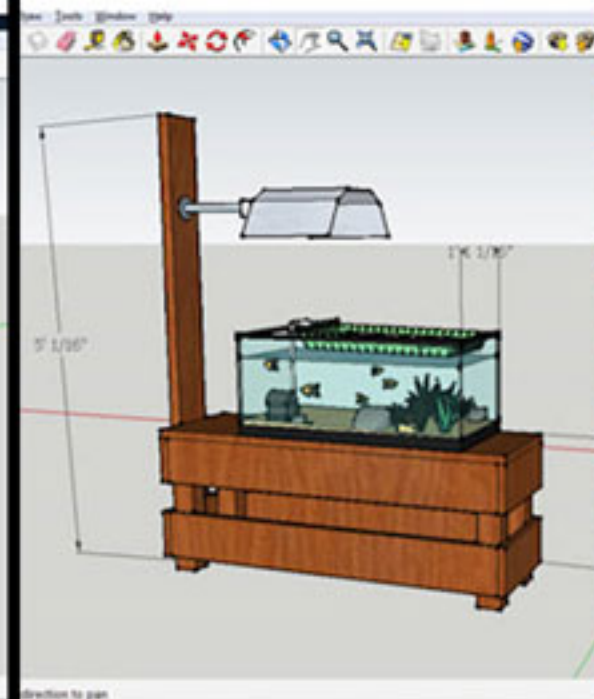
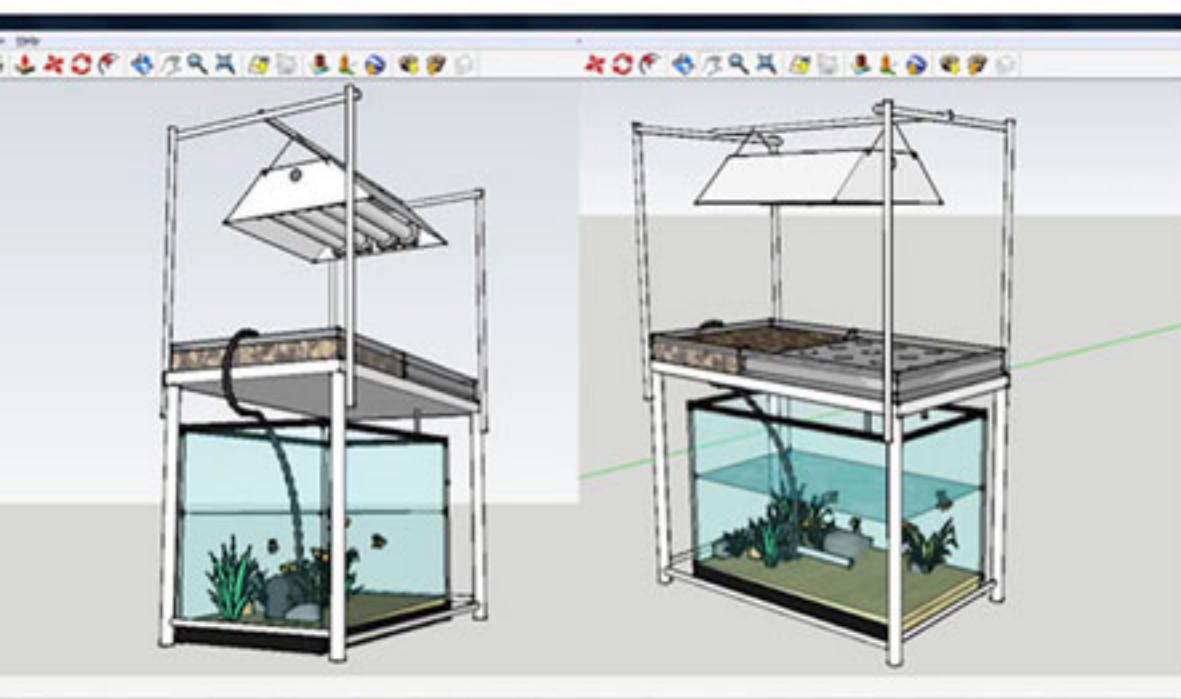
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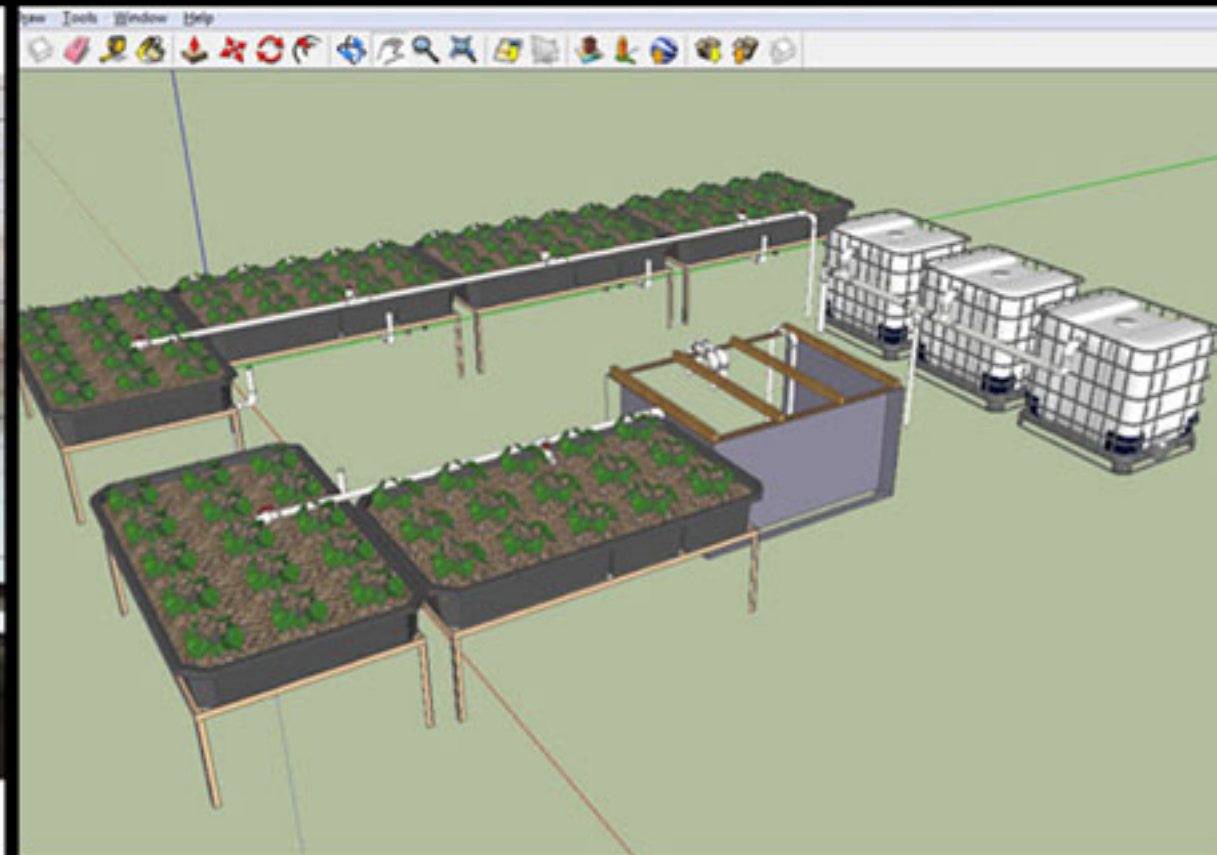
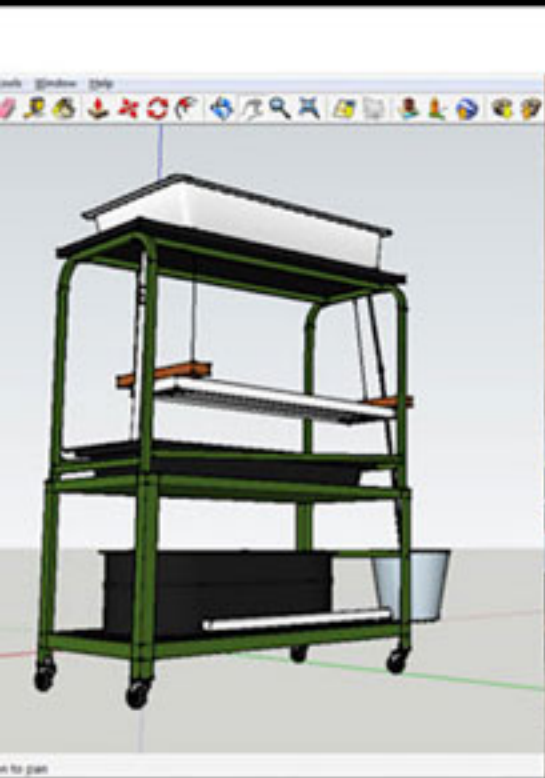
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Hollywood artist Harald Beker is a SketchUp superstar











Cornell University



THE UNIVERSITY OF CHICAGO



FIU

FLORIDA INTERNATIONAL UNIVERSITY
Miami's public research university



HARVARD UNIVERSITY



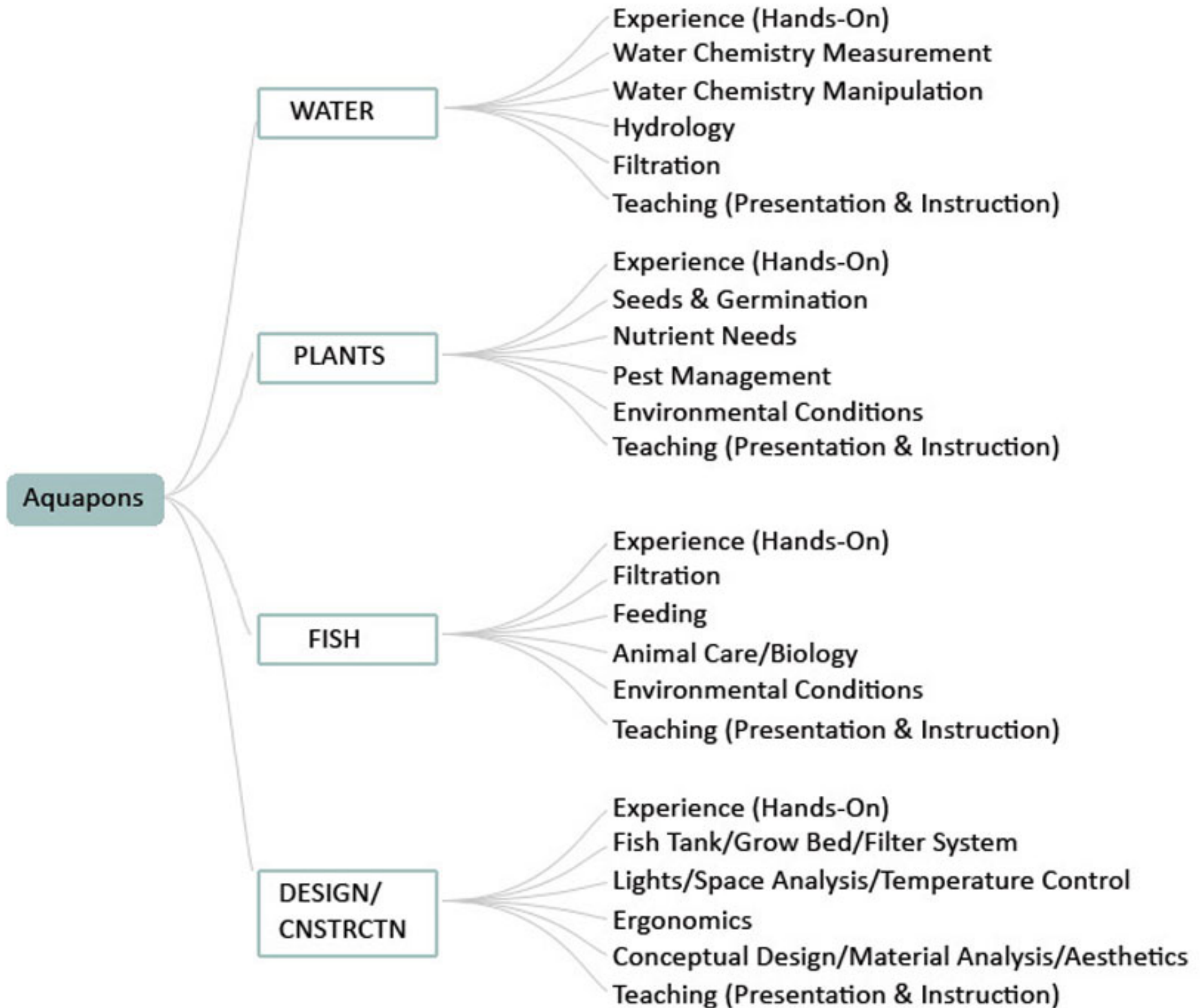
Kellogg
School of Management



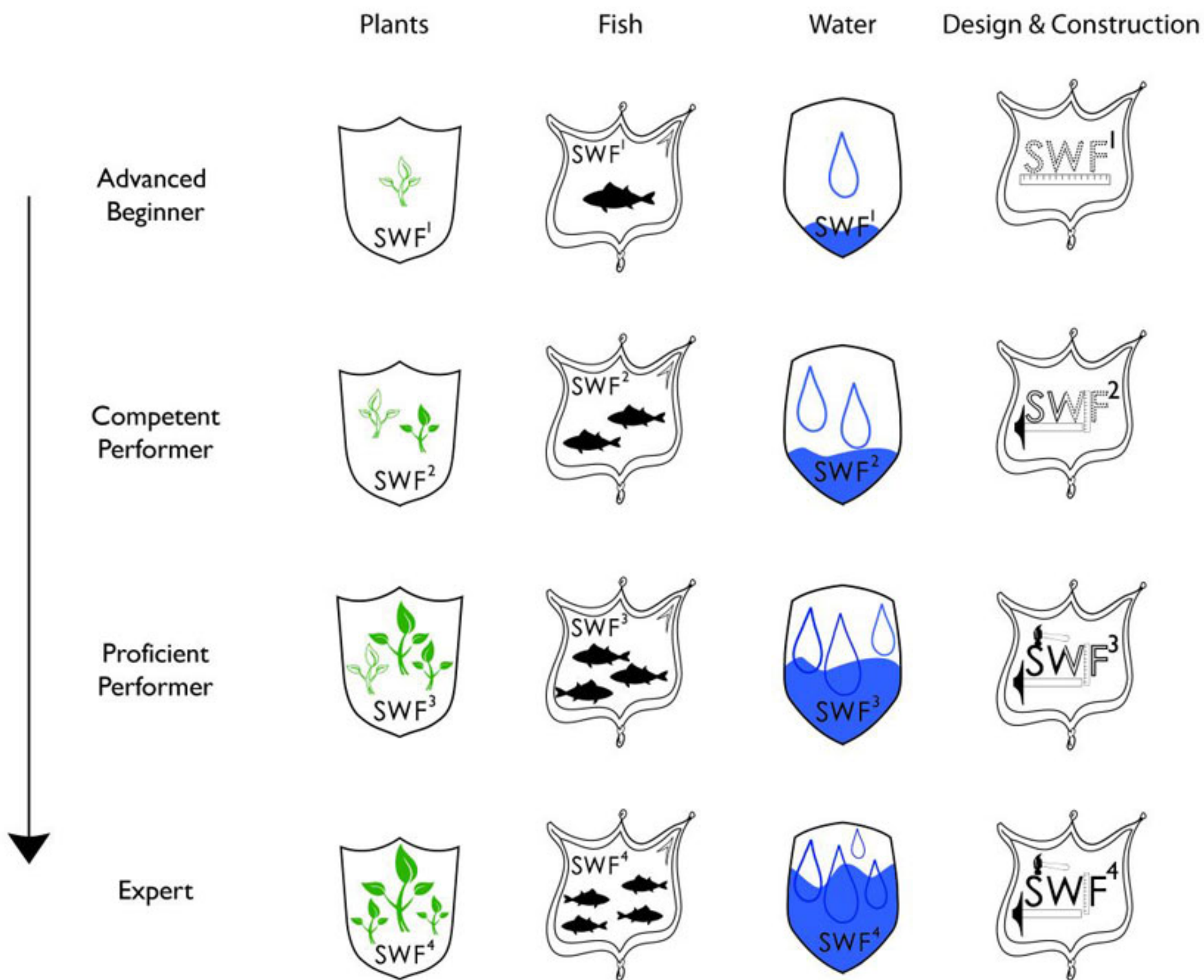


SWEET WATER FOUNDATION

There grows the neighborhood



SWEET WATER AQUAPONS BADGE HIERARCHY



Name (first, middle I, Last)
Birthday (needs be protected!)

Role(s)
Skills
Qualifications

Dossier
Badges

Program (SWF, school, etc)
Role [Program specific]



**SWF Program
Learner**



**SWF Program
Evaluator/Instructor**

Name (first, middle I, Last)
Program (SWF, school, etc)

Role(s)
Skills
Qualifications

Dossier
Badges

Program (SWF, school, etc)
Role(s): Evaluator/Instructor

Outsiders Check
Learner's Dossier

**Outsiders Interested
in SWF Learners**



Opportunities

Learner Earns
New Badge



Outsiders Assess Skills &
Offer New Opportunities

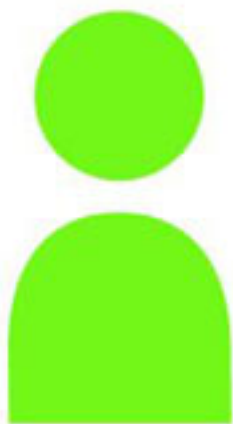
Satisfies Badge Reqs



Performance metrics
Requirements (what is needed before you start)
Requirements (what is needed to complete)

Evaluates Learner's Work
(based on reqs)



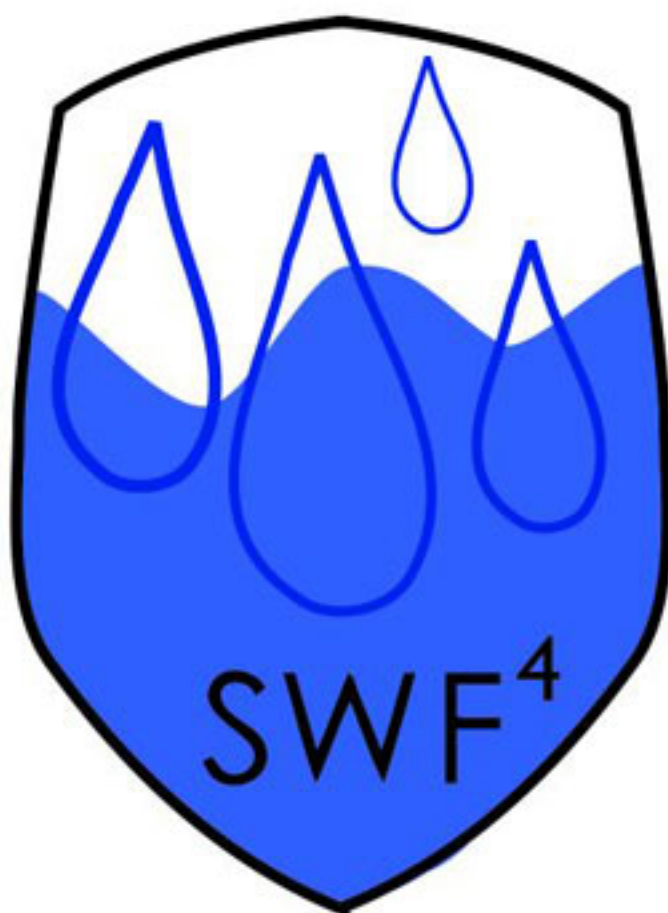


Richard Santana

Milwaukee, WI / Birthday: June 4th, 1999

[edit](#)

BADGES



CONGRATS!

*You keep it flowing & balanced.
Naturally.*

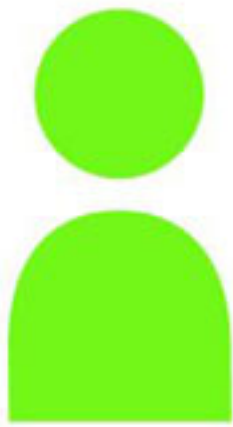
*You've just earned the
Expert Water Badge
from Sweet Water.*

PUBLISH FINAL PROJECT

SHARE



[print certificate](#)



Richard Santana

Milwaukee, WI / Birthday: June 4th, 1999

[edit](#)

PROGRAMS

Sweet Water Foundation, \$avvy Youth, ChicagoYES, DiscoverWater.org

SKILLS

Media: Photography, Video, Audio Editing
Math & Science: Basic Finance, Analytics, Charting, Visualization, Water Cycle, Aquaponics, Bacteria, Basic Chemistry

INTERNSHIPS

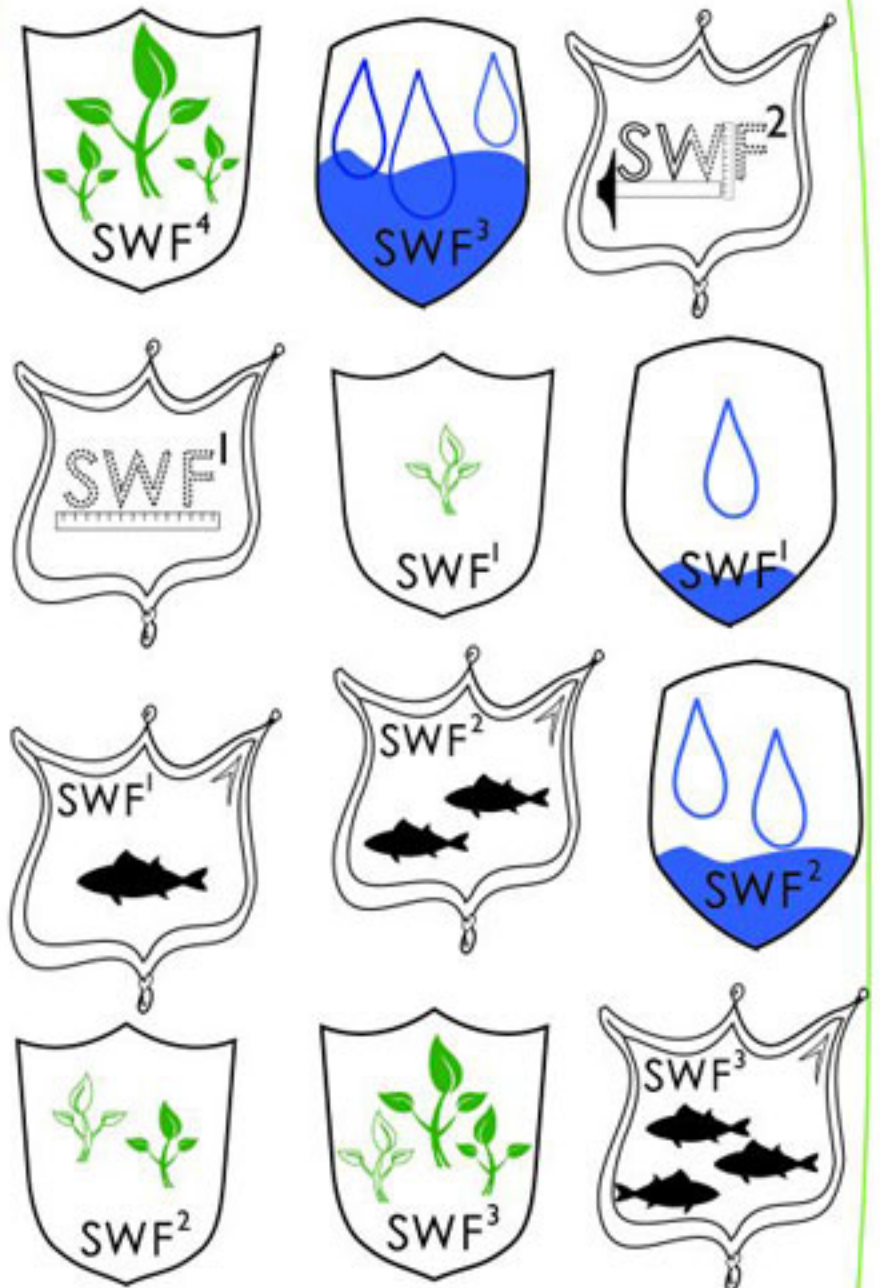
SWF + DiscoverWater
MKE/Chi Joint Water Program

PROJECTS / ACCOMPLISHMENTS

SWF: Water - Proficiency Project
SWF: Fish - Competency Project
DiscoverWater.org: Project

[more ...](#)

BADGES



biomimetics/biomimicry:

1.

:the examination of Nature, its models, systems, processes, and elements to emulate or take inspiration from in order to solve human problems. The term biomimicry and biomimetics are derived from the Greek words *bios*, meaning life, and *mimesis*, meaning to imitate. Biomimetics is the study of the structure and function of biological systems as models for the design and engineering of materials and machines.

source: <http://biomimicry.net/>

informatics:

: the science of information, the practice of information processing, and the engineering of information systems. Informatics studies the structure, algorithms, behavior, and interactions of natural and artificial systems that store, process, access and communicate information. It also develops its own conceptual and theoretical foundations and utilizes foundations developed in other fields

source: http://ischool.uw.edu/informatics/prospective/at_uw

BIOMIMETIC INFORMATICS

Heisenberg Principle (a.k.a. the Uncertainty Principle)

1.

A principle, especially as formulated in quantum mechanics, that greater accuracy of measurement for one observable entails less accuracy of measurement for another. For example, it is in principle impossible to measure both the momentum and the position of a particle at the same time with perfect accuracy....Similar uncertainty principles hold for non-quantum mechanical systems involving waves as well.

2.

The theory that it is impossible to measure both energy and time (or position and momentum) completely accurately at the same time

Challenges:

1.
Increased education, outreach, and awareness on urban agriculture
2.
Reconfiguration of Zoning and Land Use policy to support a wider range of techniques in urban agriculture and indoor farming (including aquaponics, hydroponics, aeroponics)
3.
Formulation of new, flexible architectural & spatial typologies supporting practical applications of indoor growing systems and job creation
4.
Creation of new forms of 'metrics' and codes with respect to impact analysis on market values, comparative analysis of externalities, and ecological outcomes
5.
Revolution of values and overall shift in mindset re-examining efficiency in 20th century 'economic models' and impact analysis on natural capital into 21st century paradigm