“All truth passes through three stages. First, it is ridiculed. Second, it is violently opposed. Third, it is accepted as being self-evident.”

-Arthur Schopenhauer

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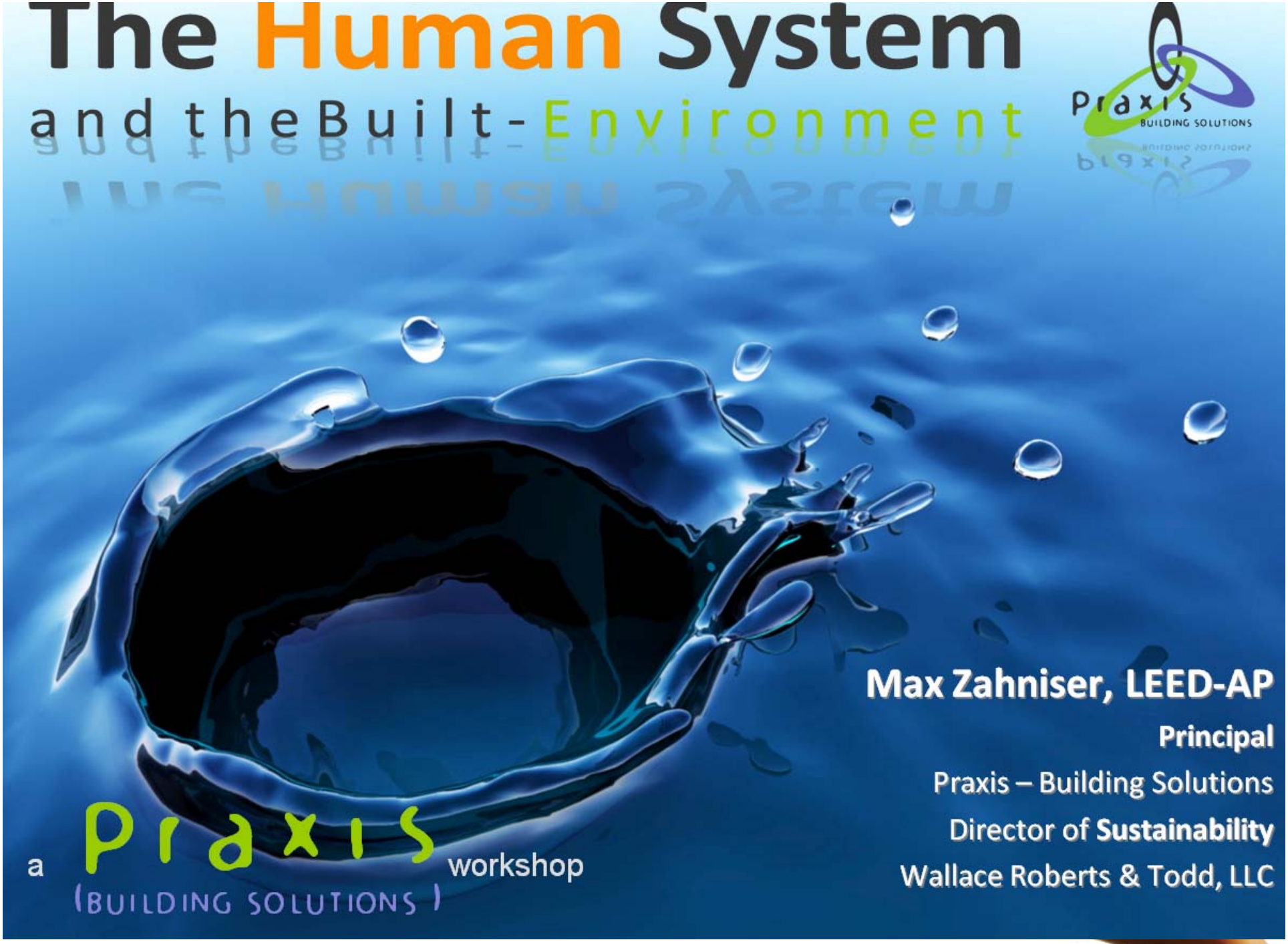
The Human System

and the Built-Environment



Max Zahniser, LEED-AP

Principal

Praxis – Building Solutions

Director of **Sustainability**

Wallace Roberts & Todd, LLC

a Praxis (BUILDING SOLUTIONS) workshop

POLL

- LEED-APs?
- Greenbuild Attendees?

- Sustainability?
- Green Building?
- Triple Bottom Line?
- The 11th Hour?
- IPCC?
- Hubbard's Peak?
- EIA?

Design Process

Design process need not vary radically across subjects and disciplines. The underlying nature of design is quite consistent.

- Products
- Architecture
- Planning
- Software
- Etc.

Enough about you…

- Environment
- Architecture
- USGBC
- Praxis and WRT

Howard Zahniser

From Wikipedia, the free encyclopedia

Howard Clinton Zahniser (1906-1964) was an American environmental activist. Zahniser is noted for being the primary author of the Wilderness Act of 1964.

The Wilderness Act established America's National Wilderness Preservation System, which today permanently protects more than 106 million acres (429,000 km²) of federal public land for the benefit of future generations of people and wildlife alike.

Defining Sustainability

Wiktionary

LITERAL:
Sustain – ability

Potential to be Sustained

Transitive verb
to sustain (*third-person singular simple present* sustains, *present participle* sustaining, *simple past sustained*, *past participle sustained*)
1. To maintain something, or keep it in existence
2. To provide for something, or nourish it

Defining Sustainability

Wikipedia

Sustainability is a characteristic of a process or state that can be maintained at a certain level indefinitely. For planet earth, it is thus the intent to provide the best outcomes for the human and natural environments both now and into the indefinite future. One of the most often-cited definitions of sustainability is the one created by the Brundtland Commission (formerly World Commission on Environment and Development… The Commission defined sustainable development as development that ***"meets the needs of the present without compromising the ability of future generations to meet their own needs."***

Why does this matter?

IPCC – 4th Assessment Report

- 2,500 of the world's leading climate scientists and technical experts contribute to reports
- **Conclussions:**
  - **Global Warming is occurring**

    (projected 3-8 degrees, 2100)

    The last temperature change of this magnitude was the end of the last ice age
  - **Human activity is impacting it significantly**
  - **Climate instability means:**
    - **Increased frequency and intensity of detrimental weather events**
      - **Hurricanes**
      - **Floods**
      - **Droughts**
  - **Sea level rise (37 inches by 2100)**

THE EVOLUTION OF THE EARTH

One day = 750 million years

THE EVOLUTION OF THE EARTH

One day = 750 million years

DAY 1 - MONDAY:

Formation of Geology

The Pre-Cambrian Period has begun

Praxis BUILDING SOLUTIONS

THE EVOLUTION OF THE EARTH

One day = 750 million years

DAY 2 – TUESDAY

8:00 AM - Life first appears

Blue-green algae is the dominant life form

THE EVOLUTION OF THE EARTH

One day = 750 million years

DAY 3 – WEDNESDAY

Biosphere gradually evolves

All life is restricted to the sea

THE EVOLUTION OF THE EARTH

One day = 750 million years

DAY 4 – THURSDAY

Half of the history of Earth has elapsed

Photosynthetic plants appear

THE EVOLUTION OF THE EARTH

One day = 750 million years

DAY 5 – FRIDAY

Free oxygen forms ozone blocking ultraviolet light and paving the way for life on land

THE EVOLUTION OF THE EARTH

One day = 750 million years

DAY 6 – SATURDAY

1:00 A.M. – Amphibians come onto land

4:00 P.M. – Giant reptiles appear and survive for almost 6 hours until 9:55

10:00 P.M. – Primates appear

11:44 P.M. – Grand Canyon begins to form

11:59:54 P.M. – Homo sapiens arrive

1/40th of a Second Before Midnight - Humans begin to burn fossil fuel

THE EVOLUTION OF THE EARTH

One day = 750 million years

In the past 1/200th of a second, Earth's population has doubled to over 6,500,000,000 people.

In the past 1/300th of a second, the combustion of fossil fuels has emitted 135,000,000,000 tons of CO_2 into the Earth's biosphere.

(current rate of over 27,000,000 tons per year)

^Raupach, M.R., G. Marland, P. Ciais, C. Le Quere, J.G. Canadell, G. Klepper & C.B. Field. (2007) "Global and regional drivers of accelerating CO2 emissions".
Proc. Nat. Acad. Sci. 104 (24): 10288-933. doi:10.1073/pnas. 0700609104.
^Human Produced carbon dioxide only, total carbon dioxide in atmosphere is 2,700,000,000 thousand tons

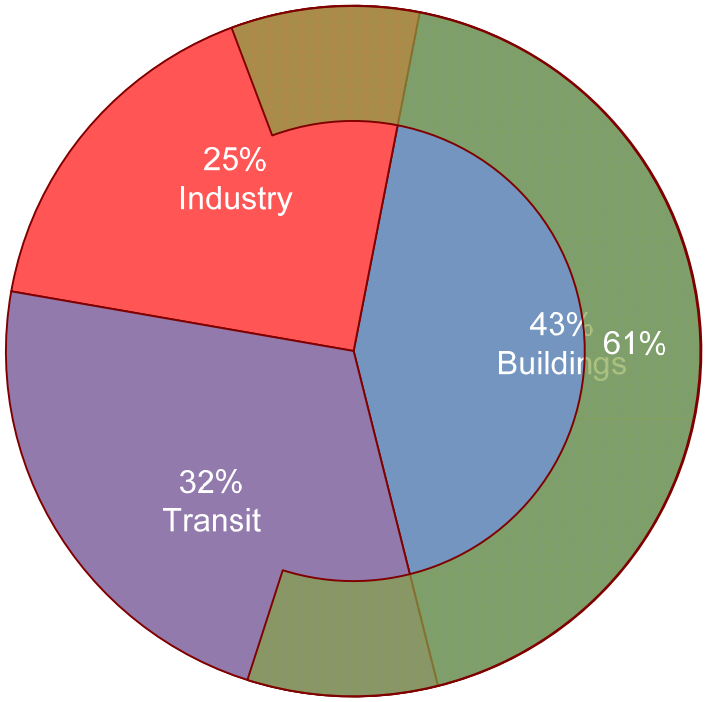
What are the sources?

Did you know?

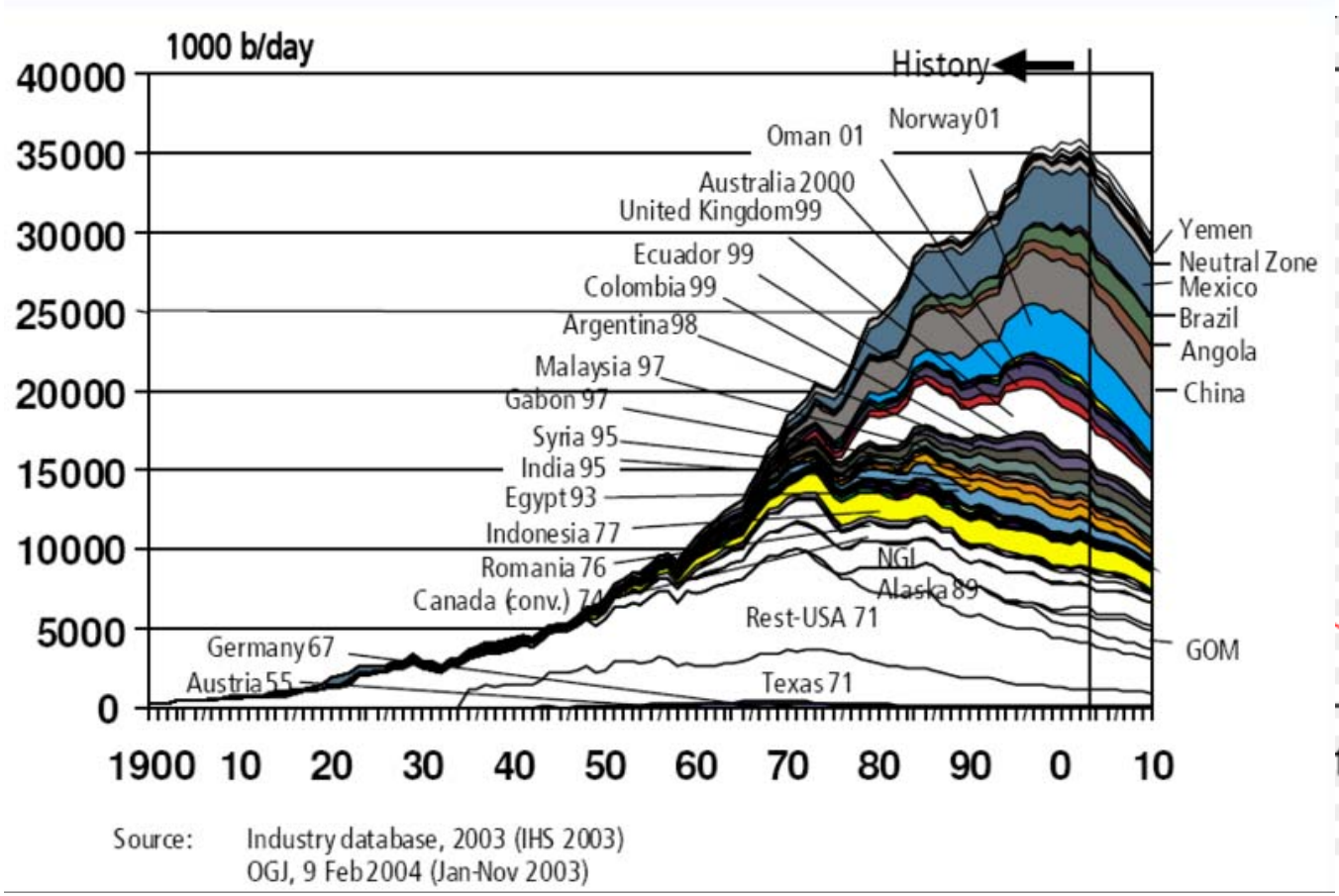
Buildings in U.S. consume more than 30% of the nation's total energy and 60% of electricity

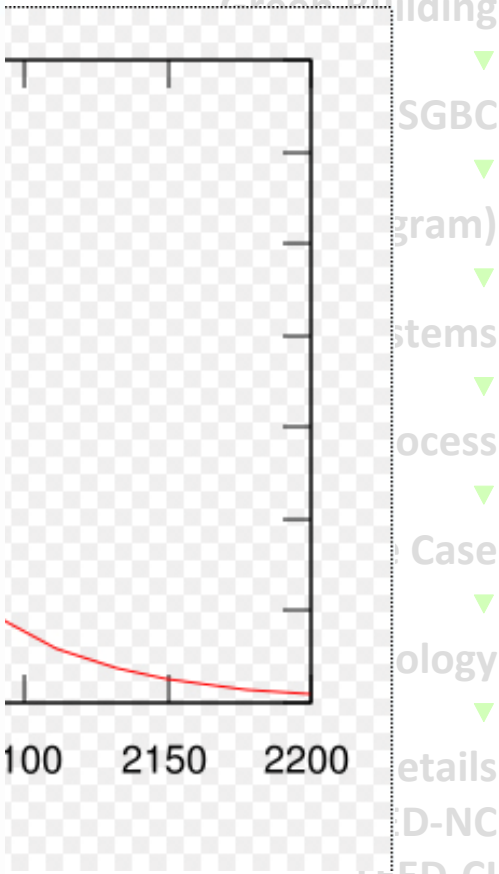
The U.S. uses 5 billion gallons of water per day flushing toilets

Buildings' Contribution to CC



Sources: Energy Information Agency, USGBC





Peak Oil

Hubbard's Peak

Opportunity

- “Green Collar Jobs”
- Economic growth area shift

Did you know?

- **Every year $42 billion of energy consumed by non-residential U.S. buildings is wasted**

- **Use of a single compact fluorescent light bulb will keep 3/4 of a ton of carbon dioxide out of the earth's atmosphere**

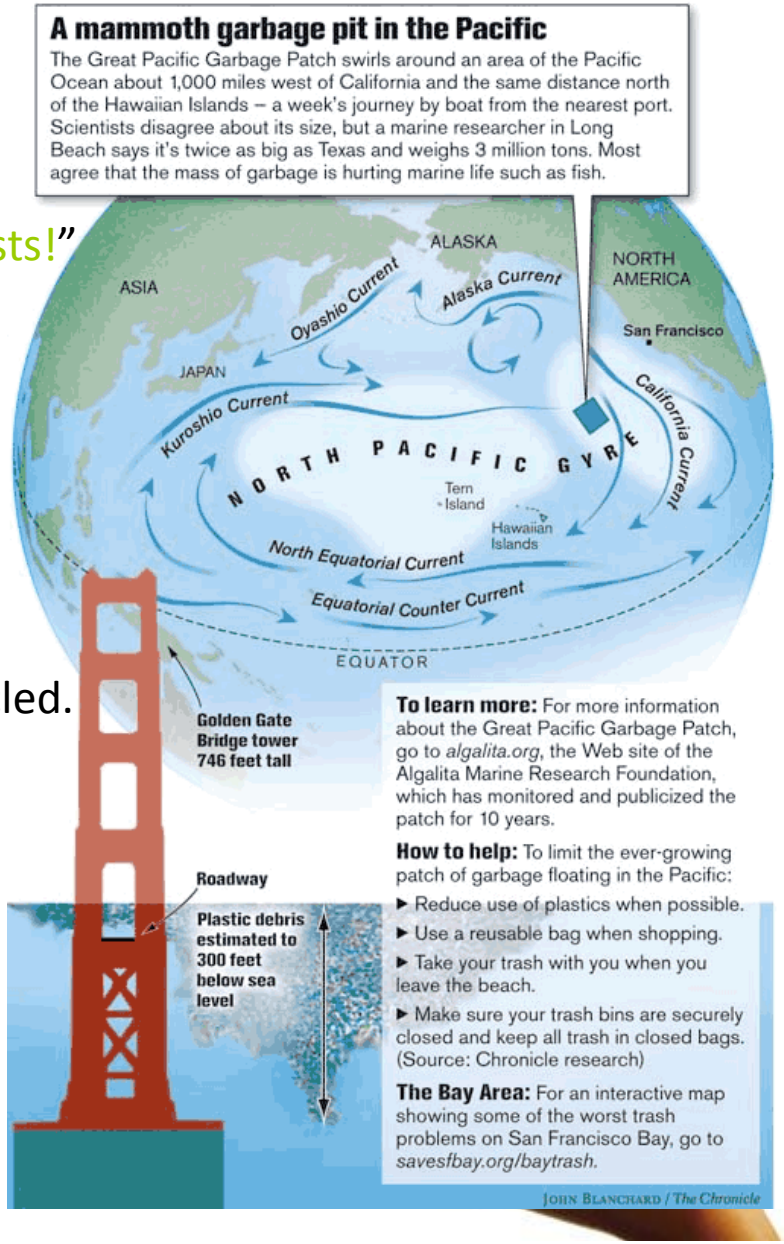
Plastics → What's the big deal?

Plastics are like diamonds, they are forever…
"Except for the small amount plastic that has been incinerated…every bit of plastic ever made still exists!"

An area known as the Great Pacific Garbage Patch that has formed in the North Pacific Gyre and is twice the size of Texas and has been measured upwards of 30 meters in depth.

Alone US manufacturers produce 100 billion tons of plastics annually and less than 4% of plastic is recycled.

Most plastic production is for single-use applications.
A million plastic bags are used every minute, and the number is rising!



stats from http://www. algalita.org/ in a paper titled "Pelagic Plastic" &
http://www.healthebay.org/currentissues/ppi/theneed_bags.asp
image from http://www.sustainmn.com/

Plastics → Marine Life & Habitat Impact

Plastics do not biodegrade or dissolve into organic matter that can reenter the nutrient cycle.

Plastics pollute marine habitats, inhibit ecosystems vitality and endanger its wildlife.

Animals suffer casualties from often ingesting and/or being entangled in the plastic debris.

In the Great Pacific Garbage Patch plastics out weigh plankton 6 to 1.

90% of Laysan Albatross chicks carcasses and regurgitated stomach contents contain plastics.

http://www.healthebay.org/currentissues/ppi/theneed_bags.asp

Construction and waste

- Of the 20,000 landfills in the U.S., over 15,000 have reached capacity and closed
- 40% of landfill content is composed of construction related waste
- Construction waste equals the total of all municipal garbage waste in the U.S.

Other issues*

- Water scarcity and quality
  - CC driven
  - Industry
- Toxification of air and water
  - Waste
  - Industry
- Occupant Health
  - Air quality
  - Light Quality
  - Ergonomics
  - Daylight and Views
- Land-use (food production and habitat)
  - Development patterns
- Other resource depletion

"It is not only what we do, but also what we do not do for which we are accountable"

– Moliere

Sustainability

Green Building

USGBC

LEED (overview of program)

Systems

Process

Making the Case

Technology

LEED technical details

LEED-NC

LEED-CI

"Energy and Persistence conquer all things"

– Ben Franklin

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What is Green Building?


PERCEPTION

New York's greenhouse gas emission levels are relatively low when measured per capita, at 7.1 metric tons per person, below San Francisco, at 11.2 metric tons, and the national average, at 24.5.[34] New Yorkers are collectively responsible for one percent of the nation's total greenhouse gas emissions,[34] though comprise 2.7% of the nation's population. The average New Yorker consumes less than half the electricity used by a resident of San Francisco and nearly one-quarter the electricity consumed by a resident of Dallas. -Wikipedia

REALITY

Bank of America Tower
at One Bryant Park
The Durst Organization
Cook+Fox Architects
New York NY
LEED-NC Registered:
Platinum Certification goal

What is Green Building?

Built-environment design, construction and operation practices that significantly reduce, eliminate or even reverse the negative impact of buildings on the natural environment and occupants.

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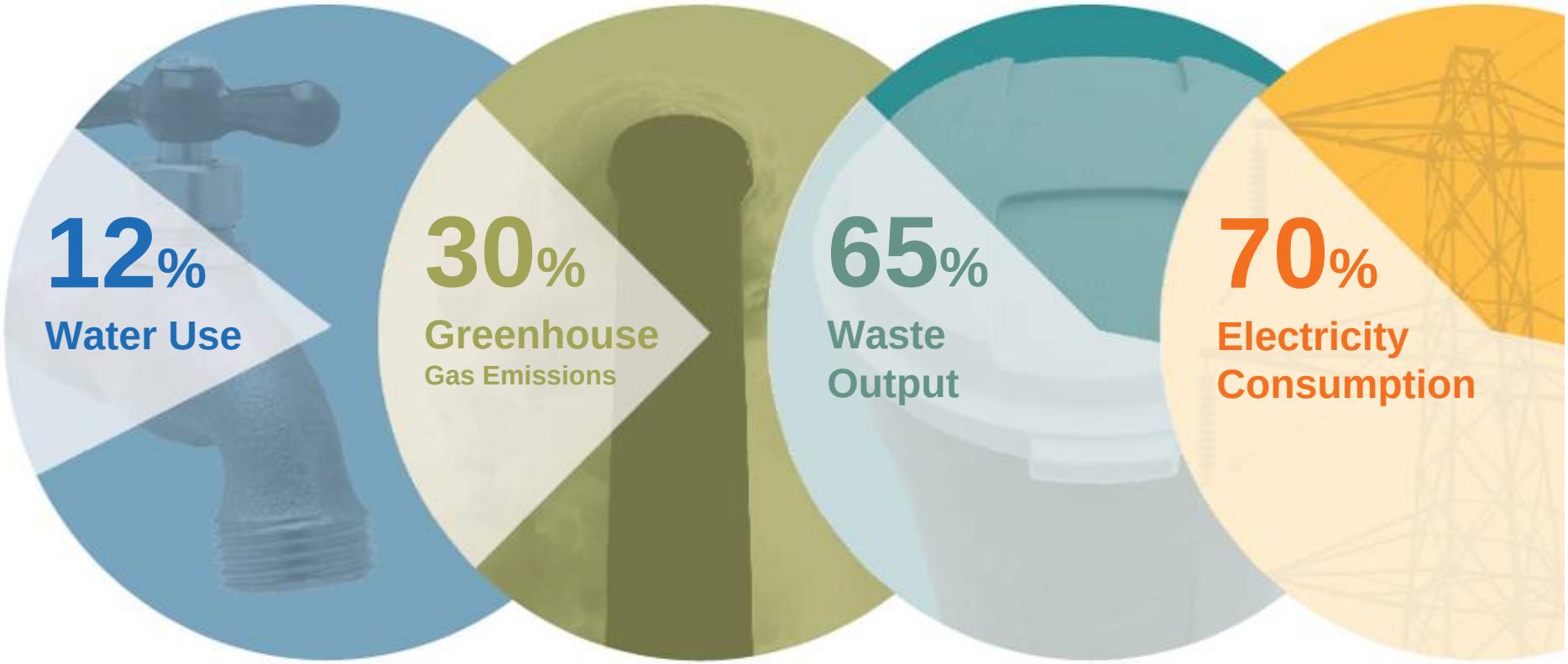
“People who say it can not be done should not interrupt those who are doing it”

–Chinese proverb

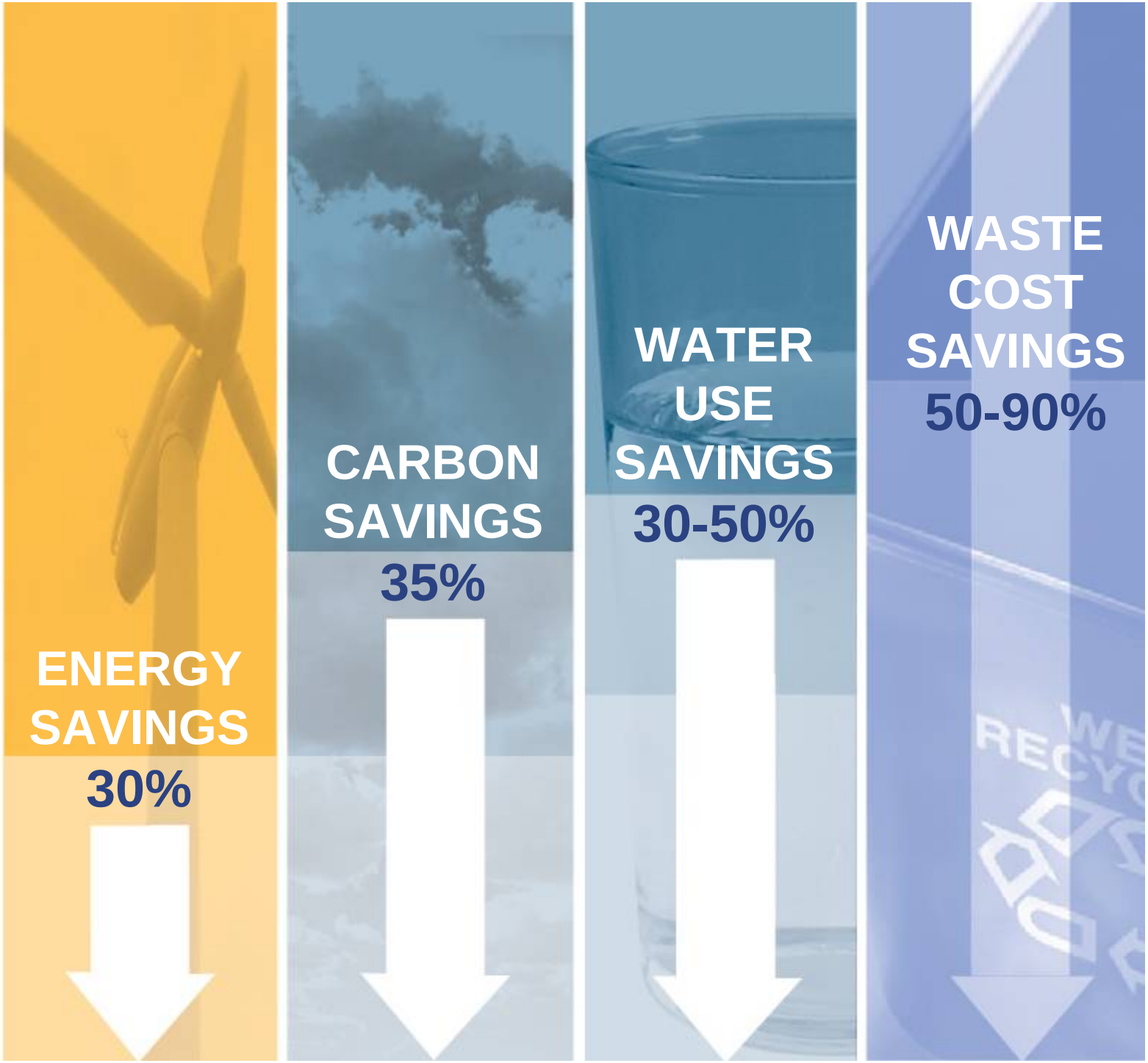
THE RATIONALE

Green roof at
Ford Rouge
Ford Motor Company
Dearborn MI
LEED-NC Gold

U.S. Building Impacts:



Average Savings of Green Buildings



Source:
Capital E

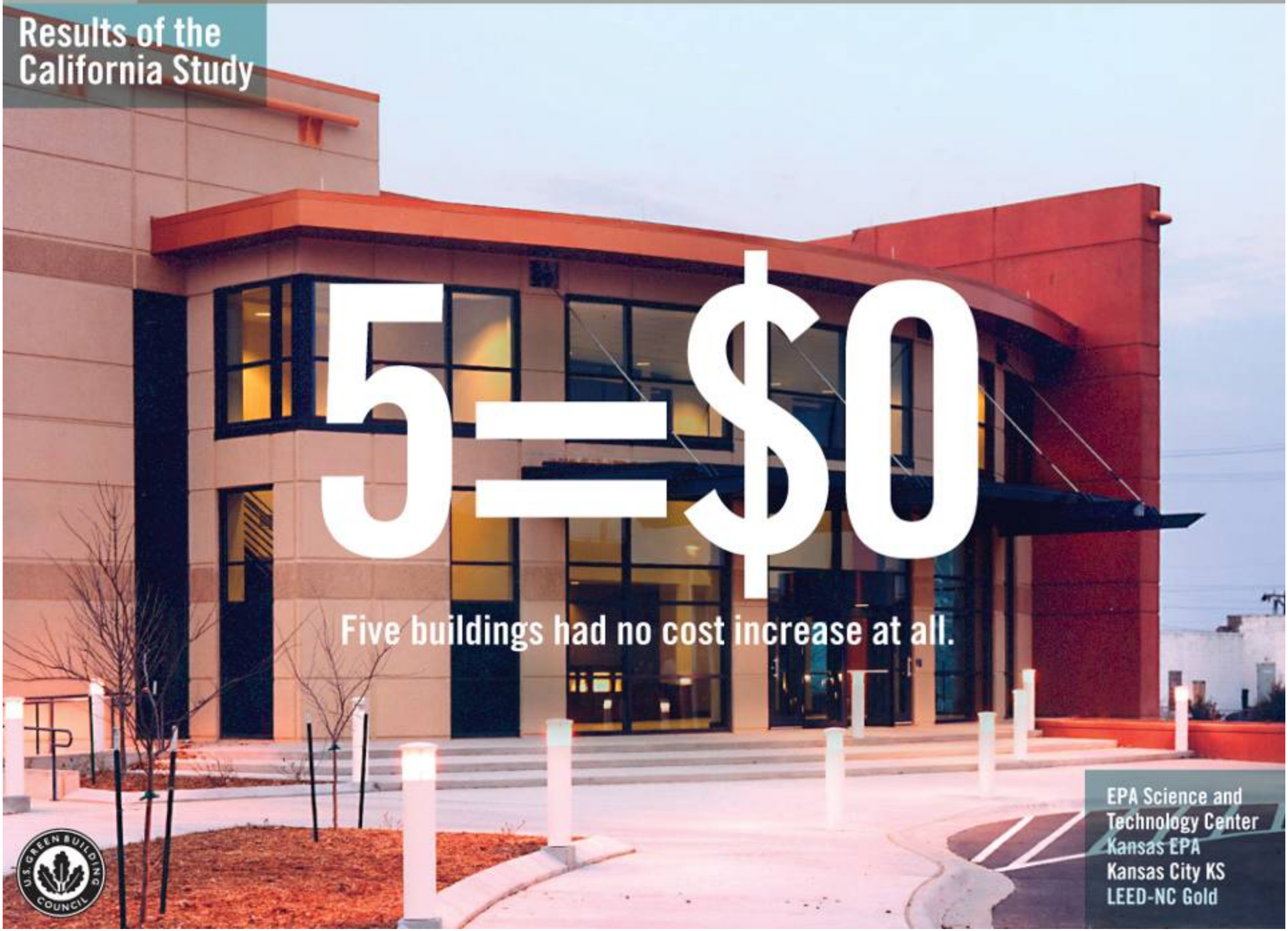
Results of the California Study

33 Diverse Buildings

Built over the last **10** years

Cost construction premiums of **1.8%**

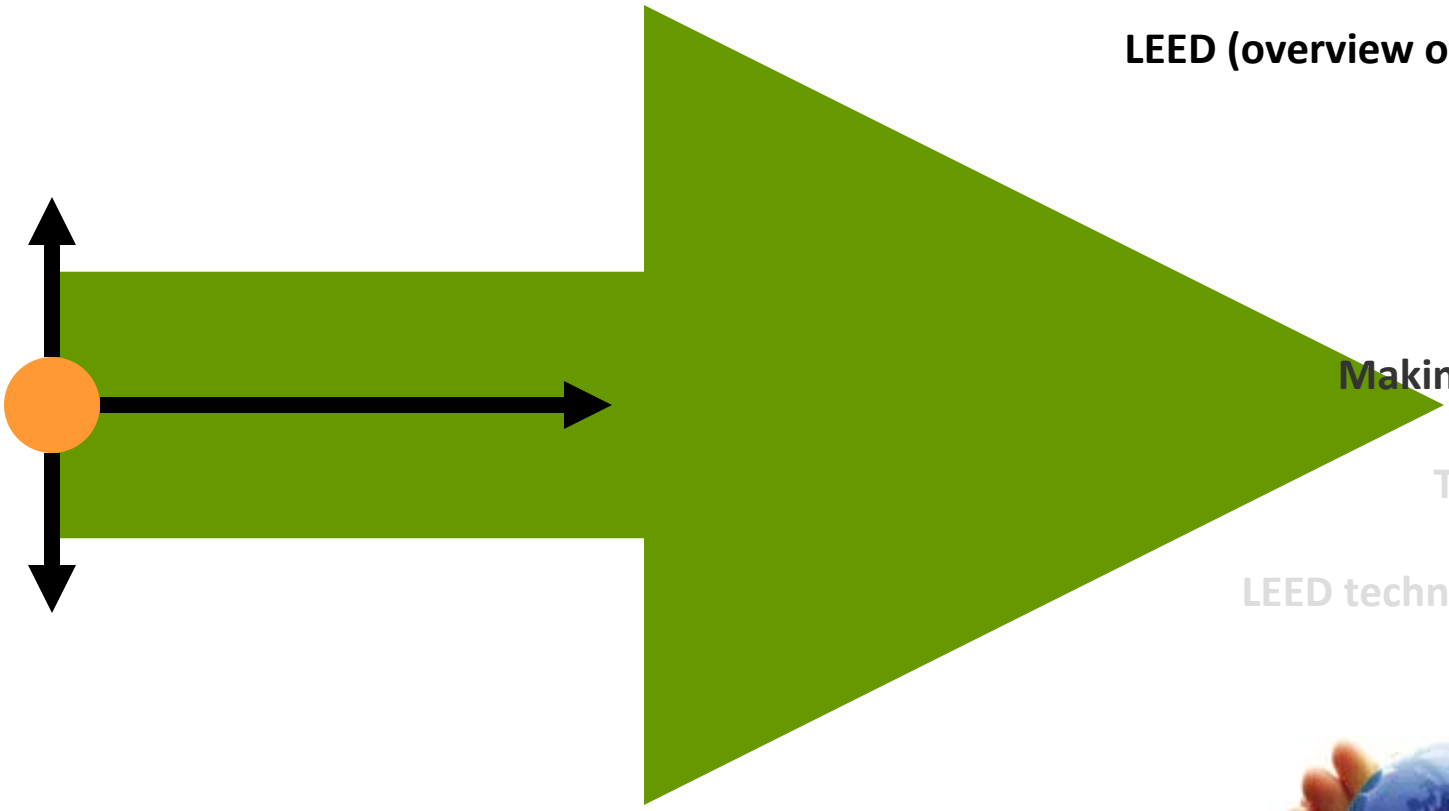
Results of the California Study



Results of the California Study:
Average Bottom Line Savings

The William and Flora Hewlett Foundation
Menlo Park CA
LEED Gold

Cost Benefit



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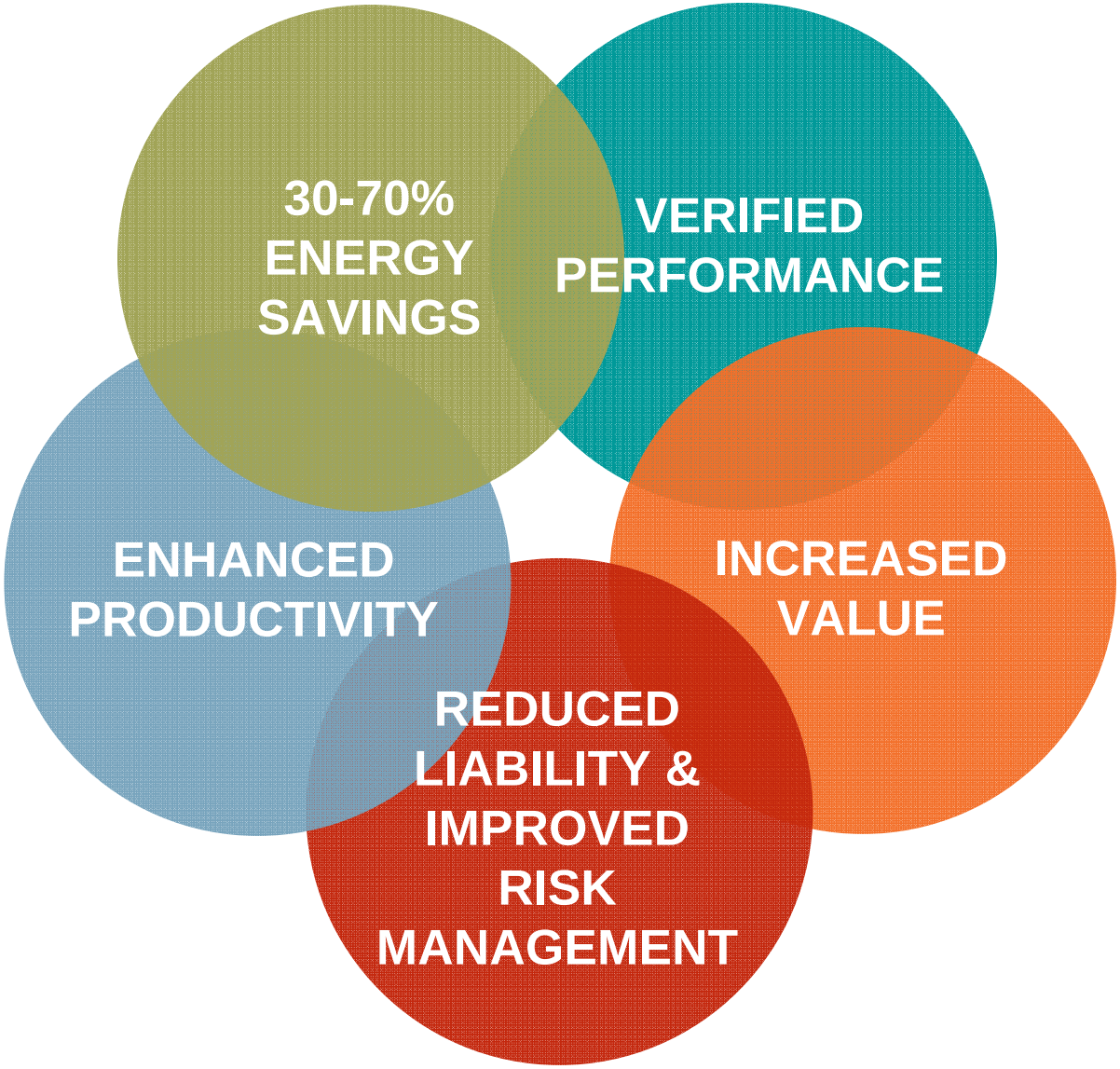
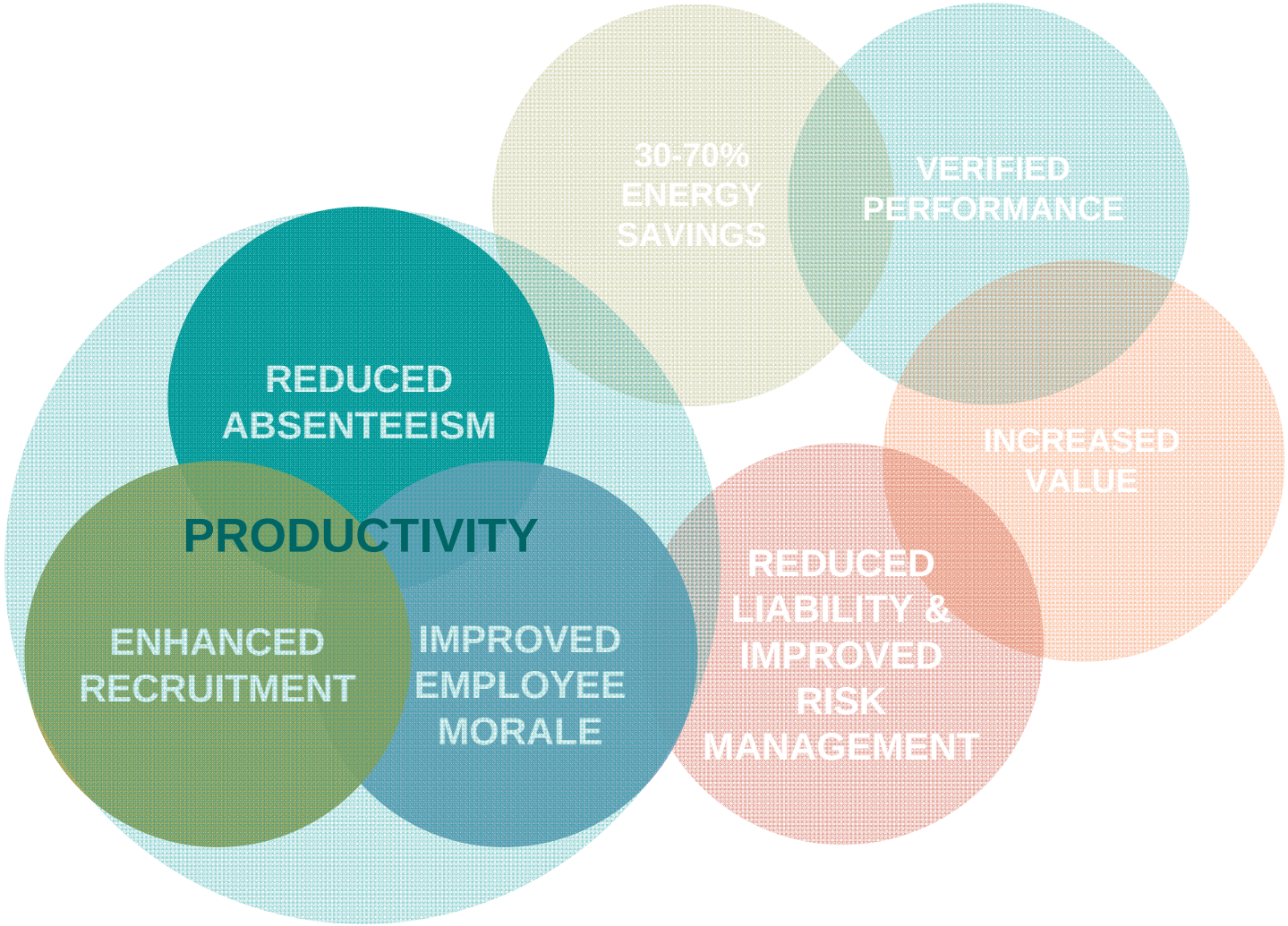
Breadth & Depth

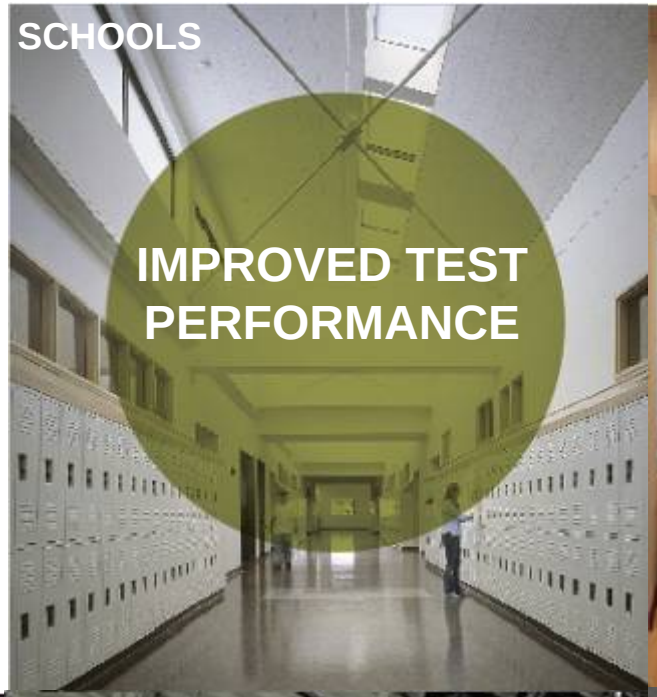
Improved Bottom Line.

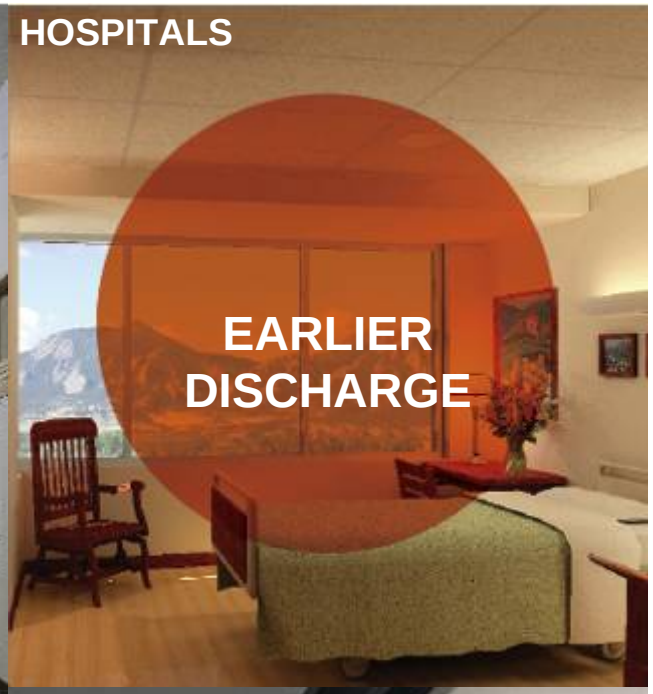


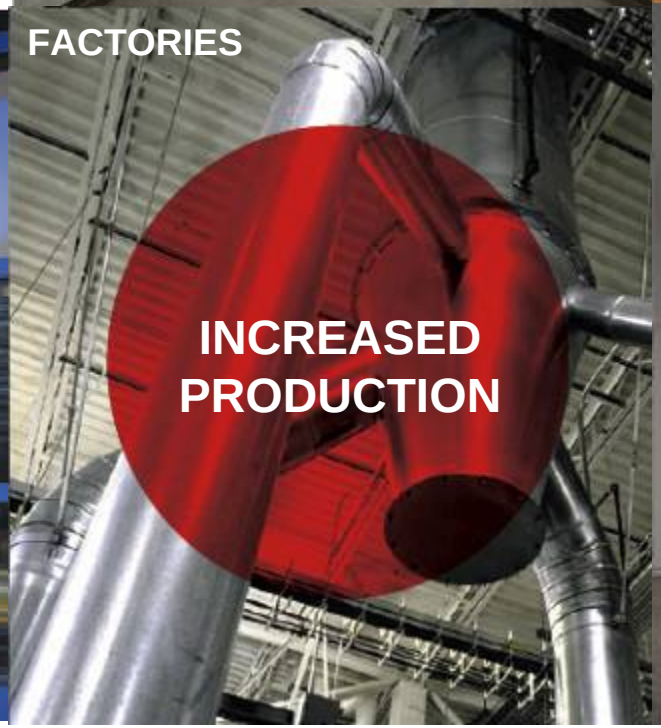
Improved Bottom Line.



Increased Productivity.

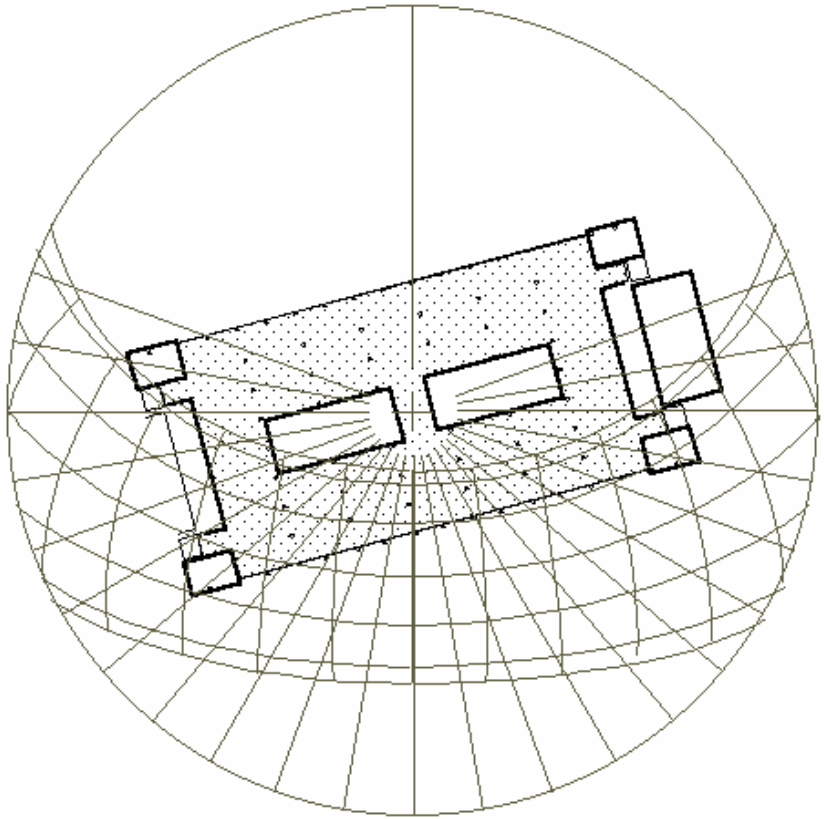






Benefits of Green

- Lockheed Building 157
  - 600,000 sf, 2700 employees



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Benefits of Green

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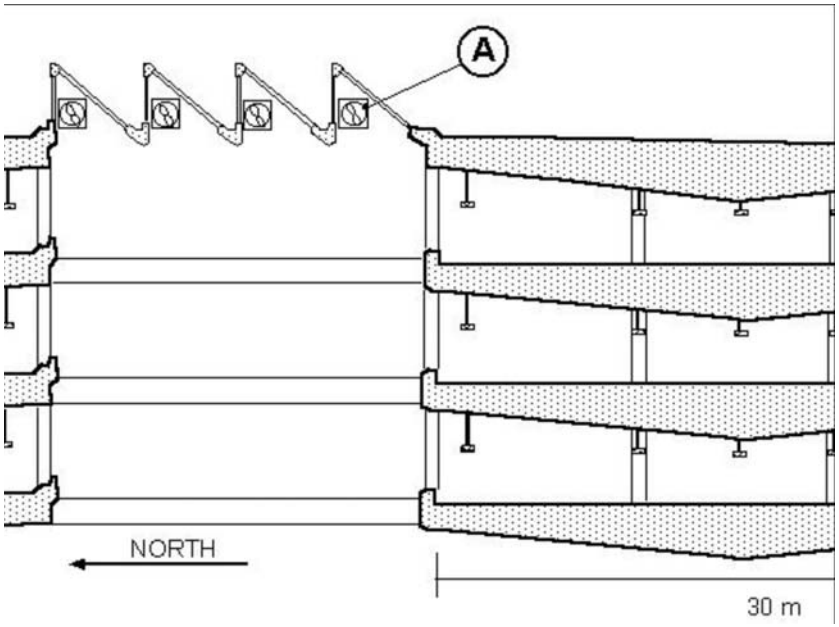
  - 600,000 sf, 2700 employees
  - Daylighting, IAQ, acoustics, user comfort, energy efficiency



Benefits of Green

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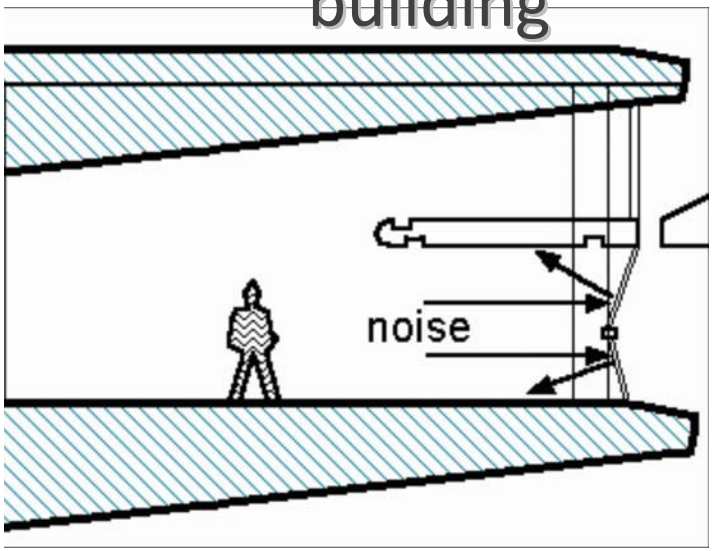
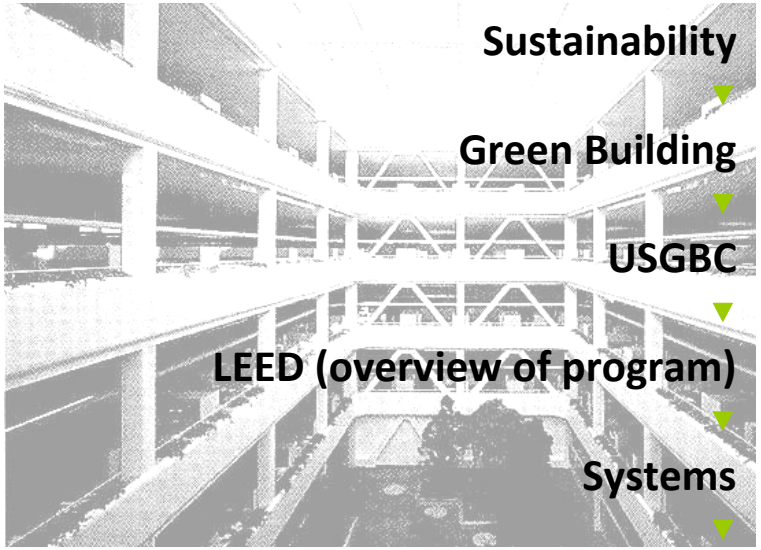
  - $50M, 4% more than comparable building



Benefits of Green

- Lockheed Building 157
  - 600,000 sf, 2700 employees
  - Daylighting, IAQ, acoustics, user comfort, energy efficiency
  - $50M, 4% more than comparable building
  - Energy savings $500,000/year
  - Absenteeism down 15% per year
  - Productivity up 15% per year



Green Synergies / Solution Multipliers

Envelope Efficiency ↔ Heating and Cooling Loads ↔ HVAC System

Surface Reflectances ↔ # of fixtures (cap cost + energy use)

Collected Rainwater ↔ Site-water Needs ↔ Stormwater System Capacity

Native Species (natural habitat) ↔ Site-water Needs…

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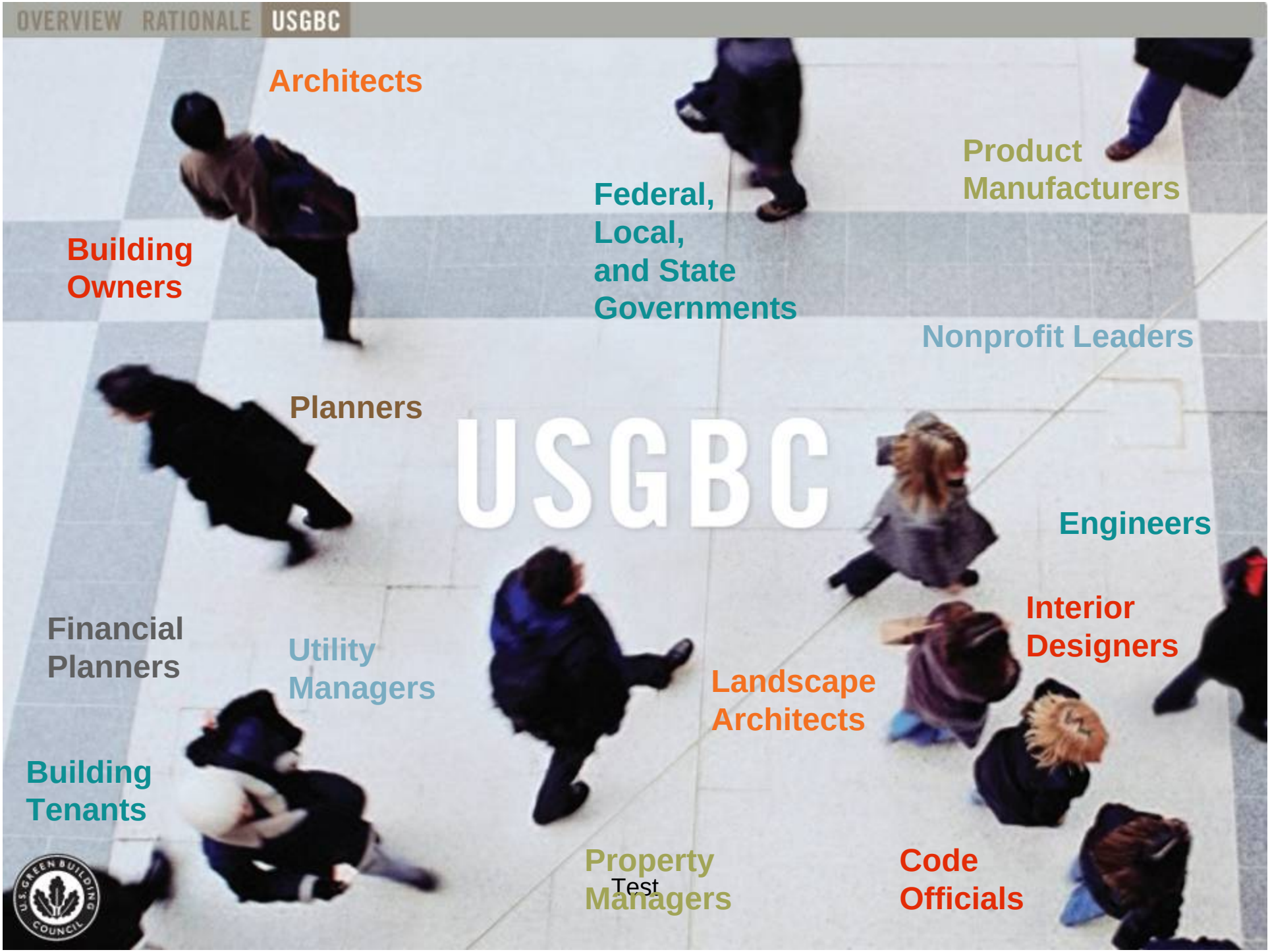

Architects
Federal, Local, and State Governments
Product Manufacturers
Building Owners
Nonprofit Leaders
Planners
USGBC
Engineers
Financial Planners
Utility Managers
Interior Designers
Landscape Architects
Building Tenants
Property Managers
Code Officials

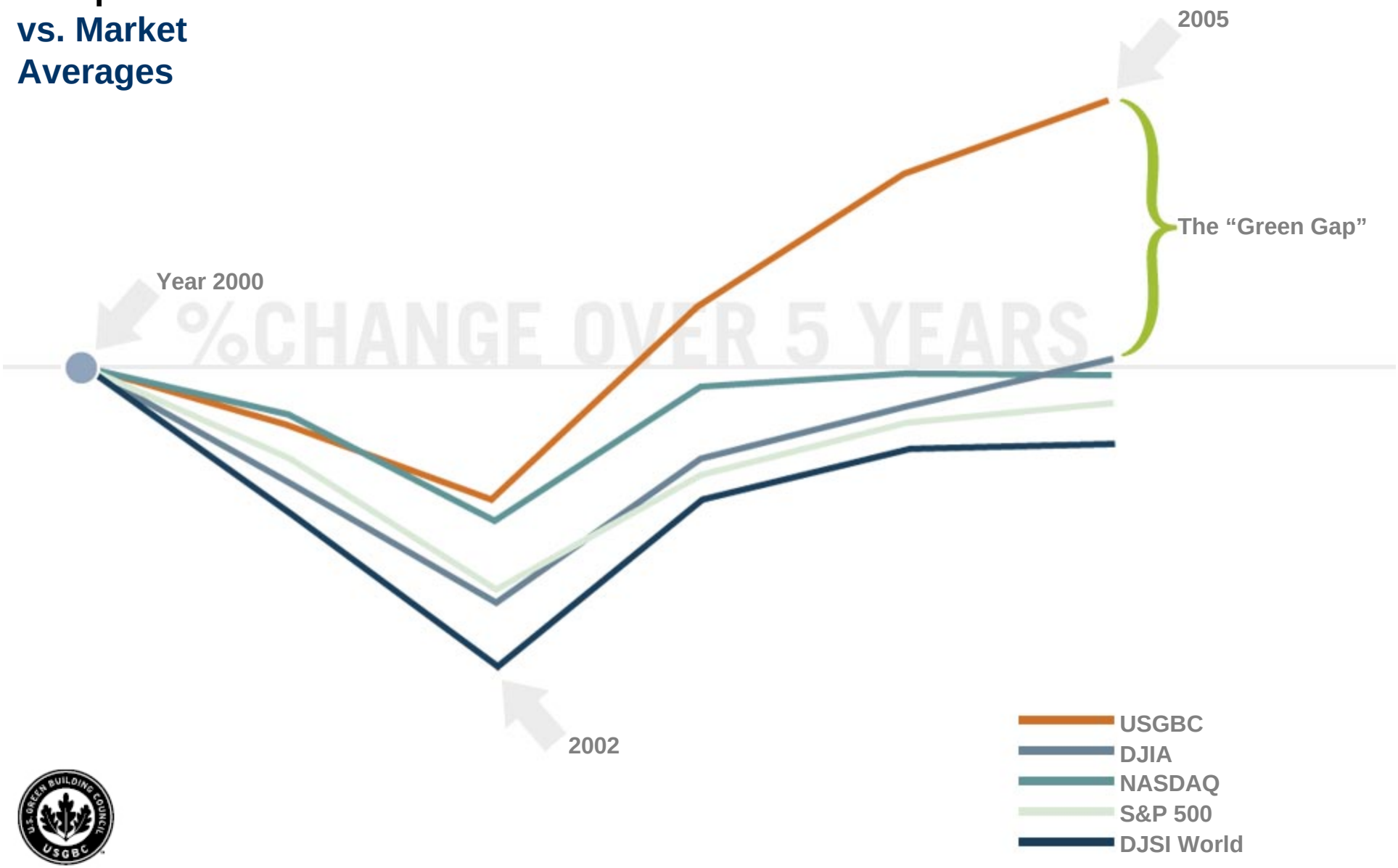
Test

Who are we?

USGBC is a coalition of the country's foremost leaders from across the building industry. We promote buildings that are:

1. Environmentally Responsible
2. Economically Profitable
3. Healthy Places to Live and Work

Publicly Traded USGBC Affiliated Companies vs. Market Averages



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What is LEED?

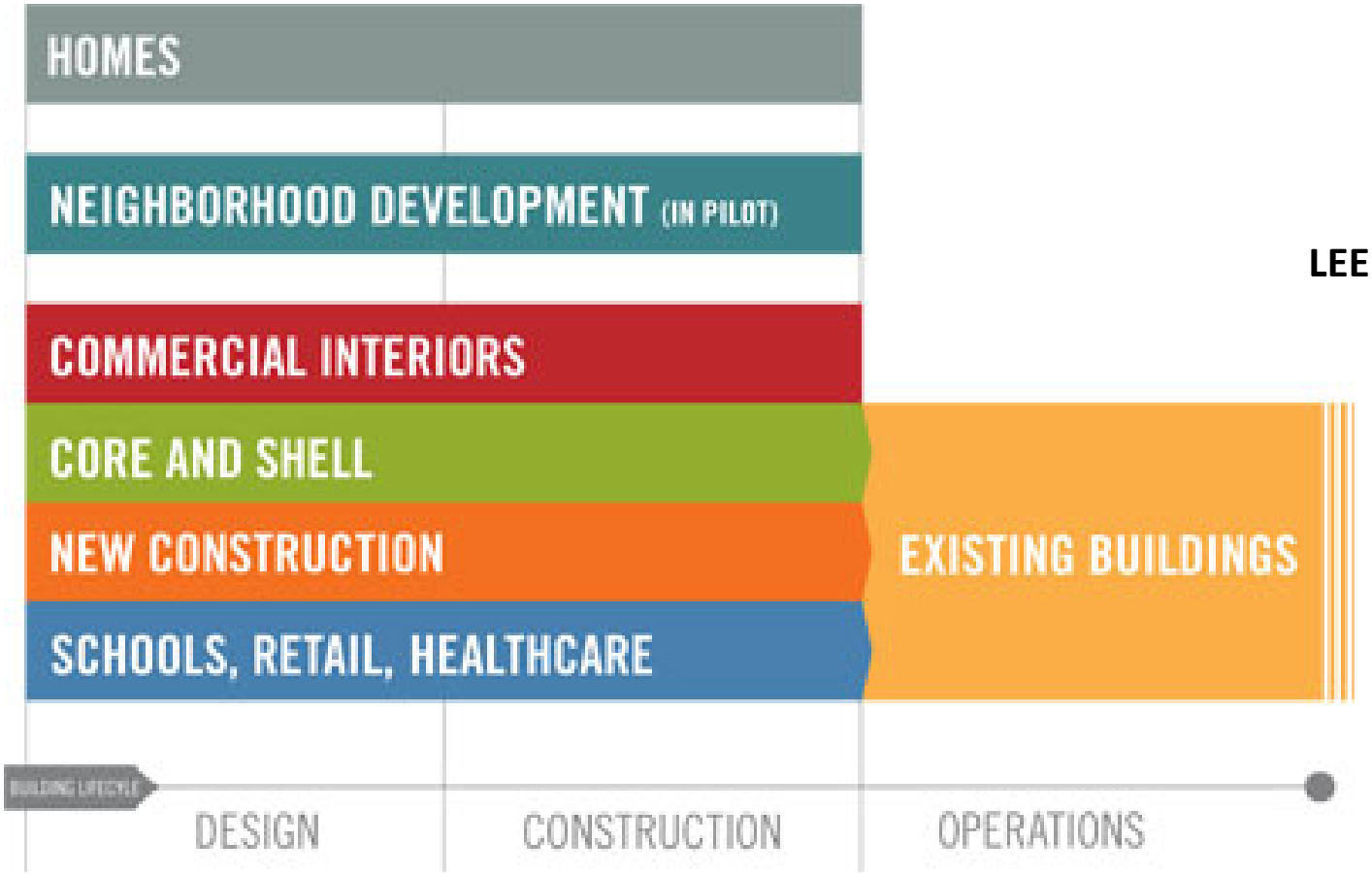
What is LEED?

- Reverse Engineered Acronym:
  Leadership in Energy and Environmental Design
- 3rd Party Certification for green buildings
- Rating Systems
- Credit Categories
- Credits
- Points
- Certification Levels

LEED is a means, not an end

The end is a 3rd party recognition – elimination of green-washing

The underlying end is market transformation of an enormous industry, adverse to change, toward sustainability



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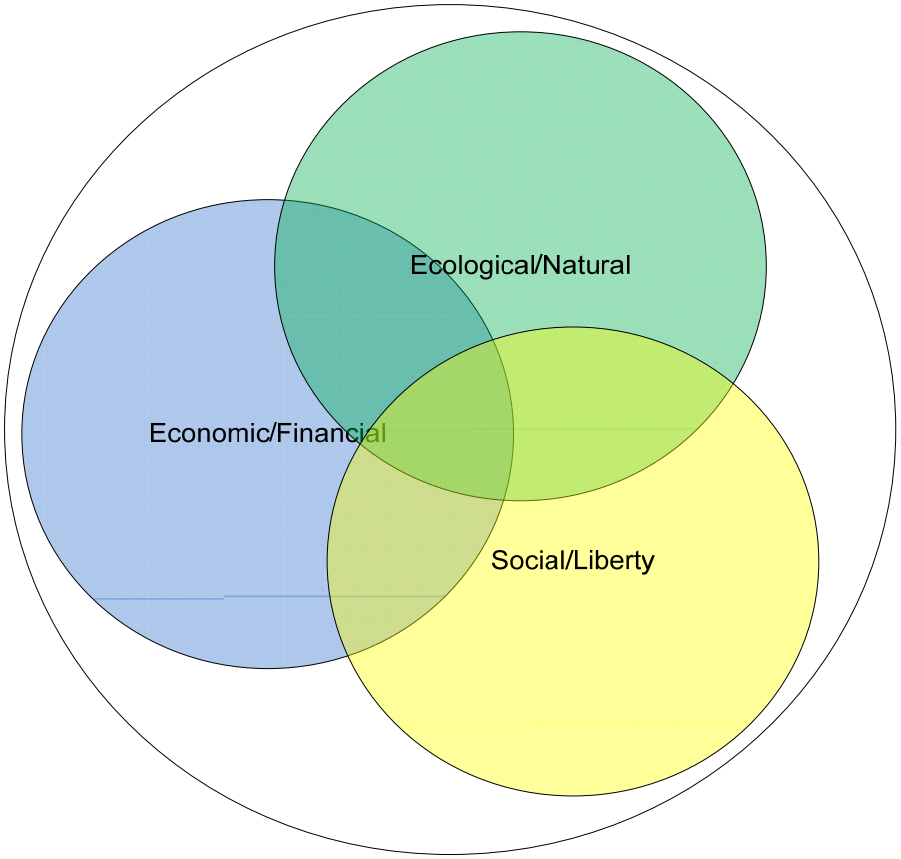
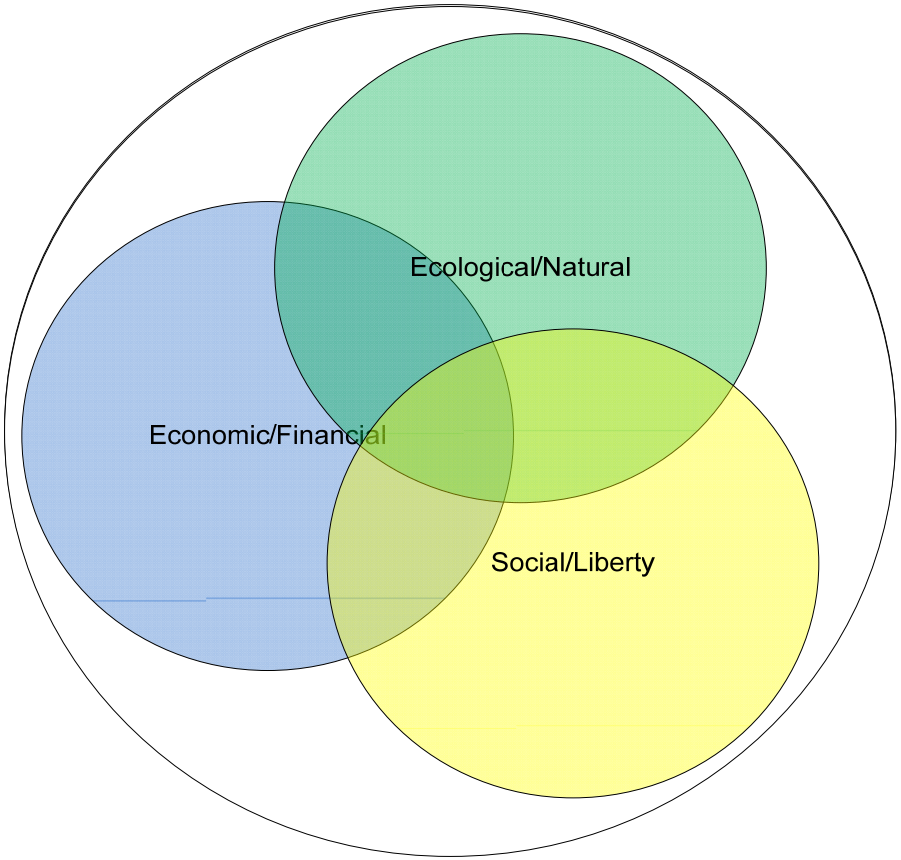
Rating Systems


Ecological/Natural
Economic/Financial
Social/Liberty


Ecological/Natural
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Social/Liberty

‘System’ Defined

Wiktionary

Etymology

From Greek *σύστημα* (systima) “organized whole, body”, from συν- (syn-) “together” + root of ἵσταμαι (histanai) “cause to stand”.

Noun

Singular

system

Plural

systems

system (***plural systems***)

A collection of organized things; as, a solar system.

A way of organizing or planning.

Praxis BUILDING SOLUTIONS

Holon

Wikipedia

- In considering what might be the basic building blocks of existence, [Arthur Koestler] observed that it seems every entity and concept shares a dual nature: as a whole unto itself, and as a part of some other whole. For example, a cell in an organism is a whole and at the same time a part of another whole, the organism.

- Built-environment projects as holons

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Systems Approach

- Systems theory as a worldview and working architectural philosophy:

  Our world is composed of many levels of interdependent systems (economics, industry, biology, physiology, ecology, psychology, etc.), whose relationships are not always obvious and often require critical, long-term thinking.

  My belief: Integrative project delivery and operations (green building) is simply the built environment application of this philosophy

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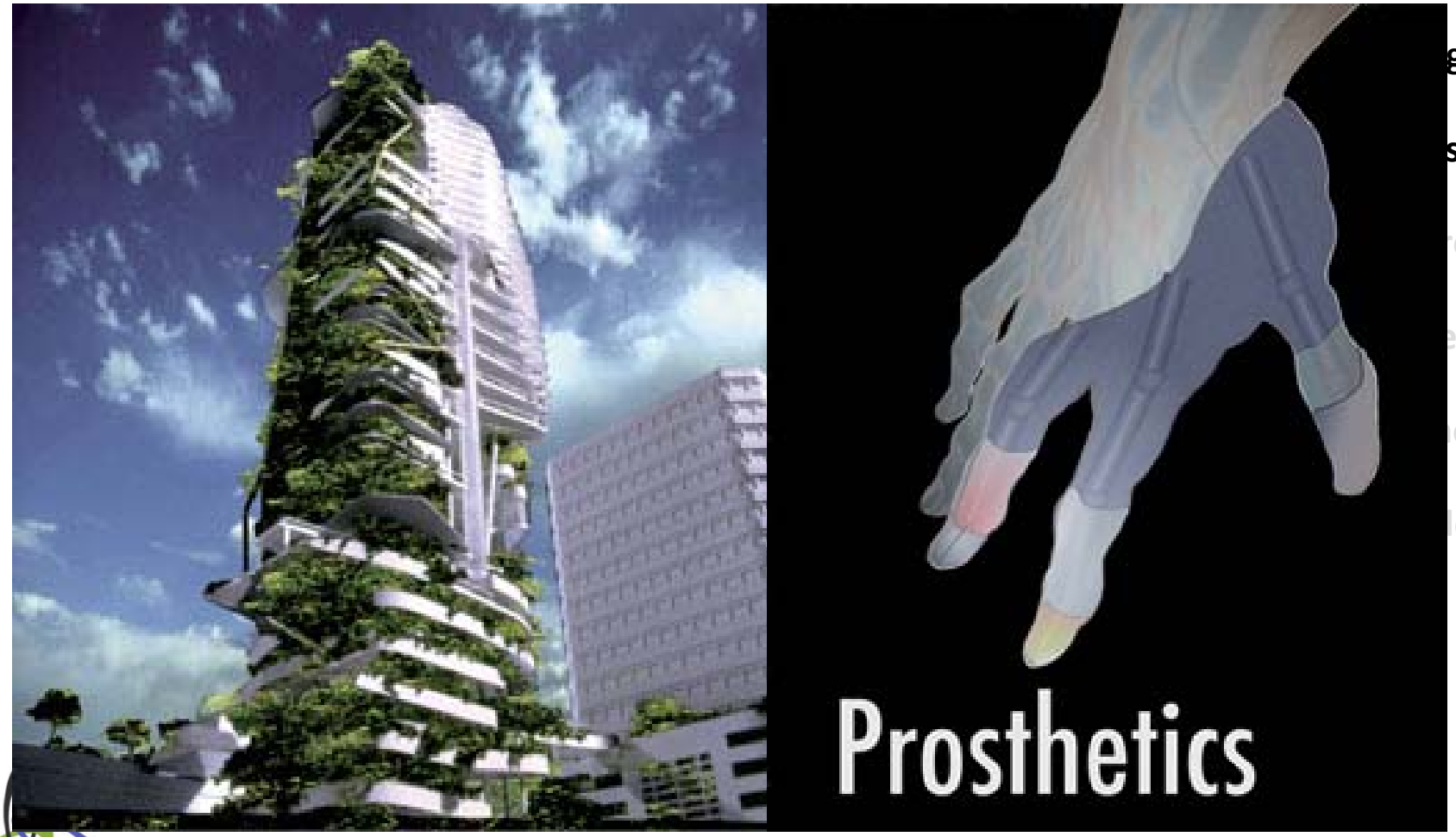
Whole-systems thinking

Interconnections between systems are actively considered and solutions are sought that address multiple problems at the same time: *Solution multipliers*

Built-Environments as Eco-system Prosthetics



- Sustainability
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Ken Yeang

Industrial Technologies Program
Oak Ridge National Laboratory

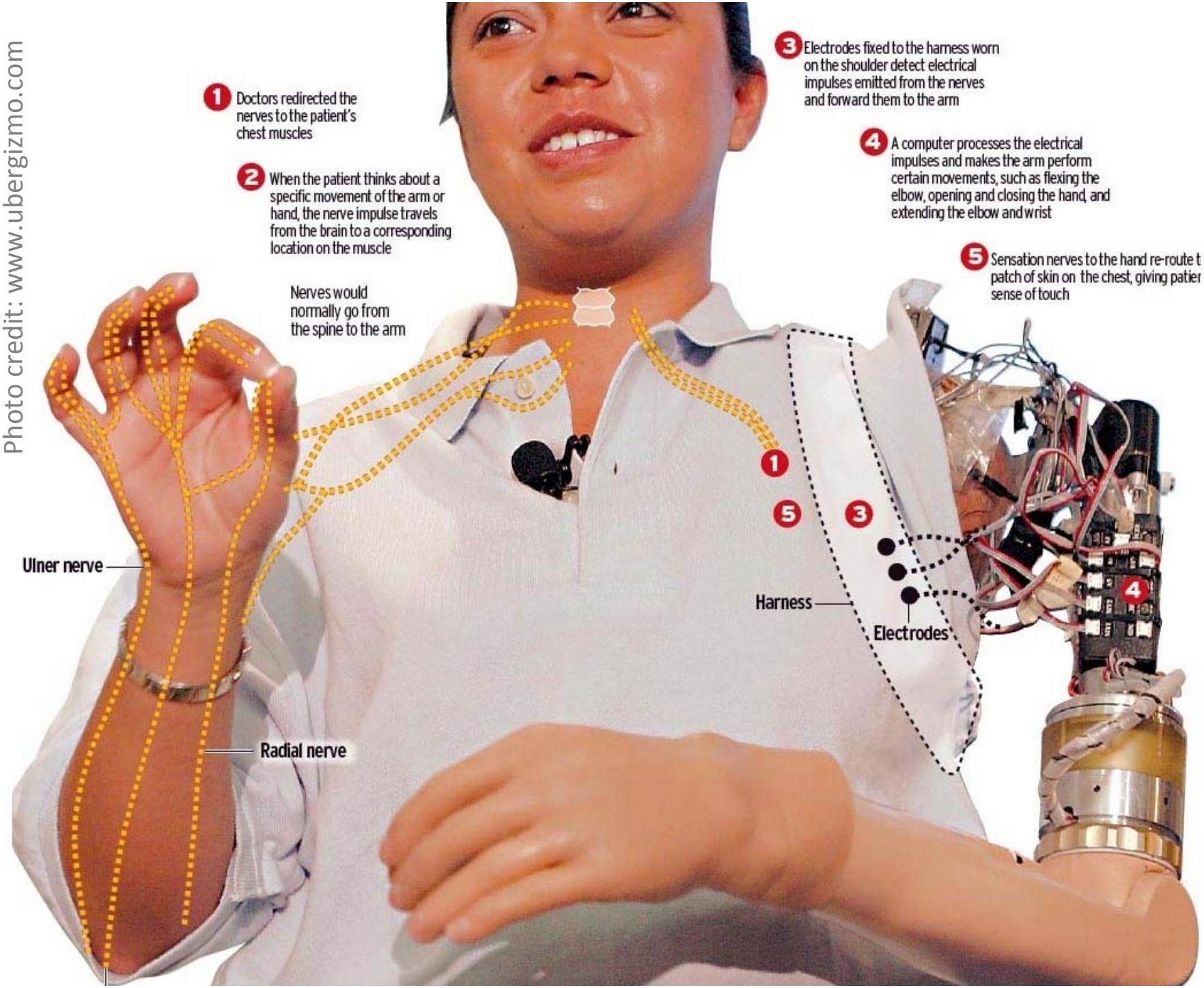

Photo credit: www.ubergizmo.com

Building = Cyborg

Cyborg

Etymology

Blend of cybernetic and organism. Term coined by Austrian neuroscientist Manfred Clynes,

[edit] Noun

(science fiction) a person who is part machine, a robot who is part organic

Cybernetics

Noun

cybernetics (*uncountable*)

The theory/science of communication and control in the animal and the machine.

The art/study of governing, controlling processes and communication.

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How do we do this?

Emergence

Wiktionary

Noun

Emergence (*plural* emergences)

1. **The act of rising out of a fluid, or coming forth from envelopment or concealment, or of rising into view; sudden uprisal or appearance.**
2. **In particular: the arising of emergent structure in complex systems.**

Sustainability

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(Strong) Emergence

Wikipedia

… is a type of emergence in which the emergent property is irreducible to individual constituents. The whole is great than the sum of its parts.

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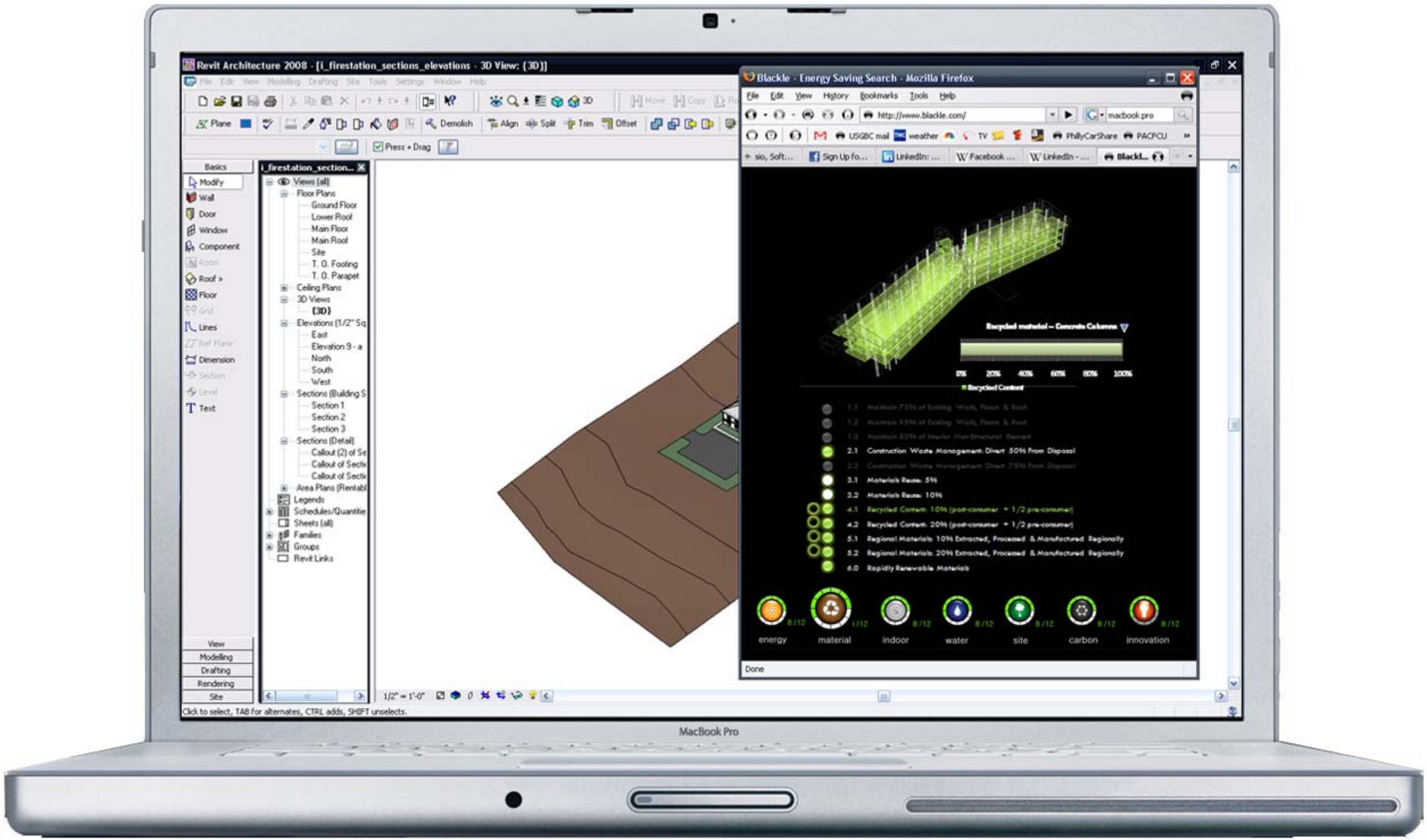
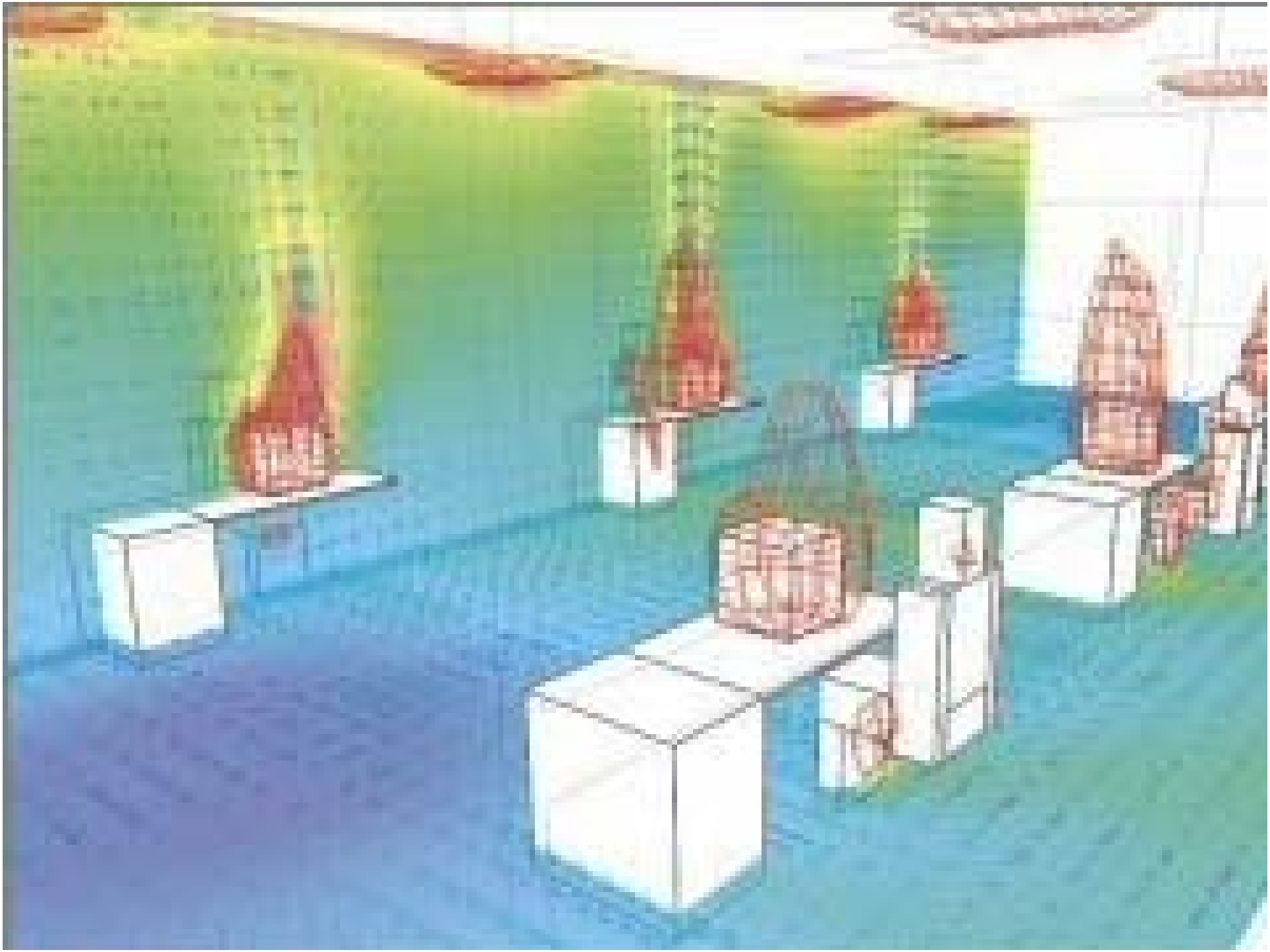
Technology

- Early Analysis
- Building Information Modeling (BIM)
  Virtual building construction
  - -Less coordination needed
    - -Between trades
    - -Between drawings
  - -More building attributes defined allowing cleaner interoperability with performance simulation tools
- Cost Analysis
- Digital Fabrication
- Design iteration (rapid prototyping)


Autodesk R
EcoRev
Building materials
Concrete
Steel
Wood
Furniture
Glass
Finishes
Furniture
Recycled material – Concrete Columns
0%
20%
40%
60%
80%
100%
Recycled Content
Materials & Resources
1.1 Maintain 75% of Existing Walls, Floors & Roof
1.2 Maintain 95% of Existing Walls, Floors & Roof
1.3 Maintain 50% of Interior Non-Structural Element
2.1 Construction Waste Management: Divert 50% From Disposal
2.2 Construction Waste Management: Divert 75% From Disposal
3.1 Materials Reuse: 5%
3.2 Materials Reuse: 10%
4.1 Recycled Content: 10% (post-consumer + 1/2 pre-consumer)
4.2 Recycled Content: 20% (post-consumer + 1/2 pre-consumer)
5.1 Regional Materials: 10% Extracted, Processed & Manufactured Regi
5.2 Regional Materials: 20% Extracted, Processed & Manufactured Reg
6.0 Rapidly Renewable Materials
Embodied Carbon (Tons)
0
50
100
150
200
Carbon
Recycled materials - Building
20%
40%
60%
80%
100%
Recycled Content
Missouri Department of Natural Resources
Jefferson City, MO
8 /12
8 /12
8 /12
8 /12
8 /12
8 /12
8 /12



Praxis
BUILDING SOLUTIONS

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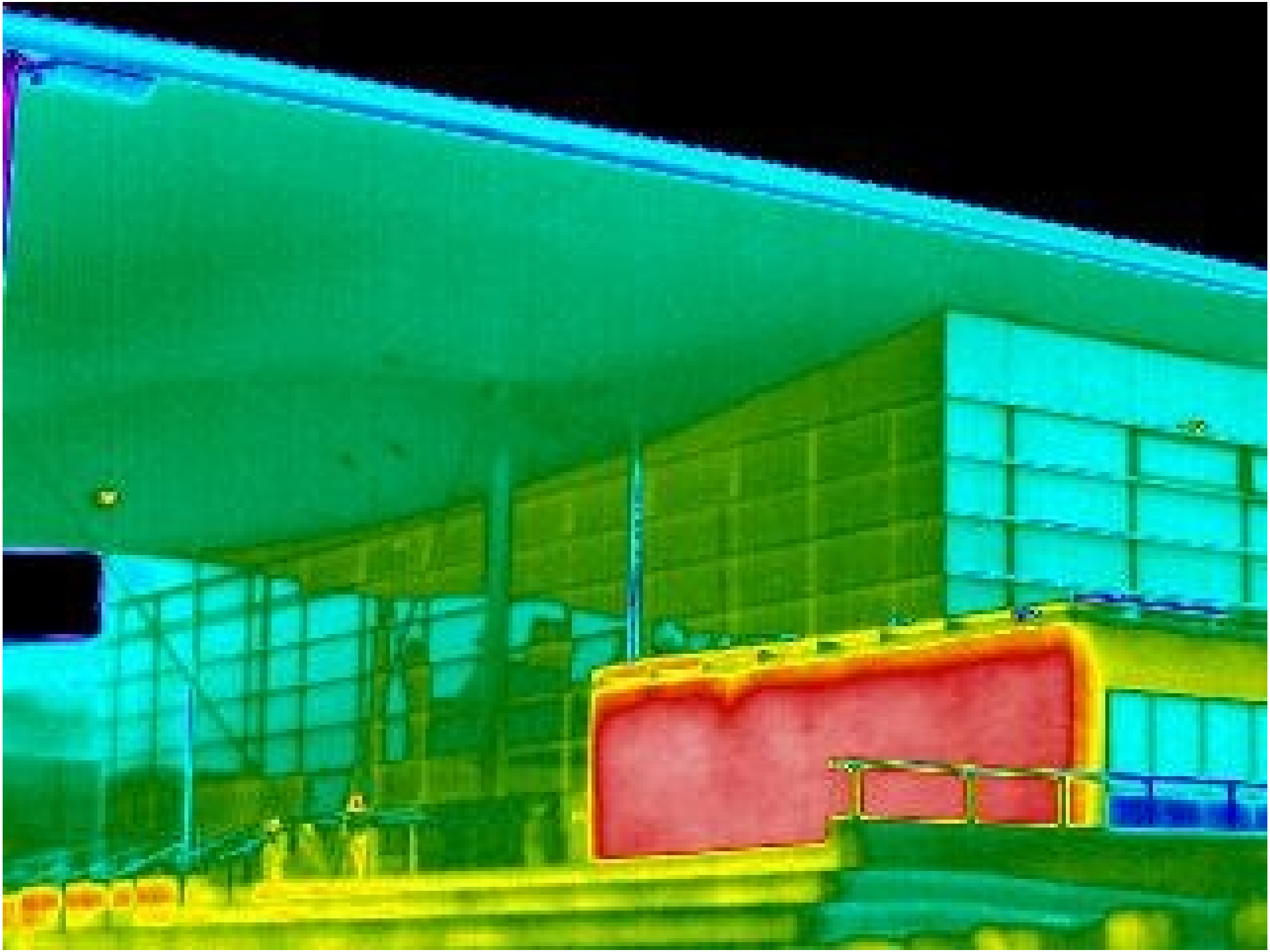
Sierra Pacific Innovations



Need a break?

Sustainability

Green Building

USGBC

LEED (overview of program)

Systems

Process

Making the Case

Technology

LEED technical details

LEED-NC

LEED-CI

"Where **talents** and the **needs of the world** cross, therein lies **your** vocation."

–Aristotle

Resources and Exploration

- Life After People (History Channel)
  - Trash

  Searh: “Life After People”, click on ‘Video’ at left
- The Story of Stuff

www.storyofstuff.com

- EPA Personal Carbon Footprint Calculator

http://www.epa.gov/climatechange/emissions/ind_calculator.html

Praxis Building Solutions - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://www.praxis-buildingsolutions.com/

Life After People Video | Keystone Regional Vo... | SKECHERS Official Sh... | GoDaddy.com: Shopp... | Web_3 | praxis hits | USGBC mail | weather | TV

Praxis Building Solutions

Praxis
(BUILDING SOLUTIONS)

A technical sustainability consulting company with clients and strategic partners including U.S. Green Building Council, Autodesk, WRT, Chrisner Group, YRG, ILiv, and Humanscale.

(UPCOMING PRESENTATIONS)

Humanscale.

DESIGN SMART SEMINARS

2/12/2008 Philadelphia
Seminar:
THE HUMAN/MASTER-SYSTEM

3/4/2008 Philadelphia
Workshop:
INTEGRATING LEED INTO YOUR PROJECTS

3/26/2008 Connecticut
Seminar:
THE HUMAN/MASTER-SYSTEM

3/27/2008 Boston
Seminar:
THE HUMAN/MASTER-SYSTEM

4/4/2008 Boston
Workshop:
INTEGRATING LEED INTO YOUR PROJECTS

4/17/2008 New York City
Seminar:
THE HUMAN/MASTER-SYSTEM

5/5/2008 New York City

Done


WRT - Symbiotic Built-Environments

I would rather work toward what I believe to be right, than against what I believe to be wrong

THANK YOU