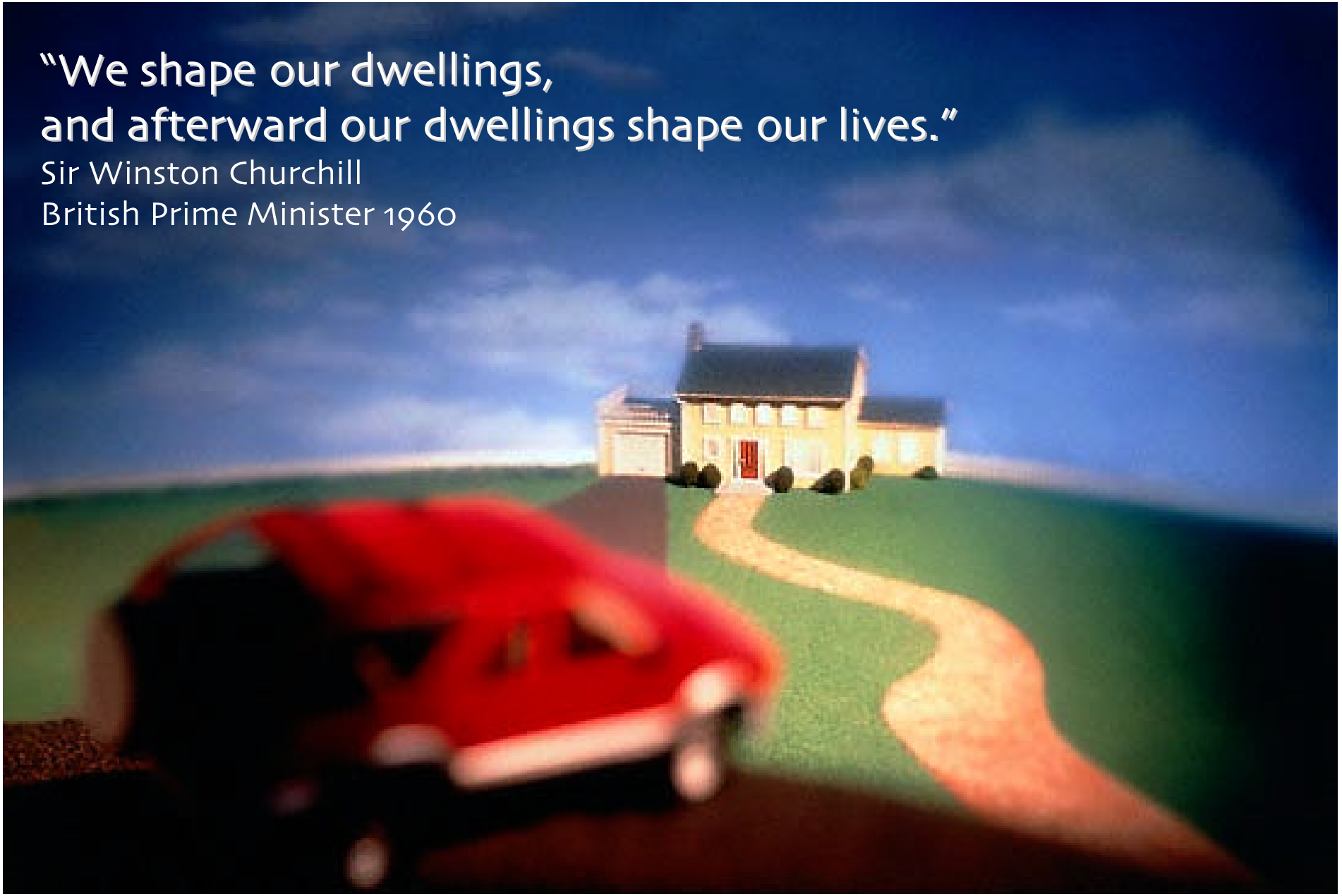


GREEN DESIGN OVERVIEW

Barbra Batshalom The Green Roundtable

What is "Architecture"?

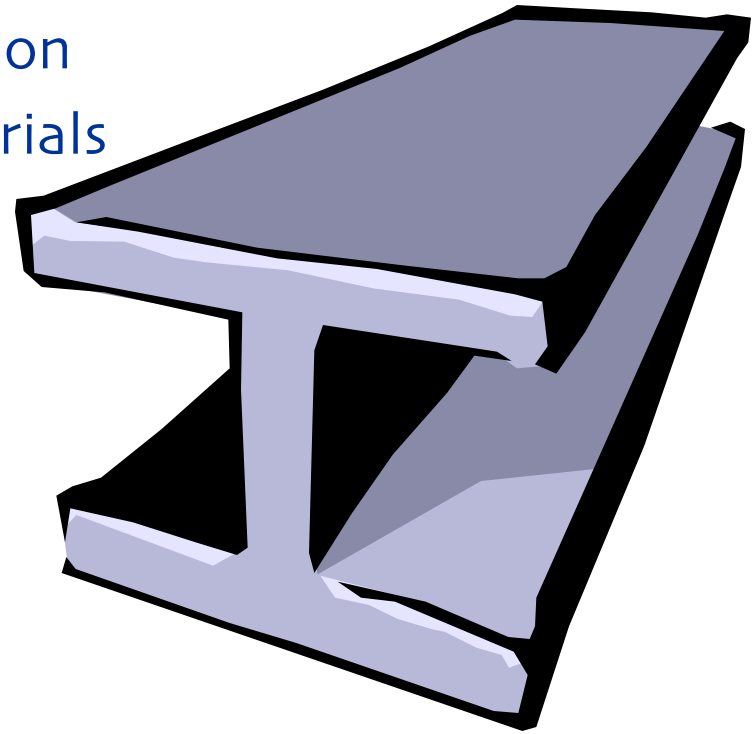
Shelter
Comfort
Aesthetics

(A place to store our stuff)

BUILDINGS IN THE USA :

Use

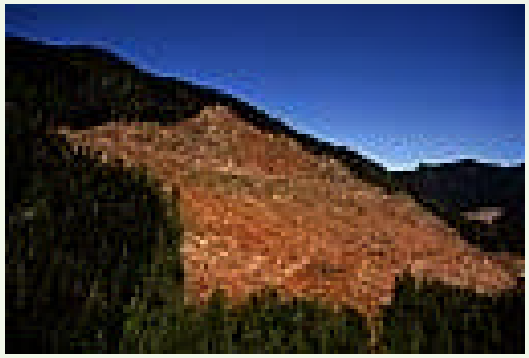
- 35 to 40% of total primary energy use in U.S.
- 65.2% of total US electricity consumption
- 30% of the US wood & other raw materials (3 billion tons /year)
- 12% of potable water in US



Contribute

- 35-38% to US air pollution
- 40% to US Co2 release
- 32 to 40% to the US municipal solid waste stream (136 million tons of C&D waste in US = ~2.8 lbs per person/ day)

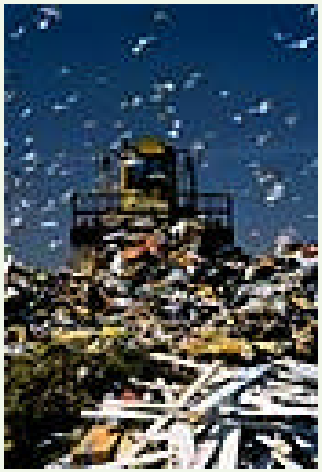
Estimate by the US Green Building Council



How did we get here?

Because up until now, we haven't designed and built our environment in a manner that sustains itself - that is aware of the far reaching consequences of our actions and decisions.

Because we haven't been considering the whole picture. Green Building seeks to address these issues in a comprehensive way, looking at the bigger picture.



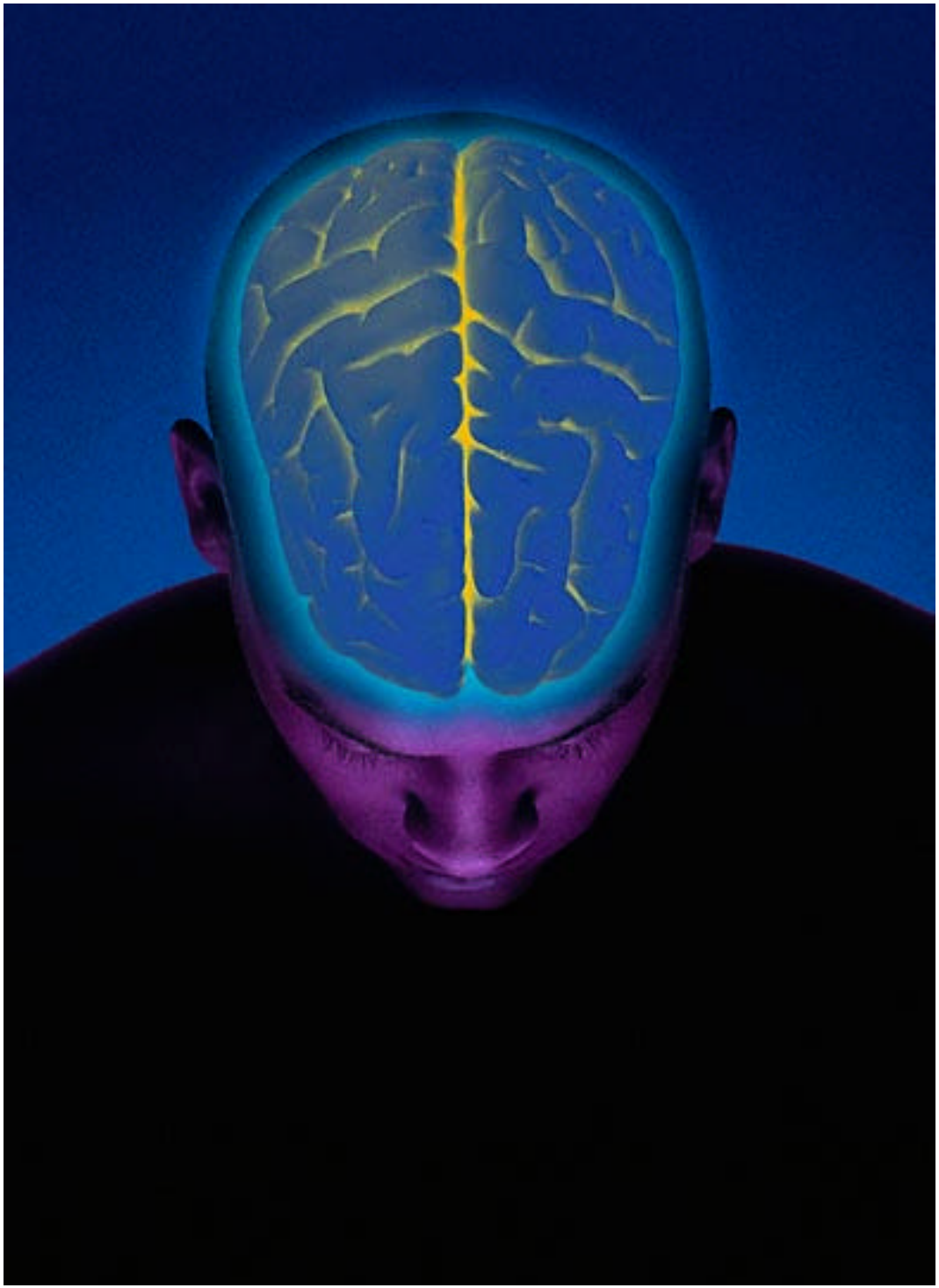
Our lens has been too narrowly focused
Not considering the larger picture….

Required:

1. A new mindset

2. A collaborative process

3. Knowledge of new Stuff (or at least feasibility) materials and systems and tools



First Element of Green Design:
The Mindset…

- This is the most difficult, and opens the door to the most possibilities and gains
- Recognizing the links, opening the Lense
- Recognizing that there are connections that we're not used to looking for…
- Incremental goals or strategies yield incremental gains

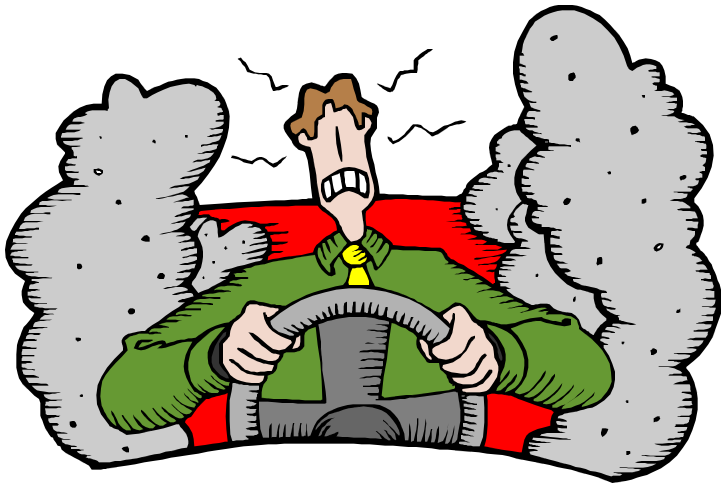
Waste Cost Accountability Connections

(RISK)

Would you buy a car with poor gas mileage, poor safety standards, no operations manual, no personal air controls, no reuse potential and maximum maintenance needs?

If not, then why do we purchase these features in buildings where we spend 80% to 90% of our time?"

-Rebecca Flora
Executive Director
Green Building Alliance - Pittsburgh
The Cornerstone Spring 2001



WASTE

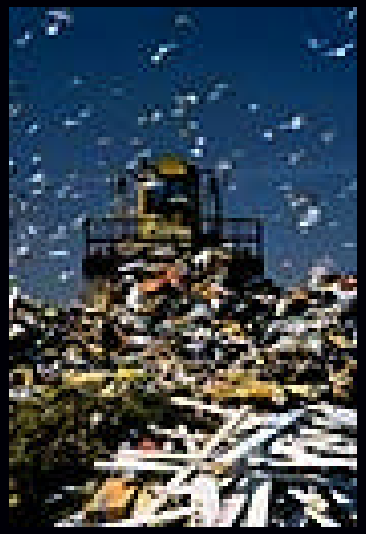
Why do we assume waste?

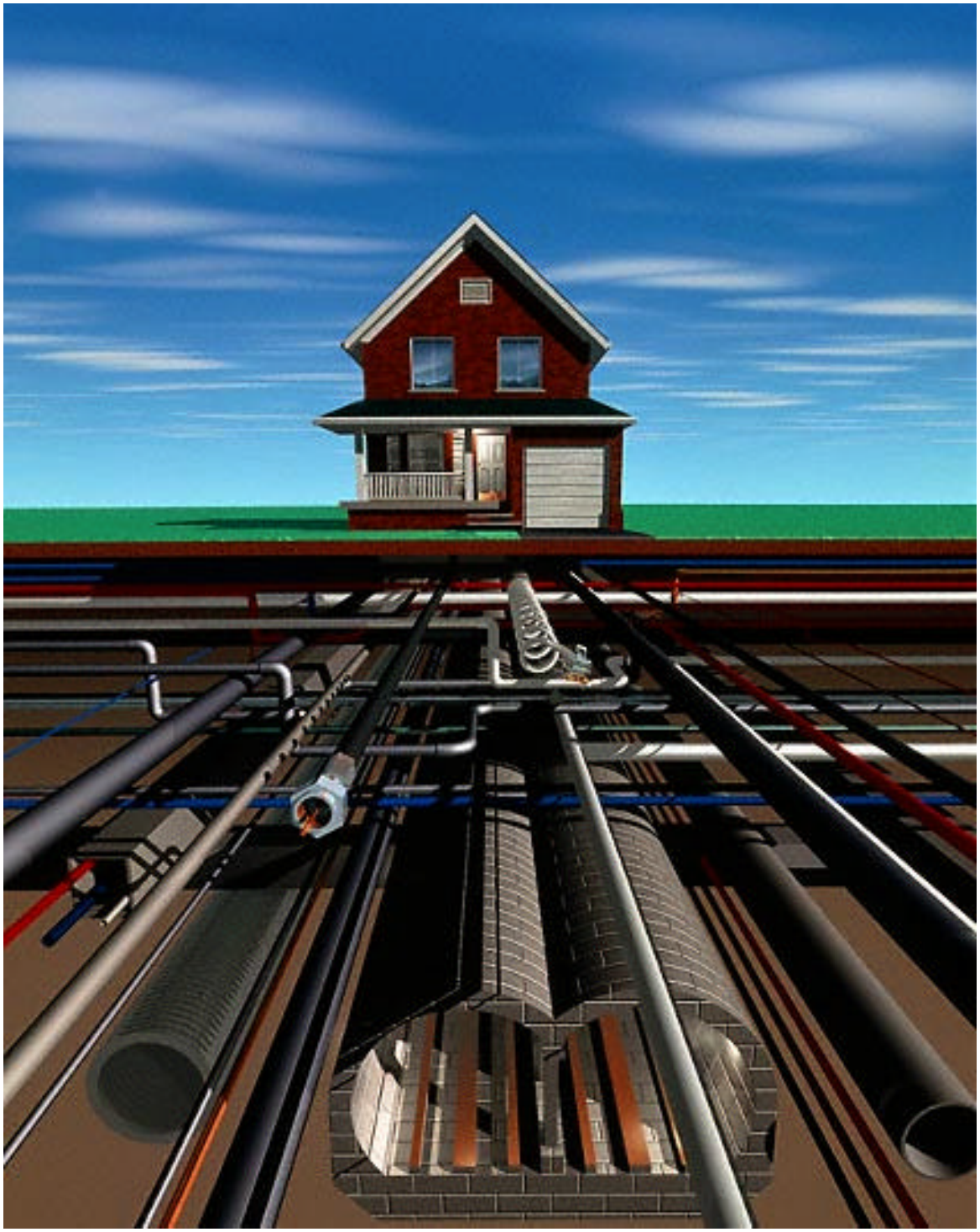
Why do we design for waste?

What if we audited all the waste from our buildings? Water,materials, energy...

What if we mined our waste as a resource?

What if we integrated our systems?





Infrastructure

What we do has many
hidden
Costs
…and less value
than we realize

Water
Energy
Waste materials
Unnecessary redundancy

Solely in the realm
of designers

We can not afford to
assume that our current
systems work and are
effective

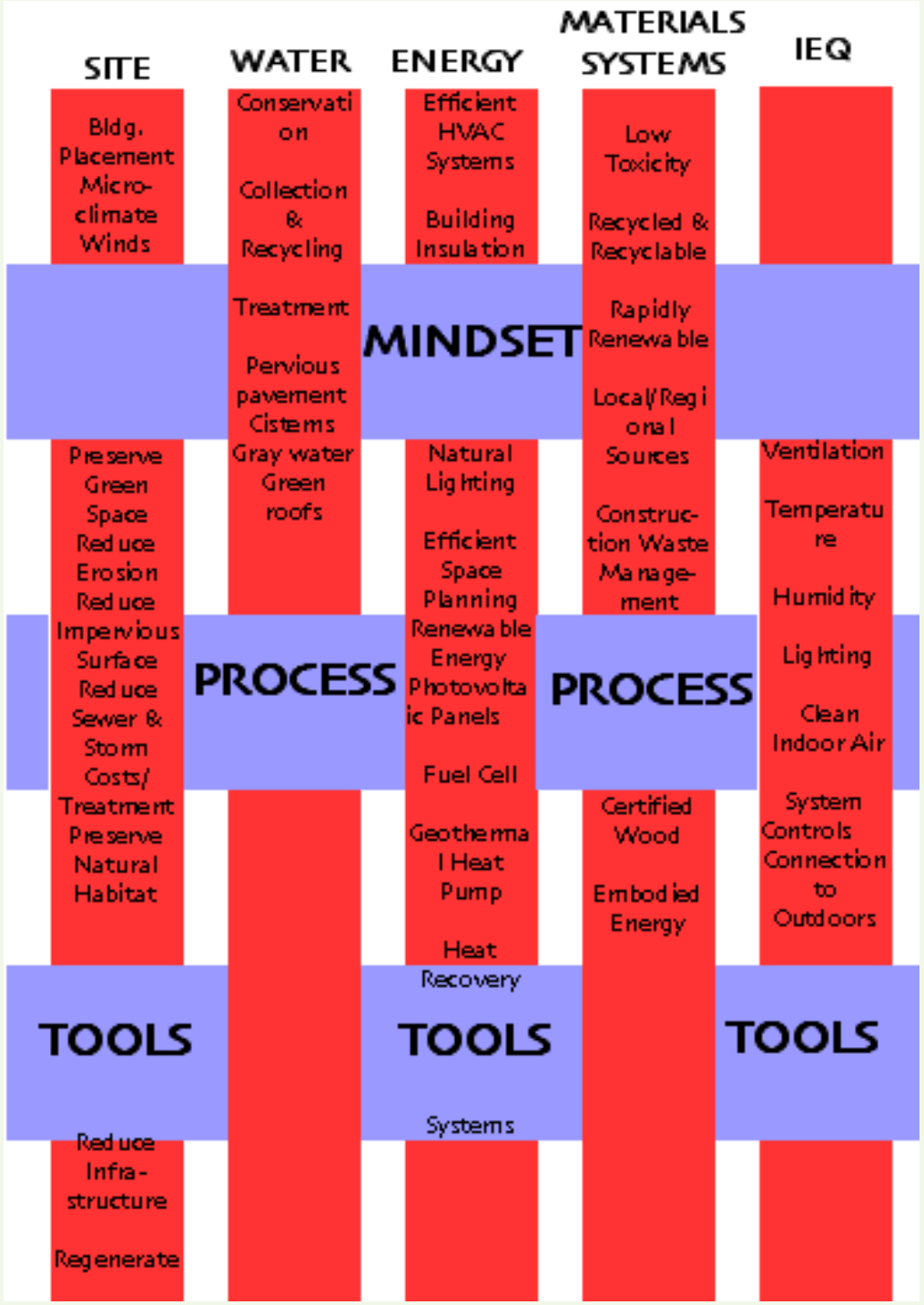
Shelter = Money

Capital costs

Operating Costs

Hidden Costs……

Life Cycle Analysis approach

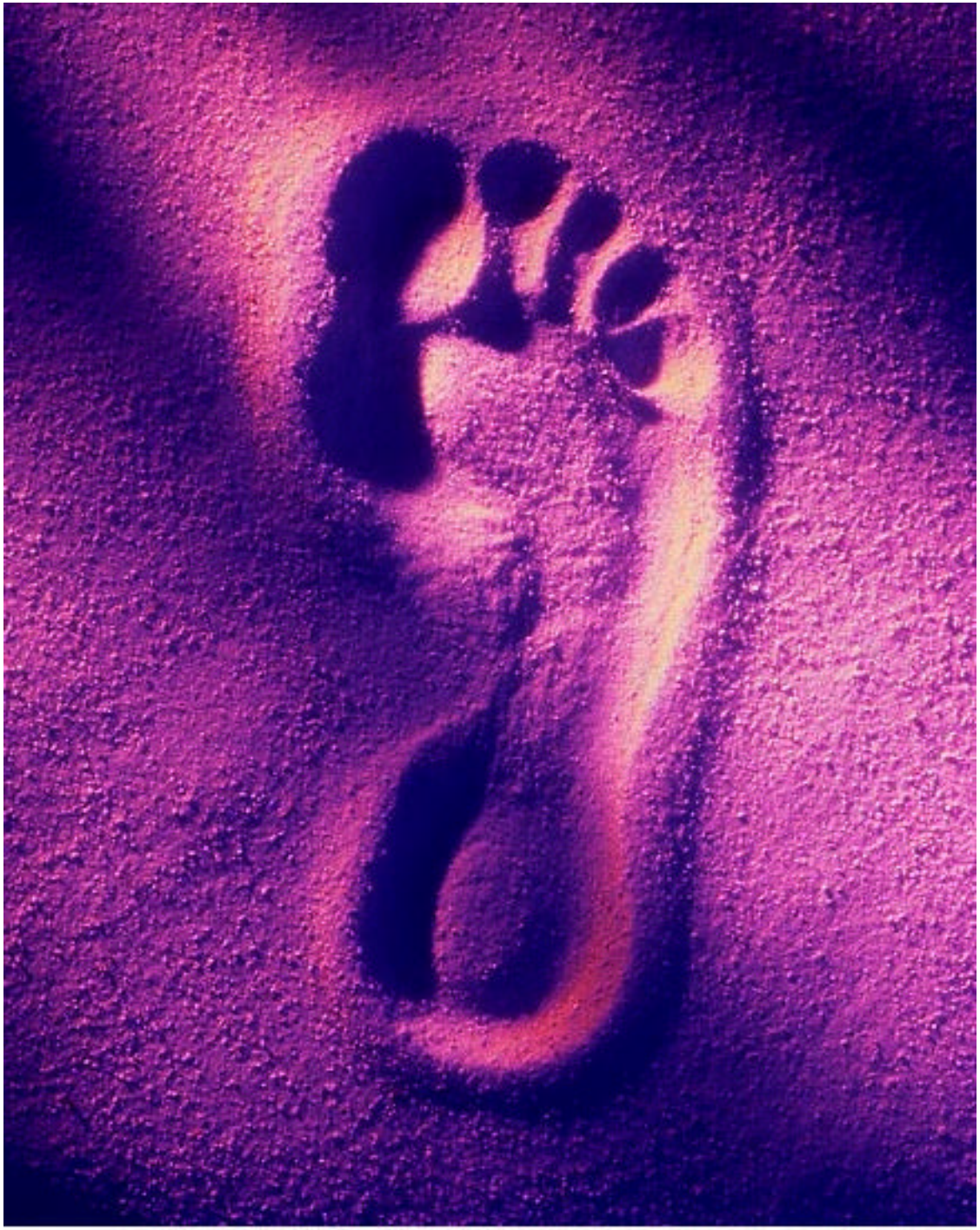


First challenge - getting beyond the pieces.

Weaving the Tapestry of our built environment

Elements of design
And pervasive concepts that determine the effectiveness of those Elements

We're dealing in SYSTEMS, not pieces.



What is the size of your footprint?

Accountability
Of
design professionals

Set Expectations
clearly -

Carrot not stick

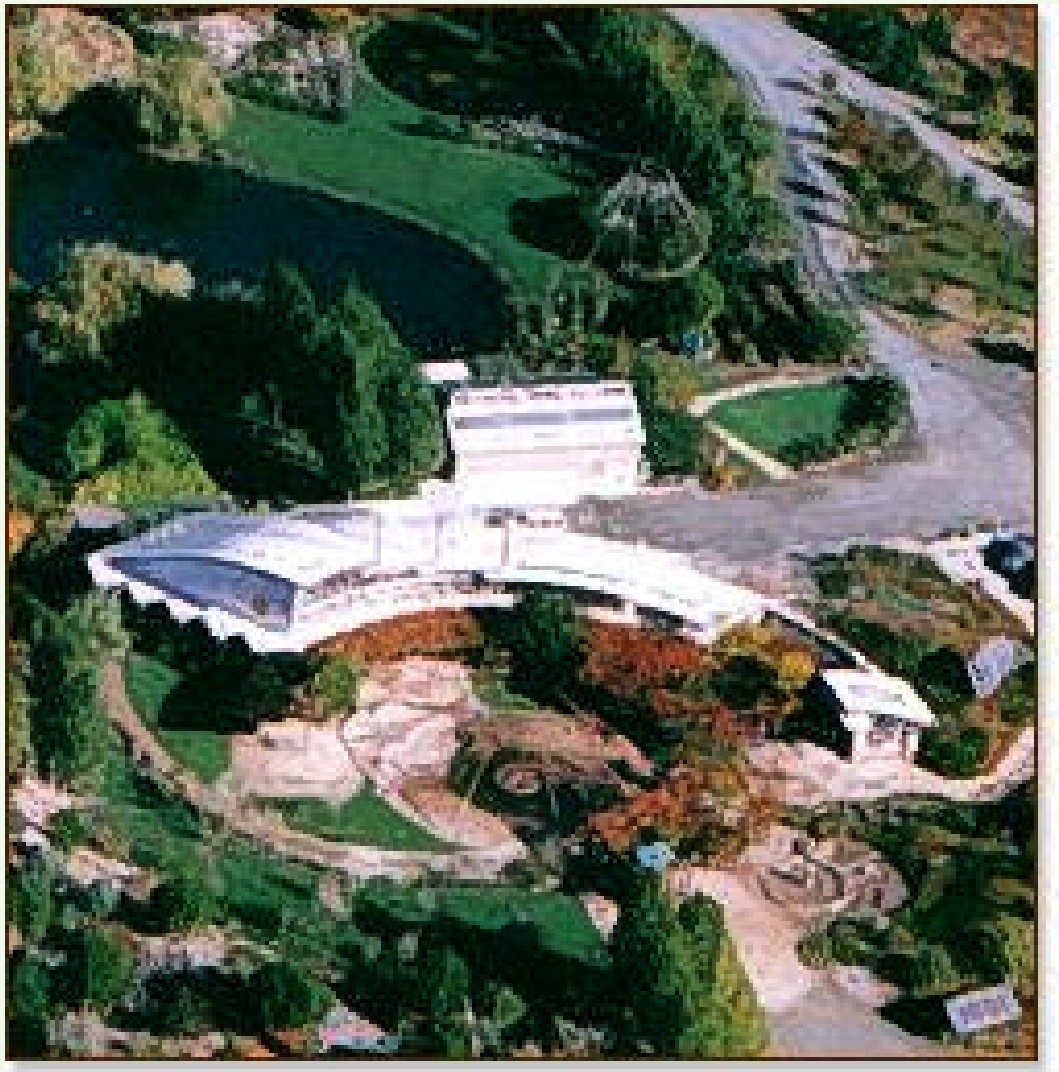
"A BUILDING IS AN OUTCOME - NOT AN OBJECT"

B. Reed/H. Brown

Therefore each building is an opportunity for:

- Building relationships
- Manifesting a vision
- Enhancing the environment

Every design intervention should solve, not create problems



Second Element of Green Design: The Process…

A collaborative, integrated design process requires Buy-In from all stakeholders

An interactive working style throughout the process, not just traditional meetings

A front loaded process

Evaluating decisions based on Life Cycle Issues rather than first cost

Deliverables / Contract language

What are we up against?

Collaborative Process

WHEN ?

As soon as possible -
feasibility studies need to reflect full scope

WHO ?

Everyone .. Input from landscape arch, facility manager/operator, contractor, community

HOW ?

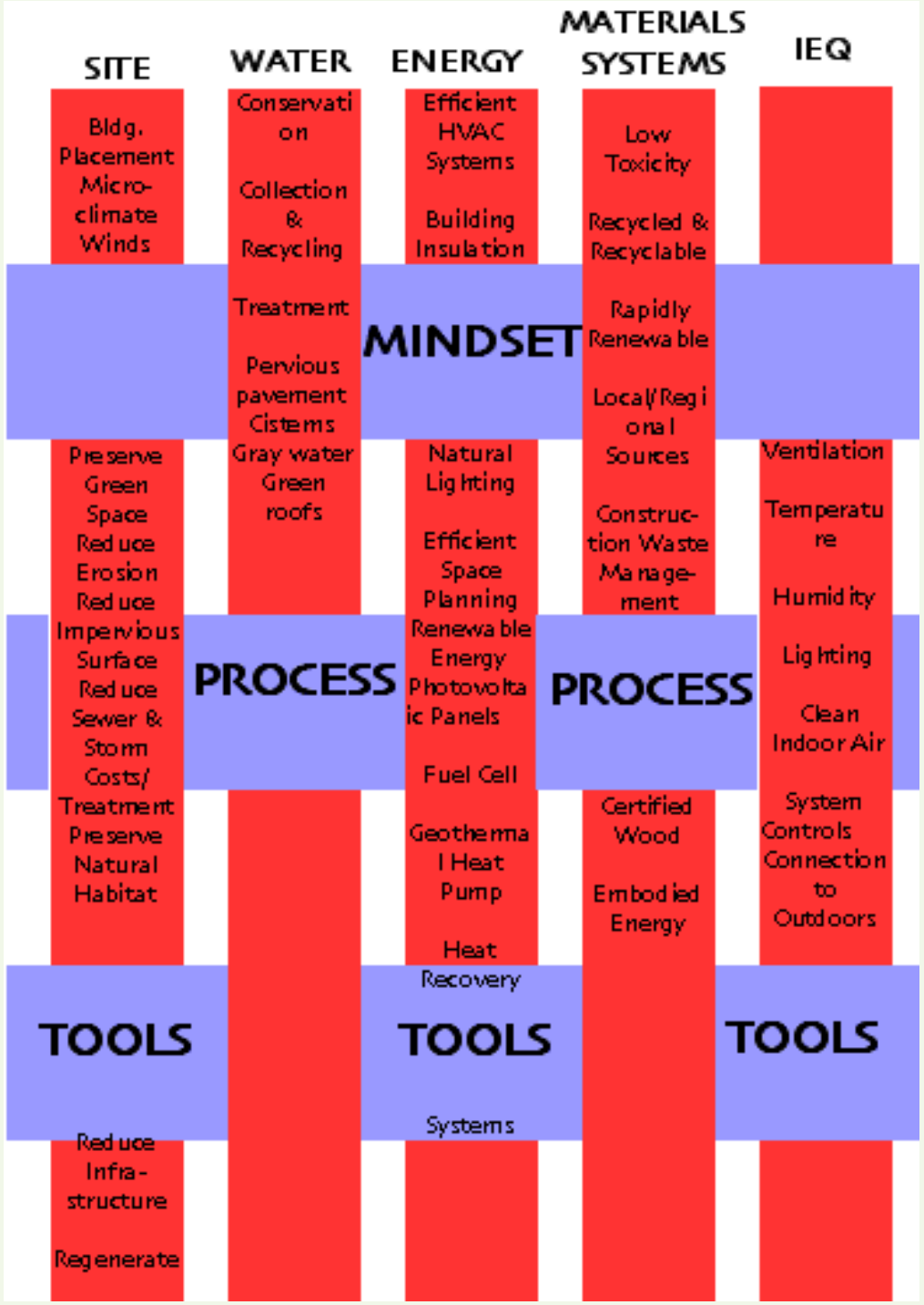
Performance oriented, not prescriptive - exploit existing knowledge and expertise

Third Element of Green Design:
The Stuff…

- Materials and specifications
  - Issues of toxicity, durability, embodied energy and Life Cycle Analysis
- Building systems and technologies
  - Gray water systems, green roofs, constructed wetlands, BIPV's
- Alternative / Renewable energy assessments
  - Feasibility and analysis, economies of scale and appropriate application
  - Tools: LEED, DOE2, Energy Star

Third Element of Green Design: **The Stuff…**

- Knowledge of technologies, systems and strategies
- Don't rely on assumptions
- Appropriate use of Stuff : Hi-Tech does not necessarily mean Green
- Economy of scale



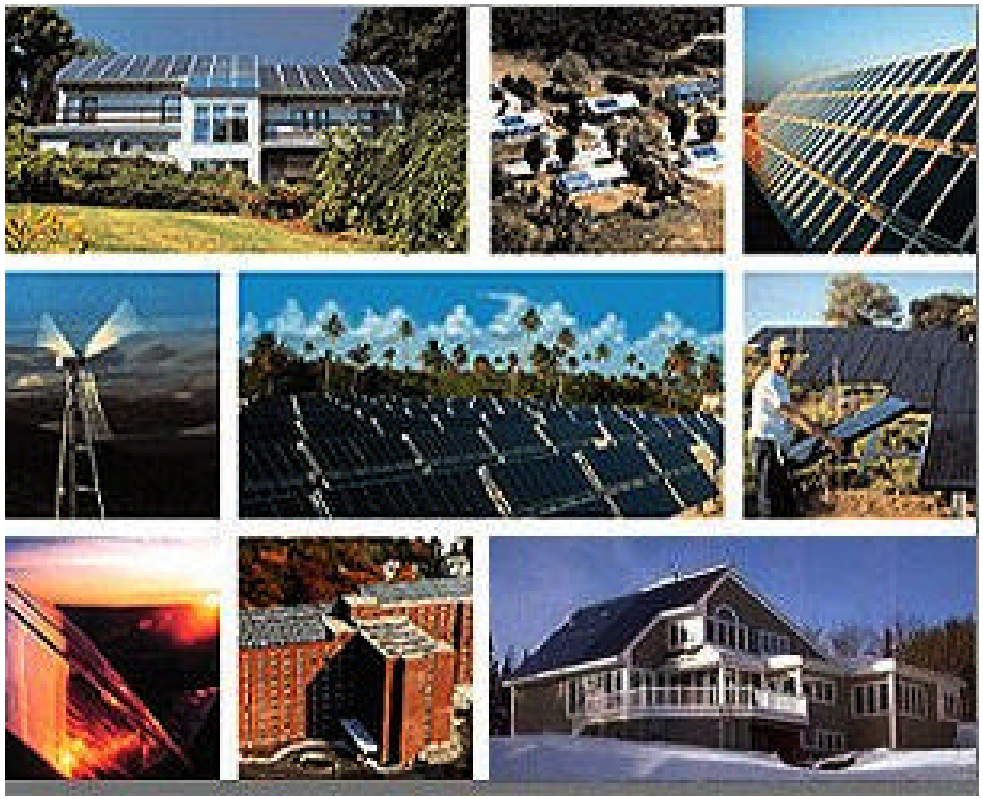
First challenge - getting beyond the pieces.

Back to the pieces,

Looking at the elements

ELEMENTS OF GREEN BUILDING that green design addresses ...

1. Sustainable Sites
2. Water Efficiency
3. Energy Management
4. Materials and Resources
5. Indoor Air Quality
6. New Technologies & Renewable Sources of Energy



BEYOND GREEN BUILDING . . .

Urban Design

Waste Treatment

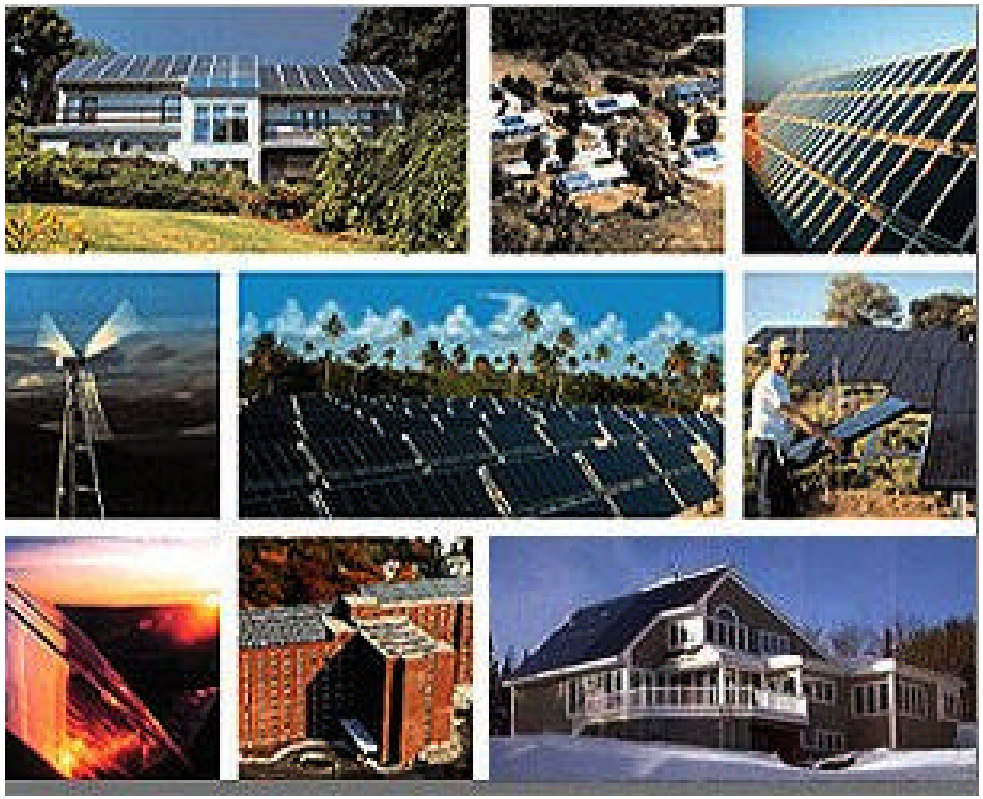
Transportation

Product manufacturing

Urban Forestry

Agriculture

Many other disciplines...



ELEMENTS OF GREEN BUILDING :

1. Sustainable Sites

- Preserve Green Space
- Reduce Sewer & Storm Costs/Treatment
- Reduce Impervious Surface
- Reduce Erosion
- Preserve Natural Habitat
- Use site intervention as a REGENERATIVE strategy (synergy between energy/water)

ELEMENTS OF GREEN BUILDING :

2. Water Efficiency/Quality

- Conservation

- Treatment
(pervious pavement, cisterns

- Collection & Recycling
(gray water or green roofs)

Photo by William G. Hartshorn

ELEMENTS OF GREEN BUILDING :

3. Energy Management

- Efficient HVAC Systems
- Building Insulation
- Natural Lighting
- Efficient Space Planning
- Renewable Energy

Basics FIRST: siting, location of mech. systems (on a black roof?), load assumptions, location of mechanical room . . .

ELEMENTS OF GREEN BUILDING :

4. Materials and Resources

- Low Toxicity
- Recycled & Recyclable
- Rapidly Renewable
- Local/Regional Sources
- Construction Waste Management
- Certified Wood
- TRANSPORTATION & EMBODIED ENERGY

ELEMENTS OF GREEN BUILDING :

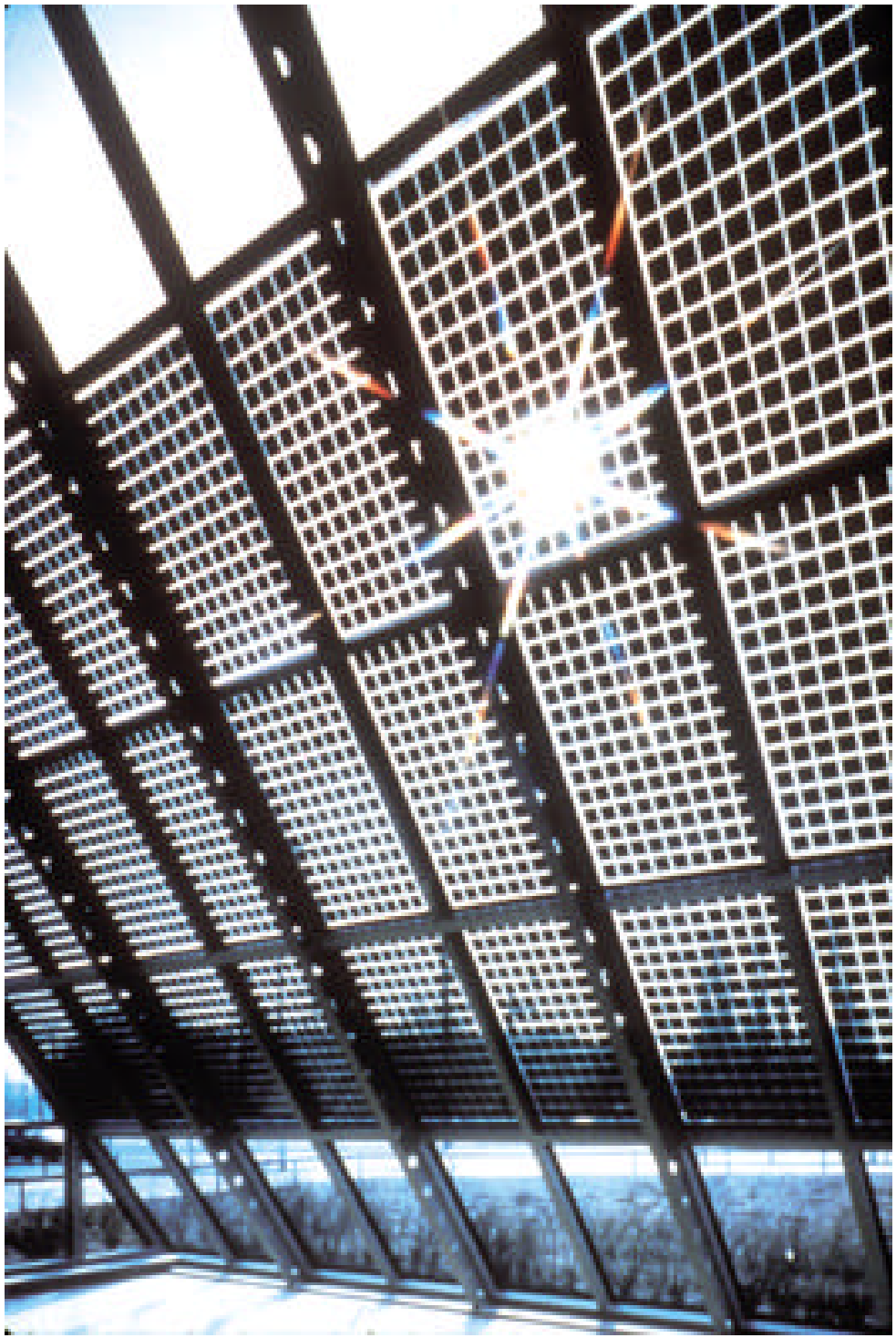
5. Indoor Environmental Quality

- Ventilation
- Temperature
- Humidity
- Lighting
- Clean Indoor Air
- System Controls
- Connection to Outdoors

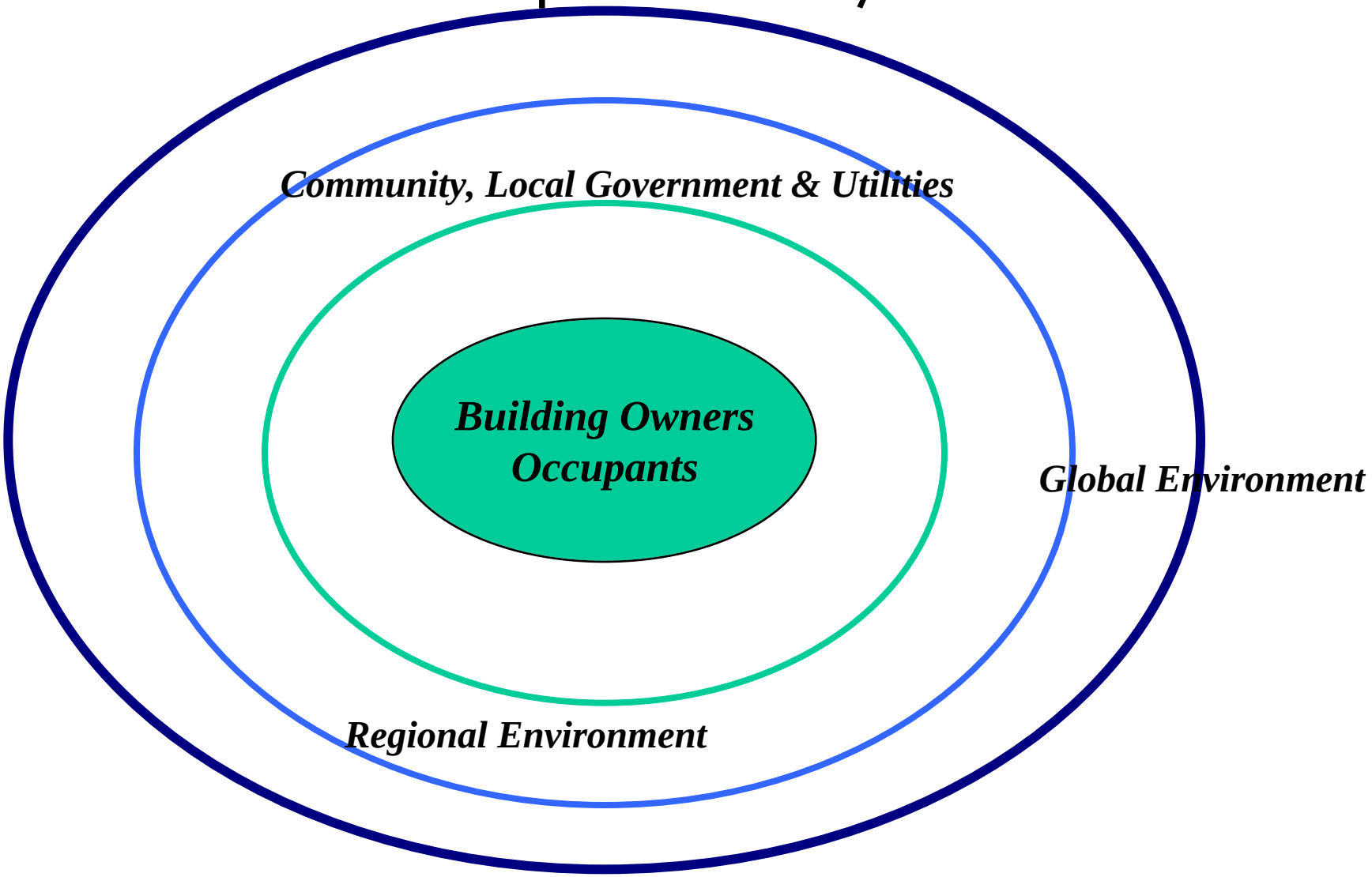
ELEMENTS OF GREEN BUILDING :

6. New Technologies and Renewable Sources of Energy

- Photovoltaic Panels
- Fuel Cell
- Geothermal Heat Pump
- Heat Recovery Systems
- … still to come



Your decisions impact every scale . . .



Be aware of connections

Leadership in Energy & Environmental Design

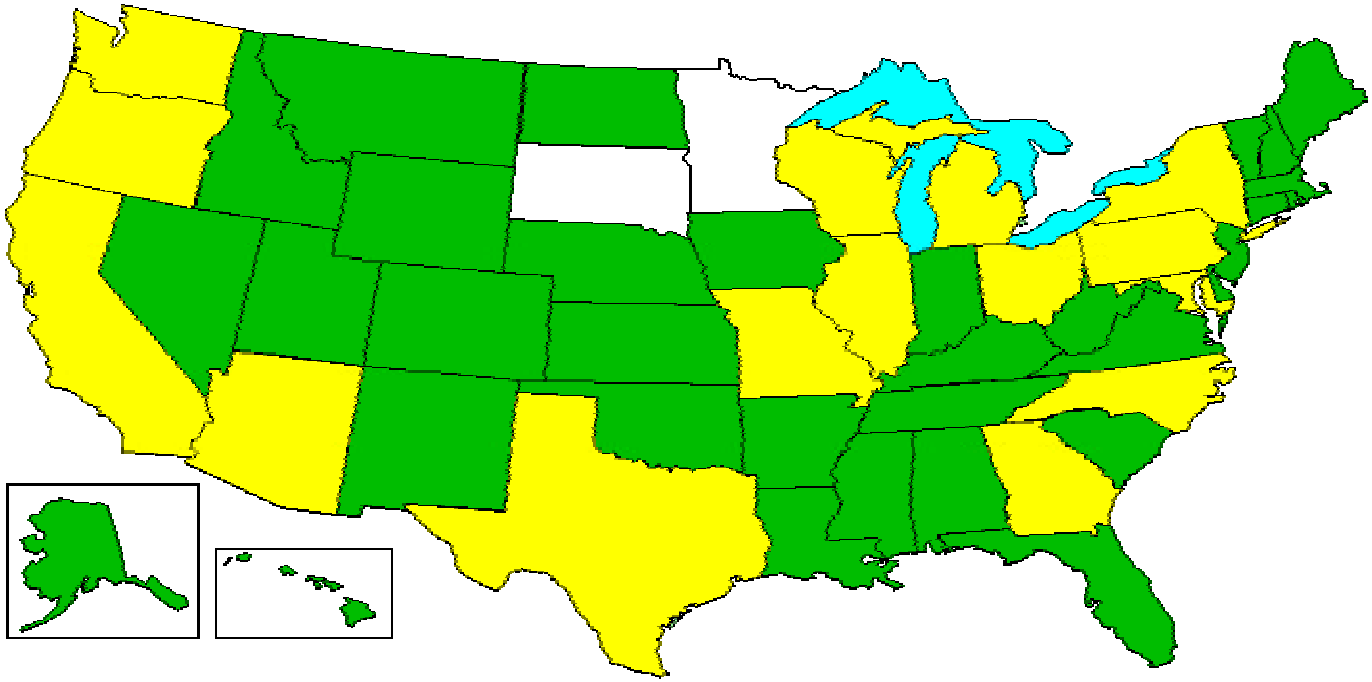
A leading-edge system for designing, constructing, operating and certifying the world's greenest buildings.

Why Was LEED™ Created?

- Facilitate positive results for the environment, occupant health and financial return
- Define “green” by providing a standard for measurement
- Prevent “greenwashing” (false or exaggerated claims)
- Promote whole-building, integrated design processes
- *TRANSFORM* the marketplace

LEED™ Market Transformation

- 38 Certified Projects*
- 601 Registered Projects*

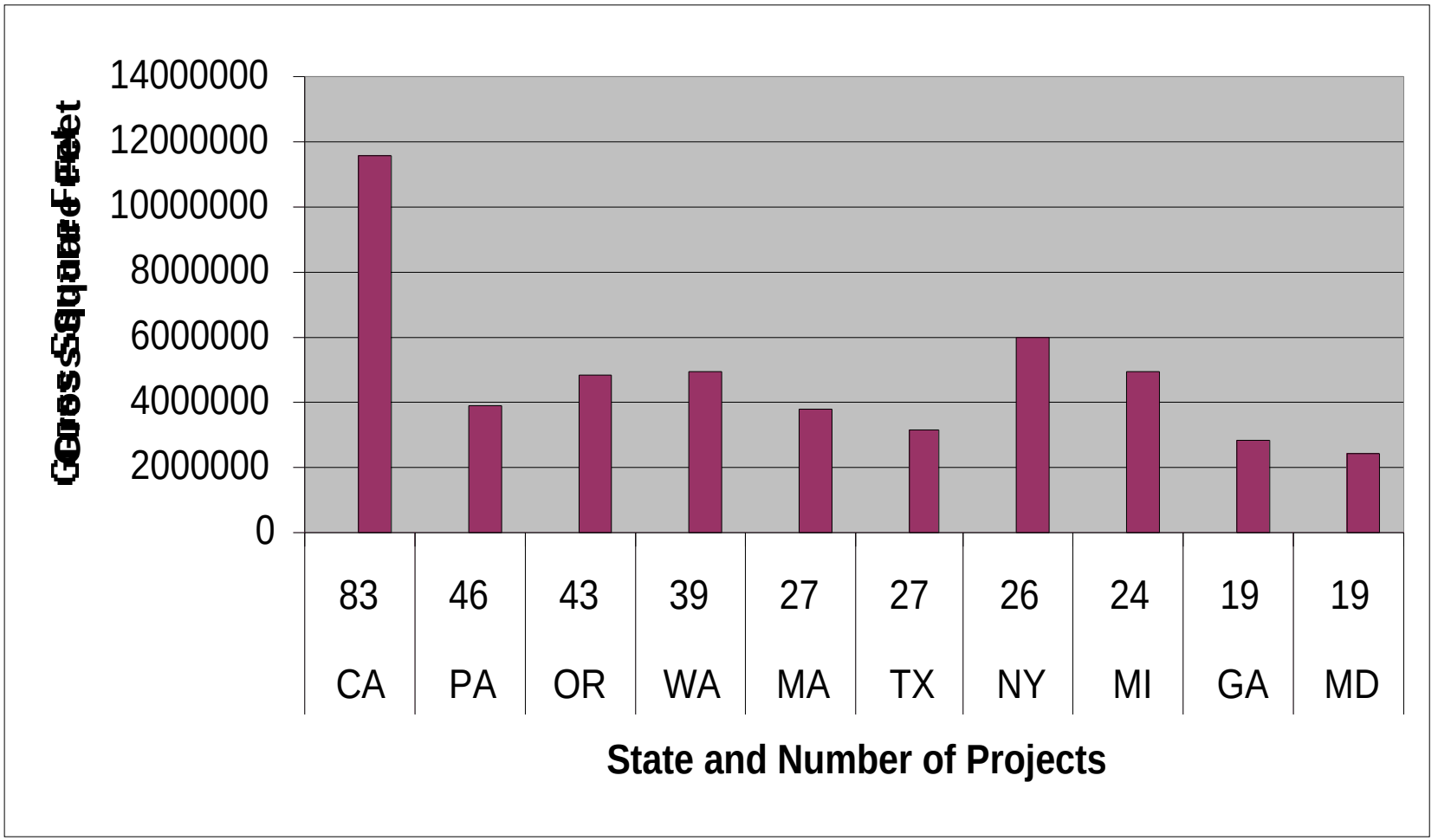


77 M gsf* 48 States 7 Countries*

*As of 12.16.02

LEED™ Market Transformation

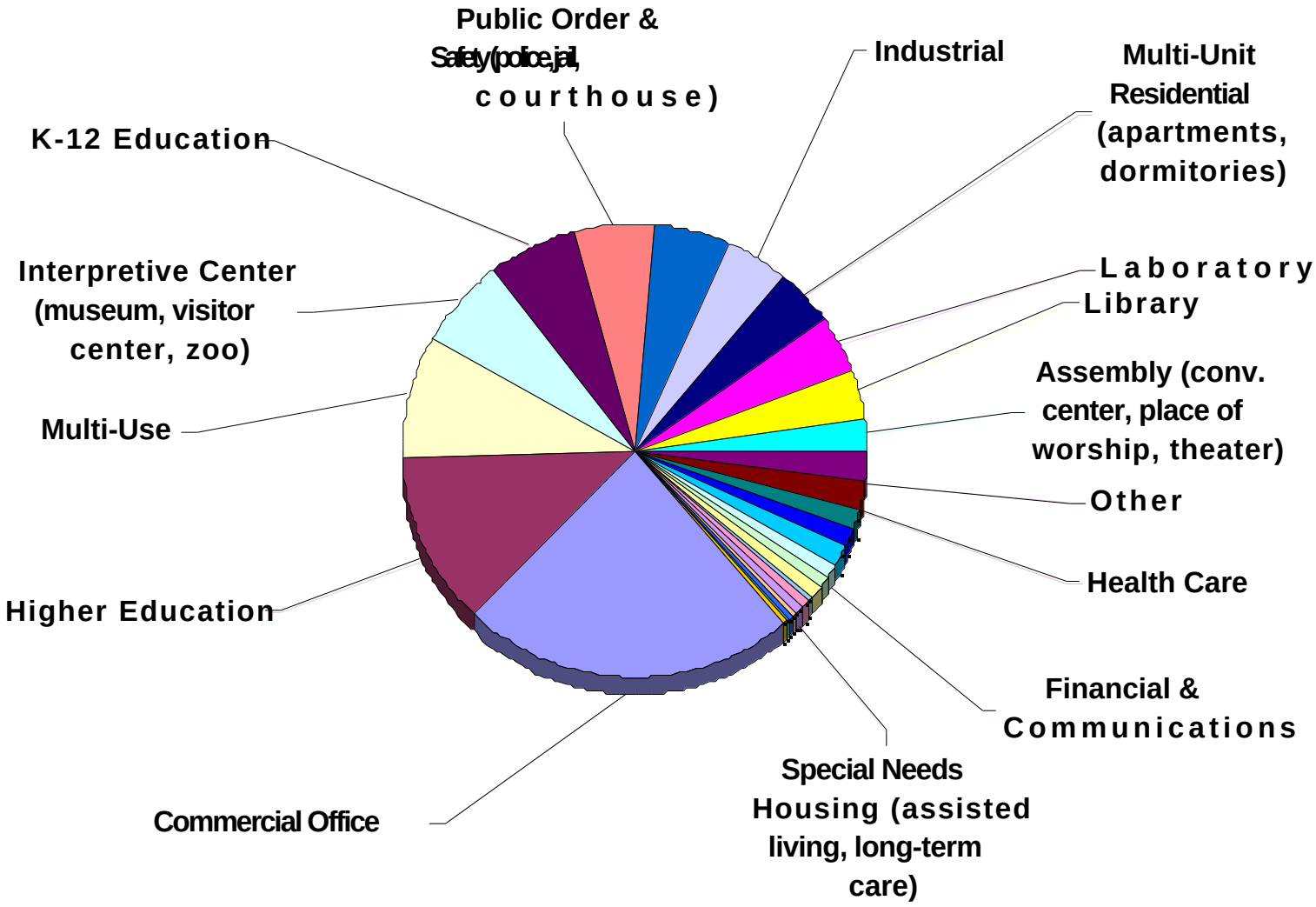
- Registered Projects by State* - Top 10



*As of 12.16.02

LEED™ Market Transformation

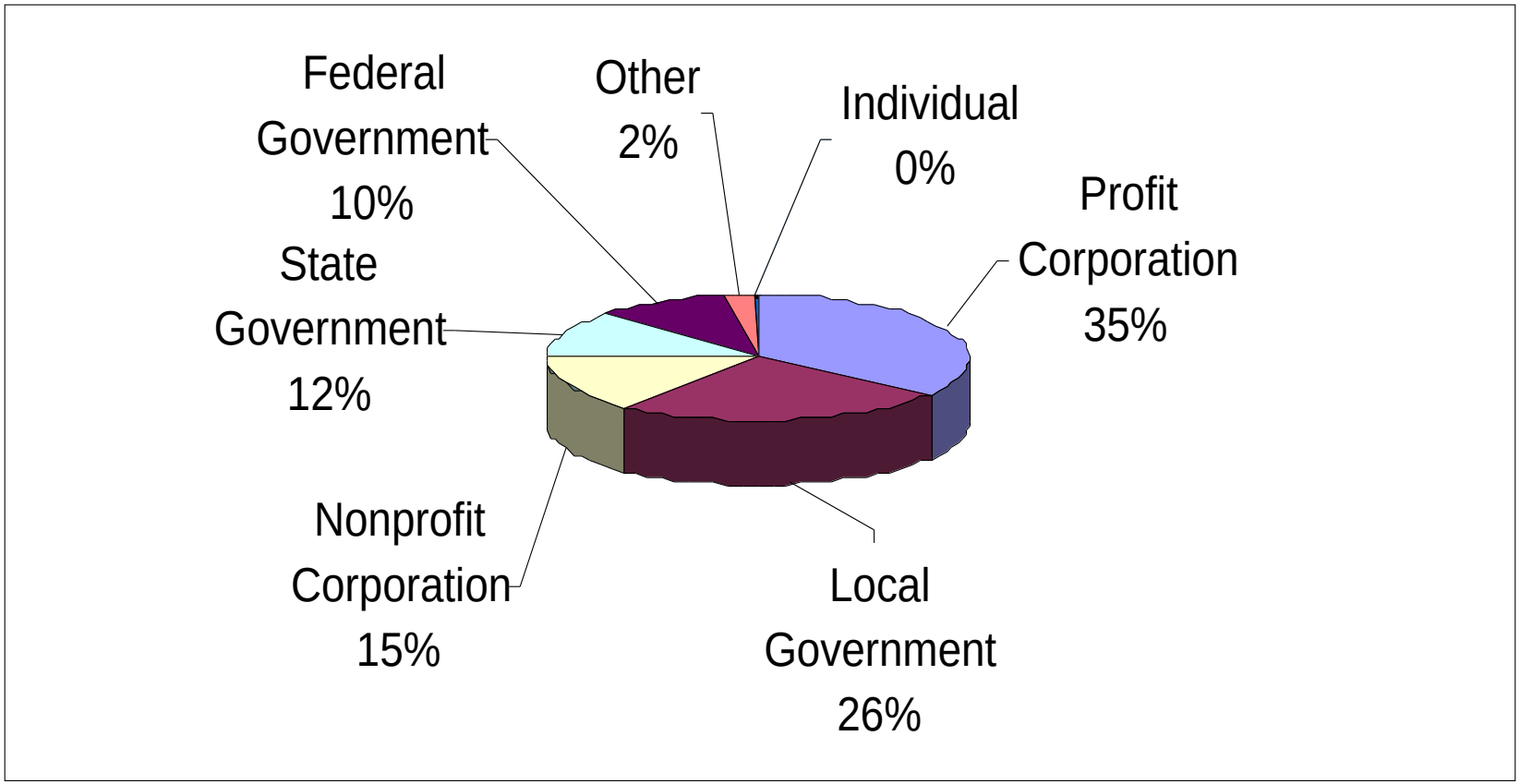
- **Registered Projects by Building Type***



*As of 12.16.2002

LEED™ Market Transformation

- Registered Projects by Owner Type*



*As of 12.16.02

LEED™ in the USA

Federal Government Use:

- **General Services Administration (GSA)**
  - LEED Certified projects beginning in 2003
- **U.S. Air Force**
  - LEED Application Guide for Lodging
- **U.S. Army Corps of Engineers**
  - Adoption of LEED™ (SPiRiT)
- **Department of State**
- **Department of Energy (DOE)**
- **Environmental Protection Agency (EPA)**
  - Grant for LEED Existing Buildings
- **U.S. Navy**
  - Grant for LEED Residential

LEED™ in the USA

State Government Use:

- California
- Maryland
- Massachusetts
- New Jersey
- New York
- Oregon
- Pennsylvania

- **Local Government LEED™ Users**
  - Austin, TX
  - Arlington, VA
  - Boulder, CO
  - Cook County, IL
  - Los Angeles, CA
  - Portland, OR
  - San Diego, CA
  - San Jose, CA
  - San Mateo, CA
  - Seattle, WA

Overview of LEED

- Green building rating system for commercial and high-rise residential
- New construction, major renovation, and built projects
- Existing, proven technologies
- Evaluates and recognizes performance in accepted green design categories
- Whole-building integrated approach
- Different LEED rating systems under development for residential, commercial interior, etc.

Overview of LEED

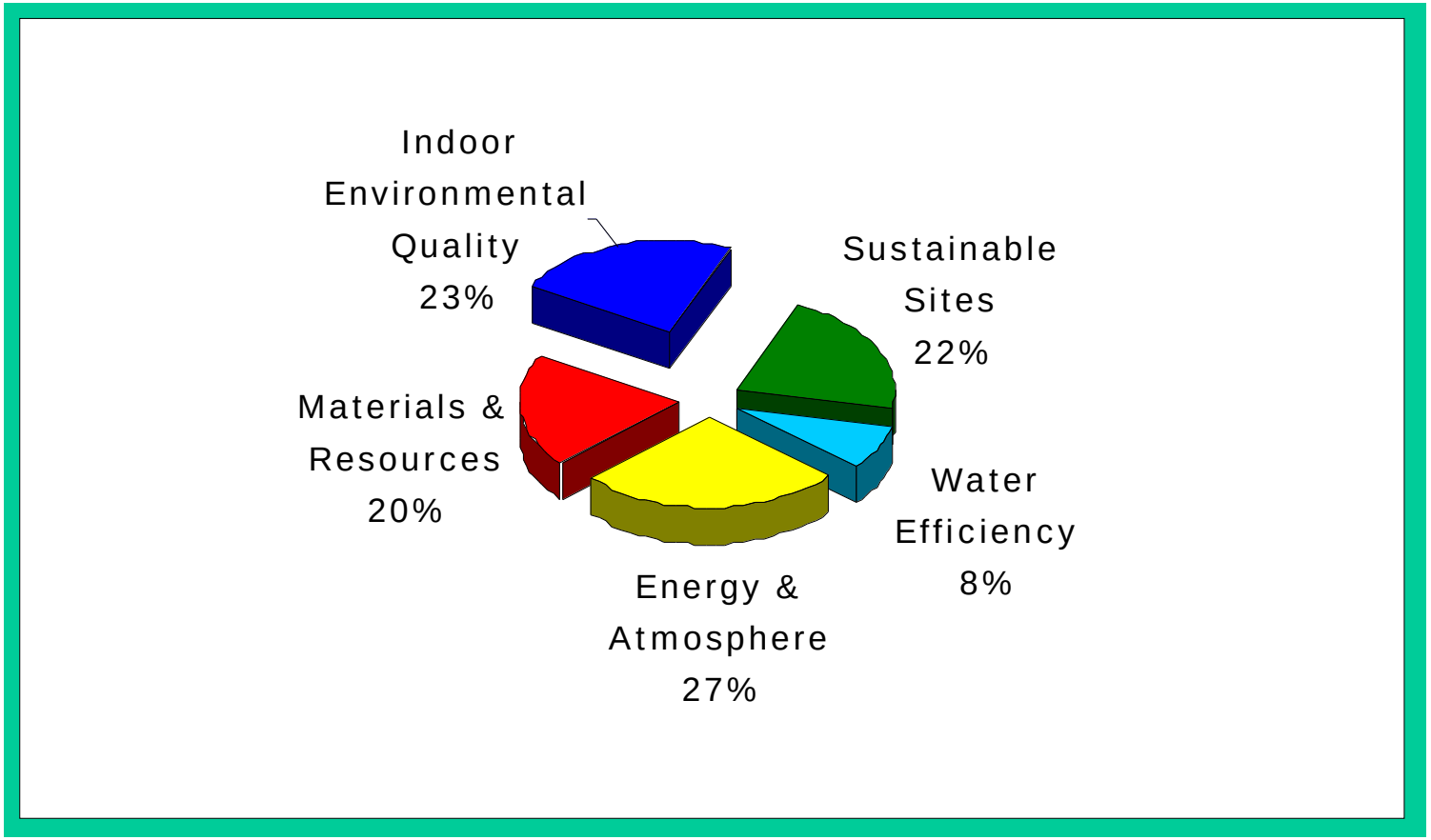
- Encourages and guides collaborative, integrated design team and construction process
- Optimizes environmental and economic factors
- Self-assessing system with 4 levels of certification

• LEED Certified	26 - 32 points
• Silver Level	33 - 38 points
• Gold Level	39 - 51 points
• Platinum Level	52 + points

LEED Rating System Design Elements

- Sustainable Sites (8 credits/14 points)
- Water Efficiency (3 credits/5 points)
- Energy and Atmosphere (6 credits/17 points)
- Materials and Resources (7 credits/13 points)
- Indoor Environmental Quality (8 credits/15 points)

LEED™ Point Distribution



Five LEED credit categories

Credit Format & Structure

- Each credit identifies the **Intent**, **Requirements** and Technologies and **Strategies** to achieve the credit

- Offers market transformation and educational information rather than simply a statement of required elements

Sustainable Sites

- Develop only appropriate sites
- Build or reuse an existing building
- Protect natural and agricultural areas
- Reduce need for automobile use
- Protect and restore the site

Sustainable Sites

Credit	Point(s)
Erosion of sedimentation control	Required
Site selection	1
Urban redevelopment	1
Brownfield redevelopment	1
Alternative transportation	1-4
Reduced site disturbance	1-2
Stormwater management	1-2
Landscape & exterior design to reduce heat islands	1-2
Light pollution reduction	1

Water Efficiency

- Reduce the quantity of water needed for the building
- Reduce Municipal water supply and treatment burden

Water Efficiency

Credit	Point(s)
▪ Water efficient landscaping	1-2
▪ Innovative wastewater technologies	1
▪ Water use reduction	1-2

Energy and Atmosphere

- Establish energy efficiency and system performance
- Optimize energy efficiency
- Encourage renewable and alternative energy sources
- Support ozone protection protocols

Energy & Atmosphere

Credit	Point(s)
Fundamental building systems commissioning	Required
Minimum energy performance	Required
CFC reduction in HVAC&R equipment	Required
Optimize energy performance	2-10
Renewable energy	1-3
Best practice commissioning	1
Elimination of HCFC's and halons	1
Measurement and verification	1
Green power	1

Materials and Resources

- Reduce the amount of materials needed
- Use materials with less environmental impact
- Reduce and manage waste

Materials and Resources

Credit	Point(s)
Storage and collection of recyclables	Required
Building reuse	1-3
Construction waste management	1-2
Resource reuse	1-2
Recycled content	1-2
Local/regional materials	1-2
Rapidly renewable materials	1
Certified wood	1

Indoor Environmental Quality

- Establish good indoor air quality
- Eliminate, reduce, manage the sources of indoor pollutants
- Ensure thermal comfort and system controllability
- Provide for occupant connection to the outdoor environment

Indoor Environmental Quality

Credit	Point(s)
Minimum IAQ performance	Required
Environmental tobacco smoke control	Required
Carbon dioxide monitoring	1
Increase ventilation effectiveness	1
Construction IAQ management plan	1-2
Low-emitting materials	1-4
Indoor chemical pollutant source control	1
Controllability of systems	1-2
Thermal comfort	1-2
Daylight and views	1-2

Additional Credits

Credit	Point(s)
Innovation	1-4
LEED Accredited Professional	1

LEED™ Certification Process

A three step process :

- Step 1: Project Registration
  - Welcome Packet and on-line project listing
- Step 2: Technical Support
  - Reference Package
  - Credit Rulings
- Step 3: Building Certification
  - Upon documentation submittal and USGBC review

Certification Benefits

Recognition of Quality Buildings and Environmental Stewardship

- Third party validation of achievement
- Qualify for growing array of state and local government incentives
- Contribute to growing knowledge base
- LEED certification plaque to mount on building
- Official certificate
- Receive marketing exposure through USGBC Web site, case studies, media announcements

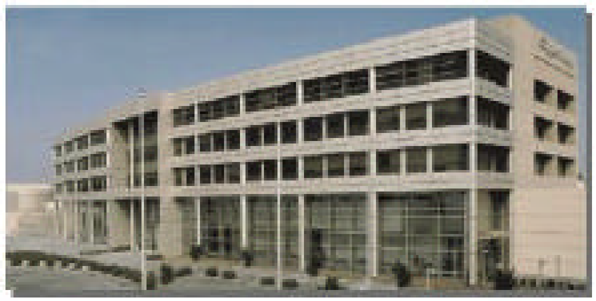
LEED™ Resources

- LEED Green Building Rating System
- Training Workshop
- Reference Package
- Professional Accreditation
- Welcome Packet
- Credit Rulings
- Website **(www.leedbuilding.org)**
- Email **(leedinfo@usgbc.org)**

Diverse Owners and Buildings:

Examples of Certified Projects

Premier Automotive Group North American Headquarters
Irvine, California



Owner:	Ford Motor Company
Project Team:	
Architect:	LPA, Inc.; SWA Group (landscape)
Engineers:	Brandow & Johnston (structural); Tsuchiyama & Kaino (mechanical/plumbing); Konsortium 1 (electrical)
Contractor:	Kell Construction, L.P.
Consultant:	CTG Energetics, Inc. (sustainability, energy and building commissioning)
Building Statistics:	
Completion Date:	November 2001
Cost:	$61 Million (construction contract only)
Size:	253,000 gross square feet
Footprint:	74,000 square feet
Construction Type:	Commercial/Industrial
Use Group:	Office and Design Center
Lot Size:	17.5 acres
Annual Energy Use:	24,356,810 kBtu
Occupancy:	788

LEED Version 2.0 CERTIFIED

Sustainable Sites
- Alternative Transportation: Three bus routes are located within ¼ mile, bicycle racks and showers provided; 30 electric vehicle recharging stations provided.
- Reduced Heat Islands: 37.5% of all impervious areas are shaded; 16.6% of non-roof impervious areas have a reflectance of 0.3 (light-colored concrete); Energy Star labeled roofing covers 45% of roof; 39% of roof is vegetated.

Water Efficiency
- Water Efficient Landscaping: Drought-tolerant plants and a high efficiency drip irrigation system with rain sensors reduces irrigation water use by 67.2%. Irrigation system uses reclaimed water.
- Innovative Wastewater Technologies: All toilets use reclaimed water, accounting for more than 50% of total sewage conveyance.
- Water Use Reduction: low-flow fixtures; two waterless urinals.

Energy and Atmosphere
- Optimize Energy Performance: Exceeds ASHRAE 90.1-1999 by 40% using a high efficiency glazing system, high efficiency lighting with T5 lamps, an underfloor air distribution system in office tower, increased chiller efficiency and a variable speed drive on one chiller.
- Ozone Depletion: Base building HVAC&R equipment uses R-134a refrigerant, which is chlorine-free and non-ozone depleting.

Materials and Resources
- Construction Waste Management: 57% of all construction waste was recycled including concrete, asphalt, paper, metal and cardboard.
- Recycled Content: 35% of the total materials, measured by LEED's weighted cost value formula, contain post-consumer and/or post-industrial recycled content.
- Local/Regional Materials: 32% of total materials, measured by USGBC's weighted cost value, are manufactured within 500 miles – including concrete, landscape materials, reinforcing steel, gypsum and stud assemblies; of those materials, 57% were harvested, extracted or recovered within the 500 mile radius.

Indoor Environmental Quality
- Construction IAQ Management Plan: All ducts and permeable materials were protected against contamination during construction; all construction filtration media were replaced before occupancy.
- Low-Emitting Materials: Carpets meet CRI Green Label standards.
- Thermal Comfort: Complies with ASHRAE Standard 55-1992, Addenda 1995.
- Daylight & Views: More than 95% of occupants have views from at least 90% of their work areas.

Innovation & Design Process
- Vertical landscaping increases vegetation, provides oxygen, and screens parking garage from view; reclaimed water is used for 100% of wastewater conveyance.

New York State Department of Environmental Conservation Office Complex at 625 Broadway Avenue

Albany, New York

Owner:	Picotte Companies	
Project Team:	Architect:	*Woodward Connor Gillies and Seleman Architects*
	Engineer:	*Quantum Engineering*
	Contractor:	*Beltrone Construction*

Building Statistics:

Completion Date:	*September 2001*
Cost:	*N/A*
Size:	*471,000 gross square feet*
Footprint:	*45,600 square feet*
Construction Type:	*Commercial*
Use Group:	*Office*
Lot Size:	*2.18 acres*
Annual Energy Use:	*22,232,209 kBtu/year*
Occupancy:	*1700 Staff*

LEED Version 2.0 *Silver*

Sustainable Sites

- Urban Redevelopment: *Urban infill site was previously a gravel parking lot.*
- Alternative Transportation: *Located 80 yards from 4 bus lines; bicycle racks and showers; 15 electric vehicle charging stations; priority carpool parking.*
- Reduced Heat Islands: *Stacked parking; light colored concrete used on 99% of non-roof impervious surfaces; 68% of parking surfaces shaded; Energy Star labeled roof.*

Water Efficiency

- Water Efficient Landscaping: *Native plants require no irrigation.*

Energy and Atmosphere

- Optimize Energy Performance: *Exceeds ASHRAE/IESNA 90.1-1999 by 23.7%.*
- Additional Commissioning: *Verified that the building is designed, constructed and calibrated to operate as intended.*

Materials and Resources

- Construction Waste Management: *51% of construction waste was recycled.*
- Recycled Content: *93% of materials, measured by LEED's weighted cost value formula, contain recycled content (e.g., steel, carpet, cobble pavers).*
- Local/Regional Materials: *56% of materials were manufactured locally (e.g., concrete, bricks, certified wood and metal studs).*

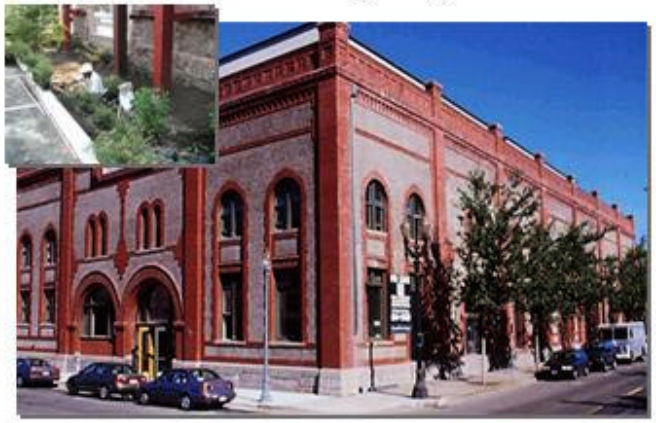
Indoor Environmental Quality

- CO_2 Monitoring: *CO_2 monitoring system has 83 sensors integrated with the building's building management system.*
- Construction IAQ Management Plan: *Included measures to protect HVAC systems, control contaminant sources, interrupt pathways, provide quality housekeeping, and replace HVAC filtration media immediately prior to occupancy.*
- Low-Emitting Materials: *All adhesives, sealants, paints, coatings, carpeting, composite wood emit low or no volatile organic compounds.*
- Daylight & Views: *97% of occupied spaces have a direct line of sight to exterior views.*

Innovation & Design Process

- *Exemplary on-site occupant recycling program that incorporates an educational guidebook, reuse of office supplies, and a composting program. Integrated pest management program for interior and exterior minimizes use of pesticides. Exemplary use of recycled content products.*

Jean Vollum
Natural Capital Center
Portland, Oregon



Owner:	Ecotrust
Project Manager:	*PGE Green Building Services* *Ralph DiNola* *(503) 603-1661*

Building Statistics:

Completion Date:	*September 2001*
Cost:	*$143/square foot*
Size:	*70,000 gross square feet*
Footprint:	*20,000 square feet*
Construction Type:	*Commercial*
Use Group:	*Retail*
Lot Size:	*0.92 acres*
Annual Energy Use:	*kBtu/sf/year*
Occupancy:	*120 Staff*

LEED Version 2.0 *GOLD*

Sustainable Sites

- Site Selection: *Reused a warehouse built in 1895.*
- Urban Redevelopment: *Part of revitalization effort in Portland's historic Pearl District.*
- Alternative Transportation: *Portland streetcar and seven bus stops within ¼ mile of building; bicycle parking available for 47% of building occupants, showers for 27% and lockers for 60%; two alternative fuel car-sharing vehicles located on site with corresponding refueling stations.*
- Stormwater Management: *Impervious area of the site reduced by 26% by adding planters, landscaping islands, porous pavement, vegetative swales and a roof garden; infiltration swale recharges groundwater while removing 100% TSS and 100% TP.*
- Reduced Heat Islands: *Fast growing native trees provide shading of impervious surfaces; light colored paving.*

Water Efficiency

- Water Efficient Landscaping: *Native plantings adapted to local conditions; no irrigation required after one year.*
- Water Use Reduction: *33% reduction.*

Energy and Atmosphere

- Optimize Energy Performance: *Exceeds ASHRAE 90.1-1999 by 21.4% using a VAV system for common areas only, wider indoor temperature range for summer/winter, operable windows with HVAC overrides, daylighting and additional roof insulation.*

Materials and Resources

- Building Reuse: *Over 75% of exterior structure and shell and interior non-shell elements of original building retained; deconstructed materials reused in rehabilitation of building; reused all flooring.*
- Construction Waste Management: *98% of constructed materials recycled/salvaged.*
- Resource Reuse: *Salvaged materials comprised 10% of total. Included stone, brick, lumber, paneling, moldings, heavy timbers and doors.*
- Recycled Content: *Over 50% of materials, as calculated by USGBC's weighted cost value, contain recycled content. Includes concrete mixed with fly-ash, steel (90-96% recycled content), insulation, resilient flooring, carpeting and interior paint (100% recycled latex).*
- Local/Regional Materials: *34% of materials were manufactured locally, including salvaged materials, lumber, concrete, structural steel and doors.*
- Certified Sustainably Harvested Wood: *66% of new wood was from forests certified by the Forest Stewardship Council, including nominal lumber, plywood, decking and windows.*

Indoor Environmental Quality

- Construction IAQ Management Plan: *HVAC system protected during construction and flushed-out after construction, before occupancy.*
- Indoor Chemical & Pollutant Source Control: *Natural fiber mats provided at all entrances; janitors closets independently ventilated and isolated with deck to deck walls.*
- Daylight & Views: *Daylighting reaches more than 75% of occupied spaces; more than 90% of spaces have access to outside views.*

PNC Firstside Center

Pittsburgh, Pennsylvania

Photographer: Ed Massery

Owner: PNC Financial Services Group

Project Team:

Architect:	*L.D. Astorino Companies*
Engineer:	*L.D. Astorino Companies*
Contractor:	*Dick Corporation*
Consultant:	*Paladino Green Building Strategies*

Building Statistics:

Completion Date:	*November 2000*
Cost:	*$108 million*
Size:	*647,000 gross square feet*
Footprint:	*140,418 square feet*
Construction Type:	*5 floor, new construction*
Use Group:	*Financial services*
Lot Size:	*4.66 acres*
Annual Energy Use:	*59 kBtu/sf/year*
Occupancy:	*1800 staff*

LEED Version 2.0 *SILVER*

Sustainable Sites

- Site Selection: *Remediated brownfield site (previous urban railyard); contributes to an area needing economic revitalization*
- Alternative Transportation: *Ample bus lines; shower facilities for bicycle commuters; electric vehicle recharging station; site acts as downtown link for an extensive bike trail*
- Reduced Site Disturbance: *Exceeded local open space requirements by more than 25% by tightening program needs and stacking floor plans*
- Stormwater Management: *Filtering settlement basins capture and remove 80% of suspended solids and 40% of phosphorous*
- Reduced Heat Islands: *Used light colored/high-albedo materials for at least 36% of the site's non-roof impervious surfaces*

Water Efficiency

- Water Efficient Landscaping: *Sub-surface irrigation system reduces water use for irrigation by more than 50%*

Energy and Atmosphere

- Optimize Energy Performance: *Exceeds ASHRAE 90.1-1999 by 33% using exterior passive sun shading, interior motorized window coverings, underfloor ventilation systems, and air handling units with full economizer capabilities*
- Additional Commissioning: *Best practice commissioning applied*

Materials and Resources

- Recycled Content: *90% post-consumer recycled steel*
- Local/Regional Materials: *54% of materials (by cost) were manufactured within 500 miles; 11% of materials were extracted, recovered or harvested locally*

Indoor Environmental Quality

- CO_2 Monitoring: *CO_2 sensors located in the return air duct*
- Increase Ventilation Effectiveness: *Complies with ASHRAE Fundamentals Chapter 31 through use of diffusers in both the underfloor and overhead air distribution systems and full capacity economizers*
- Construction IAQ Management Plan: *Cleaned the underfloor plenum and conducted a two-week building flush out after construction and before occupancy*
- Low-Emitting Materials: *Carpeting has low VOC emissions*
- Thermal Comfort: *Meets ASHRAE 55-1992 through integrated temperature controls, independent humidifying systems and economizers*
- Daylight & Views: *93% of occupied space has access to exterior views; 79% of occupied space is daylit; strategies included a large southern exposure, skylights, atrium, glazed partitions and doors, and clerestory windows*

Innovation & Design Process

- Innovation in Design: *Carpet tile with releasable adhesives and hybrid HVAC system reduce churn costs and waste*

For more information
please visit:

www.usgbc.org

THANK YOU

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