What kind of Ancestors will we be?

Institute of Medicine
September 2007
What Problem?

The U.S. holds less than 5% of the world’s population but produces nearly 23% of global carbon emissions.

National Climatic Data Center Reports 2006:

- 2.2 degrees warmer than average
- .07 degrees warmer than 1998
- 6th warmest year on record

Source: Scientific American Sep 2006
Global atmospheric concentrations of carbon dioxide have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values determined from ice cores spanning many thousands of years.

A very high confidence (at least a nine out of ten chance, or 90% confidence rate) that the globally averaged net effect of human activities since 1750 has been one of warming.
What do you think is the top cause of greenhouse gas emissions today? Would you say it is...

Exhaust from cars and trucks, Emissions from aerosol cans, Emissions from commercial buildings, Emissions from power plants, or Natural causes?

- Cars and trucks: 40%
- Aerosol cans: 1%
- Commercial buildings: 7%
- Power plants: 19%
- Natural causes: 15%
- Other: 8%
- Unsure/Refused: 10%
It’s the Buildings….

Building design, construction, materials and operation consume more energy than any other part of the US economy!

58% of end-use energy operating buildings is consumed "on site", burning oil, natural gas or propane to power boilers, furnaces or hot water heaters

source: architecture 2030
CO2 EMISSIONS by SECTOR
(Million Metric Tons of Carbon)

Source: Energy Information Administration Statistics
It’s the Long Tail of Operations

Operating buildings consume US electrical power at an amazing rate!

The U.S. alone is projected to need 1,300 to 1,900 new power plants over the next 20 years - 1 per week!

GRAPHIC 4: 76% of all power plant generated electricity is used just to operate buildings.
Electricity Demand to Grow 160%
Where Does Electricity Come From?

5,000 megawatts
Global generating capacity of solar power

37 percent
Top efficiency of experimental solar cells

20 to 25 cents
Cost per kilowatt-hour of solar power

Competing Energy Sources
Fraction of global electricity generation

60,000 megawatts
Global generating capacity of wind power

0.5 percent
Fraction of U.S. electricity produced by wind turbines

1.9 cents
Tax credit for wind power, per kilowatt-hour of electricity

Source: Scientific American Sep 2006
Source: Scientific Architecture 2030
The AIA recognizes a growing body of evidence .... that demonstrates current planning, design, construction, and real estate practices contribute to patterns of resource consumption that seriously jeopardize the future of the Earth’s population.

Architects need to accept responsibility ..........
for their role in creating the built environment and, consequently, believe we must alter our profession’s actions and encourage our clients and the entire design and construction industry to join with us to change the course of the planet’s future.
1. Minimum 50% reduction in consumption of fossil fuels used to construct and operate new and renovated buildings by the year 2010 – carbon neutral 2030
2. Collaborate with other organizations, industry sources, scientific community and public health officials
3. Develop and promote the integration of sustainability into the curriculum for enhanced education of architects and architectural students
4. Develop new standards and metrics for the architectural profession
5. Promote measurable contributions resulting from sustainable design
6. Promote research necessary to provide life cycle assessment data
7. Promote AIA’s building performance targets to local, state and national governments
8. Communicate economic benefits of environmentally responsible design to public and private sector clients
9. Assume global role as advocates for sustainable design
50% of what?

Commercial Building Energy Consumption Survey 2003 (CBECS)

- Regionalized and type specific
- Measured in kBTU/sf/year

EnergyStar Target Finder
**Sustainability** envisions the enduring prosperity of all living things.

**Sustainable design** creates communities and buildings that advance enduring public and environmental well-being.
Architects are key to Solutions!

By 2035, 3/4 of the U.S. building stock will be either new or renovated

source: architecture 2030

AIA acting through:
Collaborations
Tools
Regulations
Incentives
Collaborating with Mayors and Counties

• **Mayors Resolution #50:** “Adopting the 2030 Challenge for All Buildings” 2005

• **Mayors Resolution #83:** “Establishing a New Municipal Energy Agenda” 2005

• **NACo Policy**
  “Supporting AIA 2030 Challenge” and voluntary measures 2007
Tools we already have

Architects can reduce consumption at NO COST today!

- Site Planning
- Building form
- Window size / orientation
- Material selection
- Natural heating / cooling / ventilation
- Day-lighting strategies
Consider the concept of Frank Lloyd Wright’s Tree of Life—roots, trunk, branches and leaves... this is the organizational framework behind the AIA’s new 50\(＞\)50.

50 PRINCIPLES

THE RESOLVE is a range of PRINCIPLES of sustainability which engage both direct and indirect actions, to help practitioners move projects toward the AIA’s immediate goal of 50% reduction of paper and fuel consumption.

Organized within the framework of the Tree of Life, this new tool will be used as a tool to evaluate the RESOLVE (the AIA Committee on the Environment’s Top Ten Resolutions), the T5001 (New Construction/Existing Construction/Community) and 50\(＞\)50 (Sustainability Site, Site, Space, Structure Systems, and Support).

The LEAVES—the set or 50 PRINCIPLES—are innovative, evidenced, exemplars of sustainability lessons offered as universal principles, under which any achievable STRATEGIES (for the AIA)—may be signed.

The specific STRATEGIES lie in underneath these 50 PRINCIPLES; and in the results below.

YOUR INPUT COUNTS!

CONSIDER THE 50 PRINCIPLES... is an attempt to address STRATEGIES that you deploy to achieve energy, economic, and environmental goals that we might think about,elahenEAECilaiiteoncand the use of innovative clients around the world.

"YOUR PRINCIPLES"

1. Take a LEAF of pride from your network.
2. Choose a LEAF every week.
3. LEAF as your next.

www.aia.org/fiftytofifty
Advocating for Federal Action

Testimony Before Congress
- Senate Energy Subcommittee
- House Transportation & Infrastructure Committee
- House Oversight & Reform Committee

“CLEAN” Energy Act (HR 6)
- Carbon Neutral Federal Buildings
- 200 kW PV “Sun Wall” @ DOE

Carbon Neutral Federal Government Act (HR 2635)

Renewable Energy & Conservation Tax Act (HR 2776)
- $1.80 / SF Tax Credit
- Renewable Production
- Biking as “qualifier Benefit
View from Corporate Board Rooms

Obstacles to Green Buildings

- Too Multi-Disciplinary – 41%
- Question Increased ROI – 37%
- Lack Understanding of Benefits – 26%
- Lack Service Providers – 20%
- Too Difficult – 17%
- Greenwashing – 16%
- Lack Shareholder Support – 10%

Source: Greening of Corporate America SmartMarket Report
McGraw Hill Construction
The Myth of First Costs

Source: Davis Langdon *Costing Green* Jul 2004
Significant O&M Savings

- 30% energy savings
- 30-50% water use savings
- 50-97% waste cost savings
Those Views are Changing…..

Drivers of Green Buildings

Increasing Energy Costs
ý CEOs – 81%
ý CFOs – 70%

Govt Regulation / Tax Incentives
ý CEOs – 38%
ý CFOs – 45%

Global Influences
ý CEOs – 33%
ý CFOs – 20%

Source: Greening of Corporate America SmartMarket Report
McGraw Hill Construction
Expenses that Return Value

Smart Irrigation System
Cost - $3600
Savings - $10,000 per year

Retrofitting parking with fluorescent lighting:
Cost - $157,000,
Savings - $100,436 per year

Monitoring System on Chillers:
Cost - $1500 reprogramming fee
Savings - $43,000 per year

Overall Retrofit:
Cost - $1.2 million
Rebates - $350,000

Savings in reduced energy and water usage- $1 million per year
The photovoltaic panels on the top and side are used as an expressive and transformative part of the design.

The pool is part of the house’s storm water retention system.

PV panels provide 95% (soon to be 100%, they are adding more) of the house’s electricity and provide shading for indoor and outdoor spaces.
They achieved 81% energy reduction, 28% of needs provided by PVs, with a future wind farm planned.

Evaporative cooling is mixed with natural ventilation.
’07 COTE Top Ten Winner

Sidwell Friends School
Kieran Timberlake Architects
Washington, DC

Desired to demonstrate an “ethical relationship between the natural and the built environment”

Solar chimneys with south-facing glass are designed for passive ventilation, operating without additional energy.
'07 COTE Top Ten Winner

Rinker Hall
University of Florida
Gainesville, FL
Croxton Collaborative / Gould Evans

Strategies create a healthy, productive environment through daylighting, ventilation, IAQ, view corridors and personal controls

Emphasis on - -

Daylighting
Window louvers
Ceiling geometry
Atrium Spine
Ballard Library
Bohlin Cywinski Jackson Architects
Seattle, WA

COTE Top Ten Winner

The big overhanging roof creates a public porch and helps shade this western exposure.

PV panels create a sundial as the sun moves across the windows
What will you chose?

http://www.aia.org/susn_default