



Developing a Business Case for Sustainable Federal Facilities

Beth Shearer, Director

Federal Energy Management Program

US Department of Energy



Outline

- **Background:** Rationale and audiences for the 'business case' for sustainable federal facilities
- **Conceptual framework:** "Sustainable" facilities – three key aspects
- **Approach:** Understanding the tangible and less tangible costs and benefits of sustainable facilities
- **Preliminary results:** Examples, gaps, and next steps



Executive order requires sustainable design

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Executive Order 13123

Efficient Energy Management

Whole Building Design Guide: the Order required DoD, GSA (with DOE and EPA) to develop sustainable design principles, which were organized into the following categories:

- Site
- Energy
- Materials
- Water
- Indoor Environmental Quality (IEQ)
- Operations and Maintenance

Executive order requires lifecycle costing

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Executive Order 13123

Efficient Energy Management

Life-cycle costing: the Order requires agencies to use life-cycle cost analysis in making decisions about investments in construction, products, services, etc.

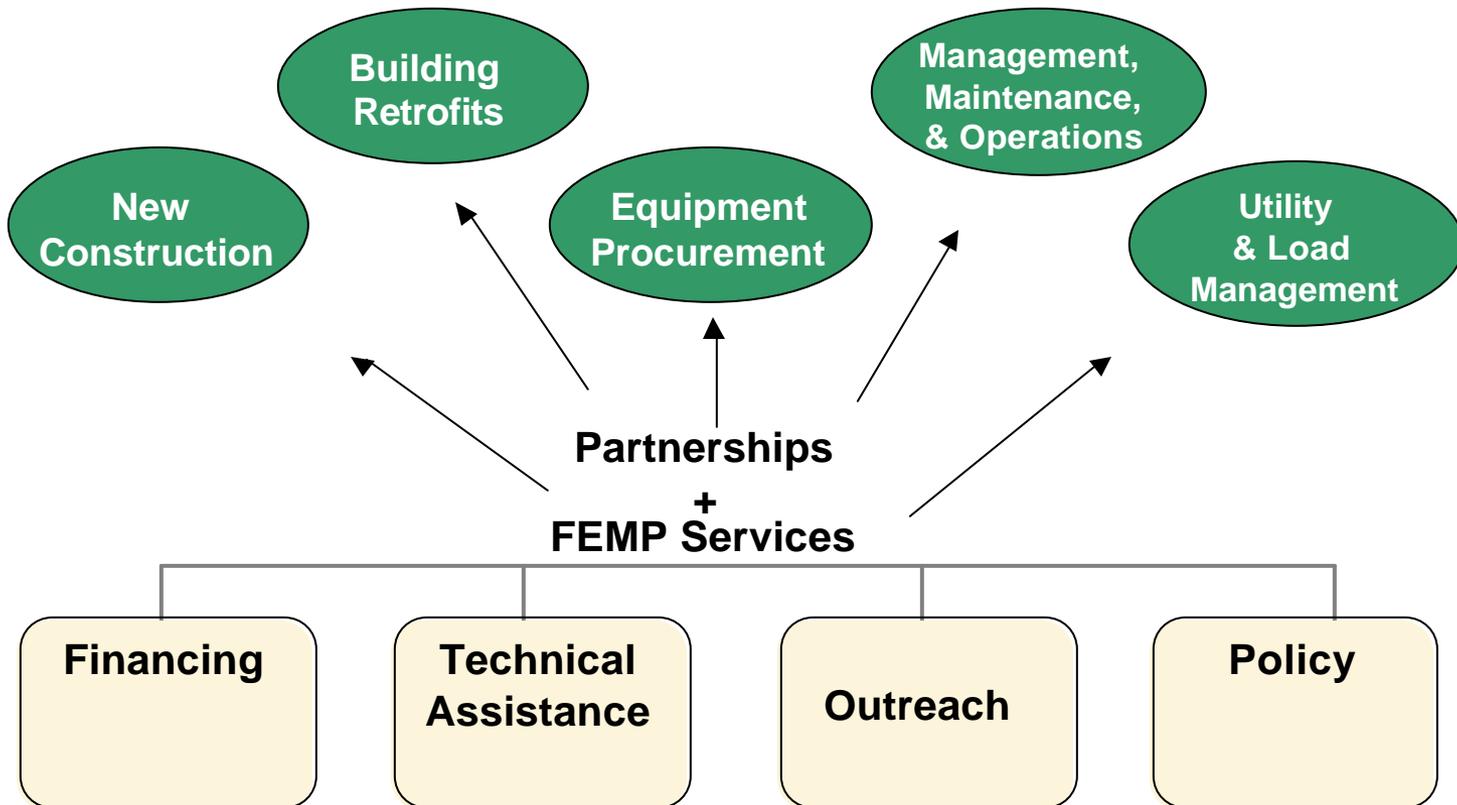
Federal Energy Management Goals

- **Reduce energy consumption**
 - Facility energy per square foot to be reduced by 30 percent in 2005 and 35 percent in 2010 relative to 1985
 - Industrial/laboratory energy to be reduced by 20 percent in 2005 and 25 percent in 2010 relative to 1990
- **Expand use of renewable energy**
 - 2.5% of Federal facility electricity consumption by 2005
 - 2,000 solar energy systems by 2000; 20,000 by 2010
- **Implement best management practices for water conservation in 80% of Federal facilities by 2010**
- **Reduce greenhouse gas emissions 30 percent by 2010 (from 1990)**

Targeting Key Opportunities



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Rationale for articulating a “business case” for sustainable facilities

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- The Federal agencies are pursuing sustainable design/construction goals, in compliance with the Executive Orders
- But higher first costs remain difficult to justify, especially in a government setting
- Need more proof that “green” is better -- compelling economic data; fact-based and balanced information



Audiences for the 'business case'

- **Designers within federal government and private A&E firms**
- **Middle managers involved in facility decisions**
- **Budget formulators in Federal Agencies**
- **High-level government policy makers**
- **The private sector**

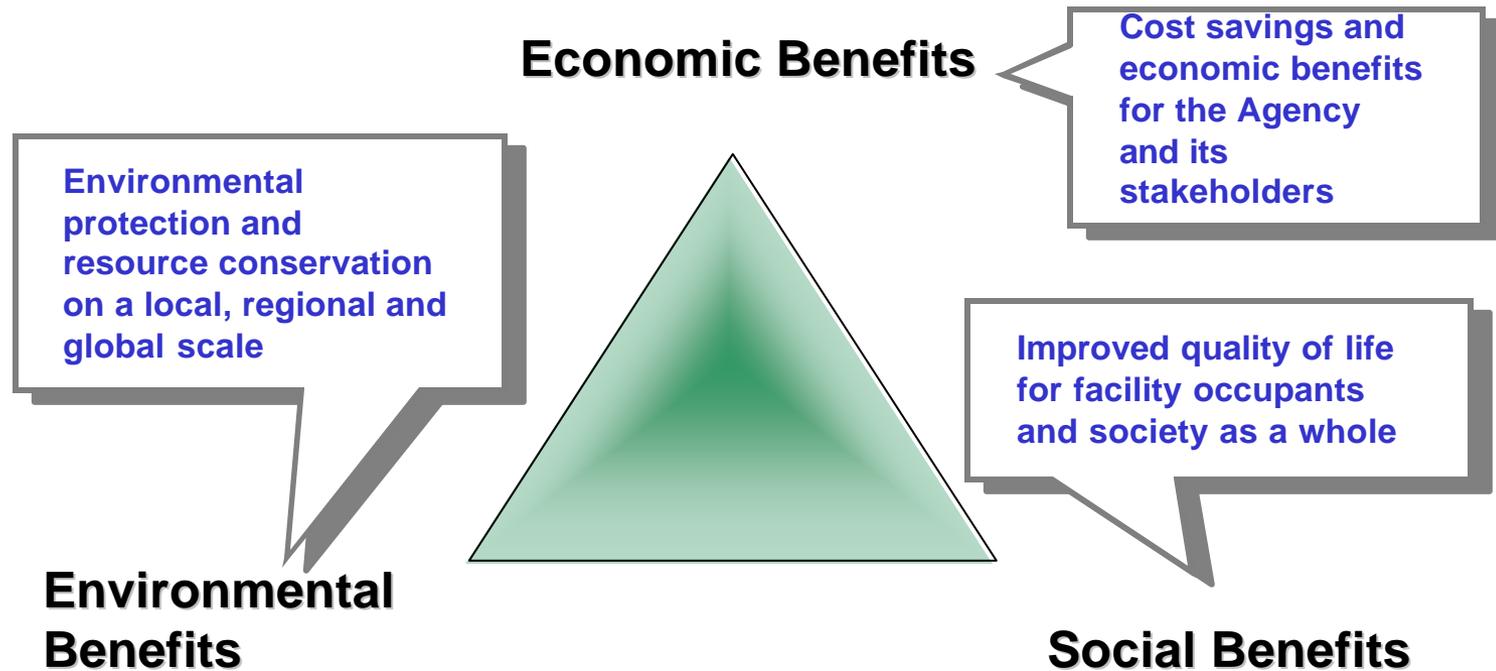
In a recent survey, USGBC members rated developing the 'business case' for sustainable design a high priority.



Conceptual Framework

Sustainable Facilities: Three Key Aspects

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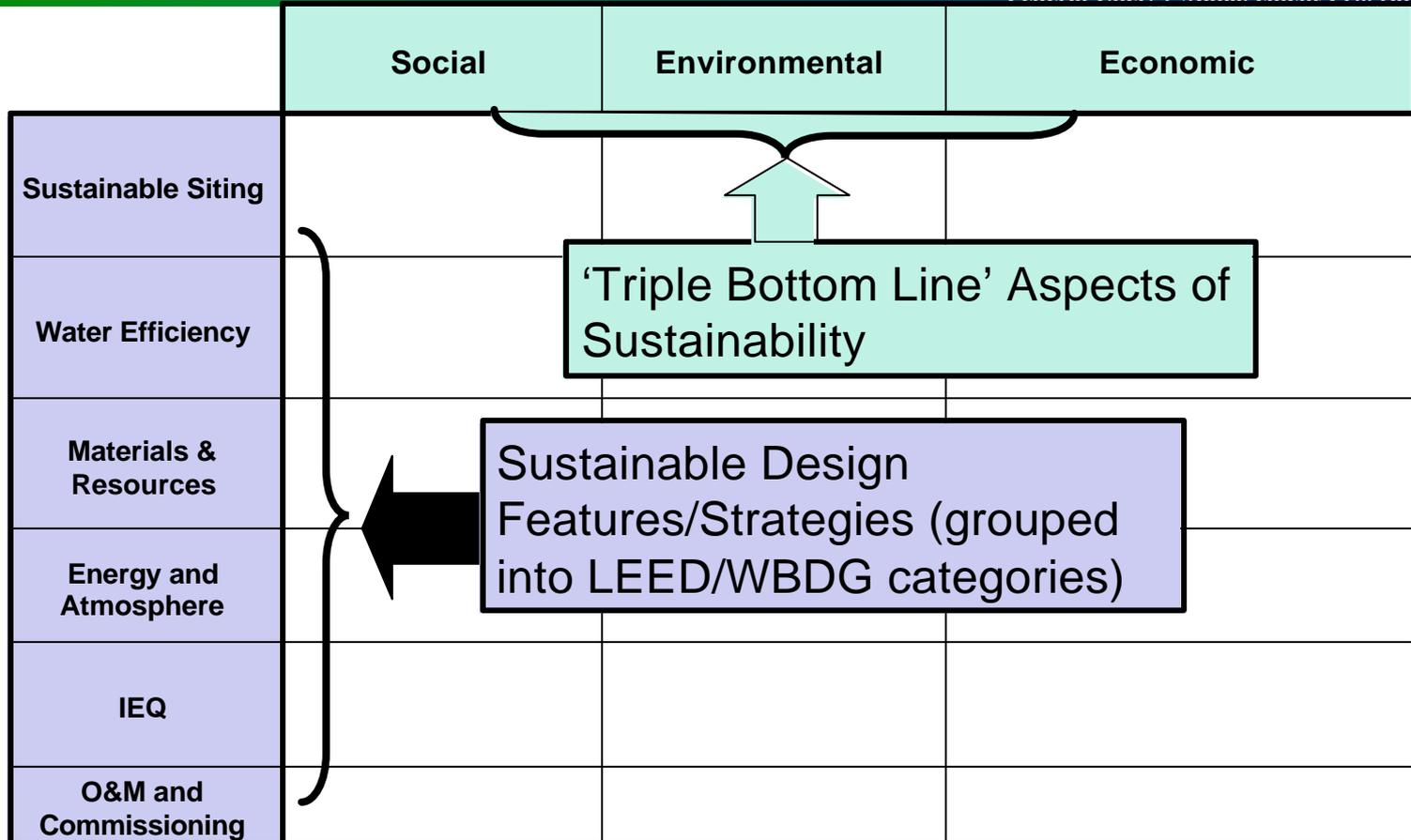


The triple bottom line of sustainability

Approach

The Matrix of Benefits

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Results

The Matrix of Benefits: Examples

| | Social | Environmental | Economic |
|-----------------------|---|---|---|
| Sustainable Siting | Land preservation, improved aesthetics, less public disturbance | Lower resource use, protection of habitats, soil and water conservation | Reduced costs for site prep & clear-cutting, parking lots, storm drainage, landscape maintenance, mech. systems |
| Water Efficiency | | | |
| Materials & Resources | | | |
| Energy and Atmosphere | | | |
| IEQ | | | |
| Commissioning, O&M | | | |

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| Energy and Atmosphere | Improved quality of interior space; better occupant comfort | Lower electricity and fossil fuel use and air pollution/CO ₂ emissions | Reduced energy costs, increased operating efficiency, possibly lower capital costs |
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| IEQ | Reduced adverse health impacts; improved occupant productivity | Better air quality inside the facility, reduced VOC emissions | Organizational productivity, lower disability/health ins. costs; reduced threat of litigation |
| Commissioning, O&M | | | |

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| Commissioning, O&M | Occupant satisfaction, health/safety | Improved energy efficiency and air pollution emissions | Energy cost reduction, lower replacement costs, reduced cost of dealing with complaints |

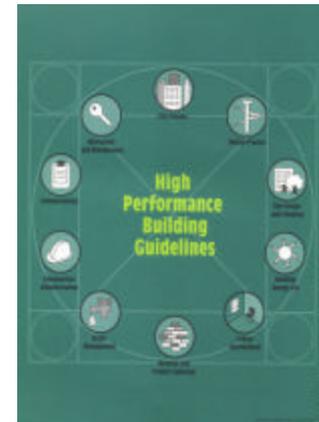
Tangible Economic Benefits: Quantitative Examples

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- **Reduced energy costs** **\$0.3-0.8/sf/yr**
- **O&M savings - water** **\$0.0025- 0.0050/sf/yr**
- **O&M savings - maintenance** **\$0.11-0.77/sf/yr**

**Source: NYC High Performance Building
Guidelines**

<http://www.ci.nyc.ny.us/html/ddc/html/highperf.html>



Case Study: Wastewater treatment

Sustainable Siting

Water Efficiency

Materials/Resources

Energy Efficiency

IEQ

Commissioning and
O&M

Headquarters Park Office Complex in Princeton, New Jersey (Four buildings; 366,500 square feet)

- Used wastewater recycling for treatment and recycling of both 'gray' and 'black' water, reduced flows to 1,600 gpd (original design was 27,000 gpd)
- System cost \$250,000 less than the originally contemplated treatment system, lowered operating costs, and accrued \$15,000 per year in water bill savings

Source: NYC High Performance Building Guidelines

<http://www.ci.nyc.ny.us/html/ddc/html/highperf.html>

Case Study: Energy

Sustainable Siting

Water Efficiency

Materials/Resources

Energy Efficiency

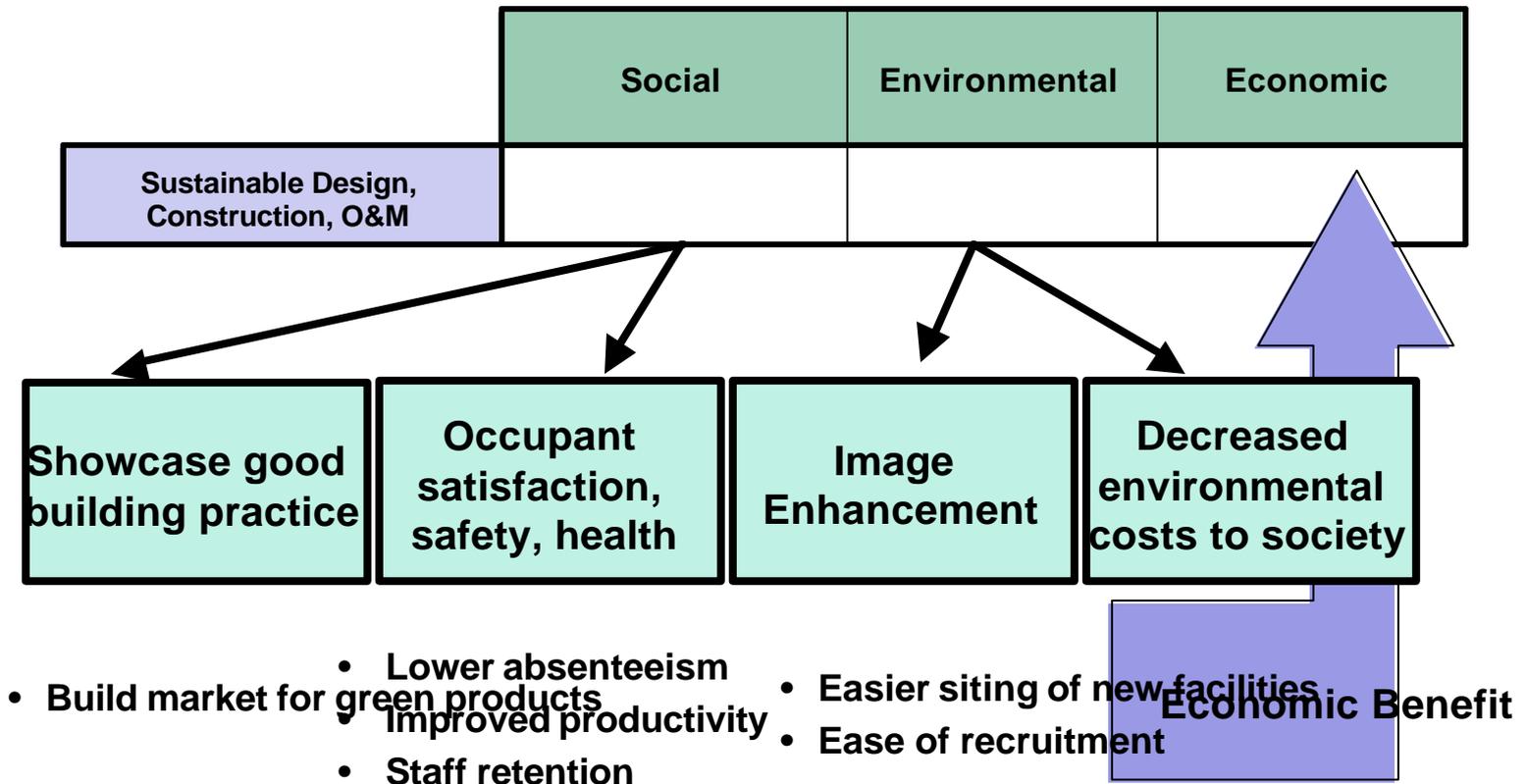
IEQ

Commissioning and
O&M

Washington Navy Yard Building 33

- **Very minimal first incremental first cost differential (features added in the last stage of design when budget was already fixed)**
- **Constrained due to historic nature of the building**
- **Added super windows, skylights, better lighting and lighting controls, high-efficiency HVAC motors; optimized chiller, piping, ductwork**
- **Obtained 15% electricity savings (\$58,000 per year) mostly due to mechanical system and downsized chiller**

The Matrix of Benefits: Less Tangible, Strategic Benefits



Results

The Matrix of Benefits – Data and Gaps

| | Social | Environmental | Economic |
|-----------------------|-----------------------------|-----------------------------|-----------------------------|
| Sustainable Siting | Anecdotal data | Anecdotal data | Anecdotal data |
| Water Efficiency | Data sparse or absent | Quantitative data available | Quantitative data available |
| Materials & Resources | Anecdotal data | Anecdotal data | Anecdotal data |
| Energy and Atmosphere | Anecdotal data | Quantitative data available | Quantitative data available |
| IEQ | Quantitative data available | Anecdotal data | Anecdotal data |
| Commissioning & O&M | Data sparse or absent | Quantitative data available | Quantitative data available |



Quantitative data available



Anecdotal data



Data sparse or absent

Next Steps

- **Complete data gathering and analysis**
- **Develop report on the “state of the art” – Sept '02**
- **Collaborate with others to develop protocols for measurement of key sustainable facility indicators – FY02-03**

