

The ATHENA Institute

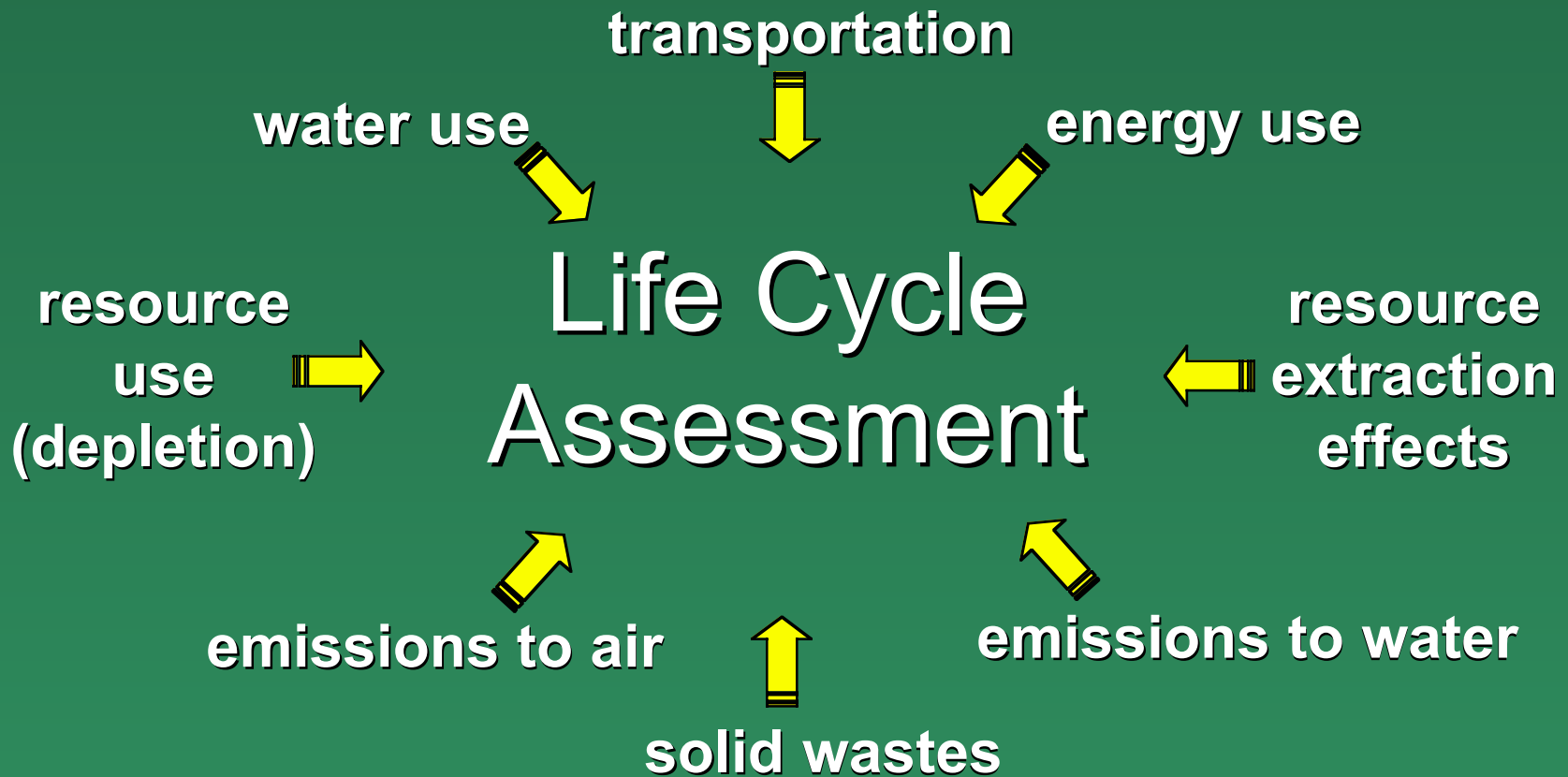


Integrating LCA Tools in Green Building Rating Systems

**USGBC Green Building International
Conference and Expo
November 15, 2002**

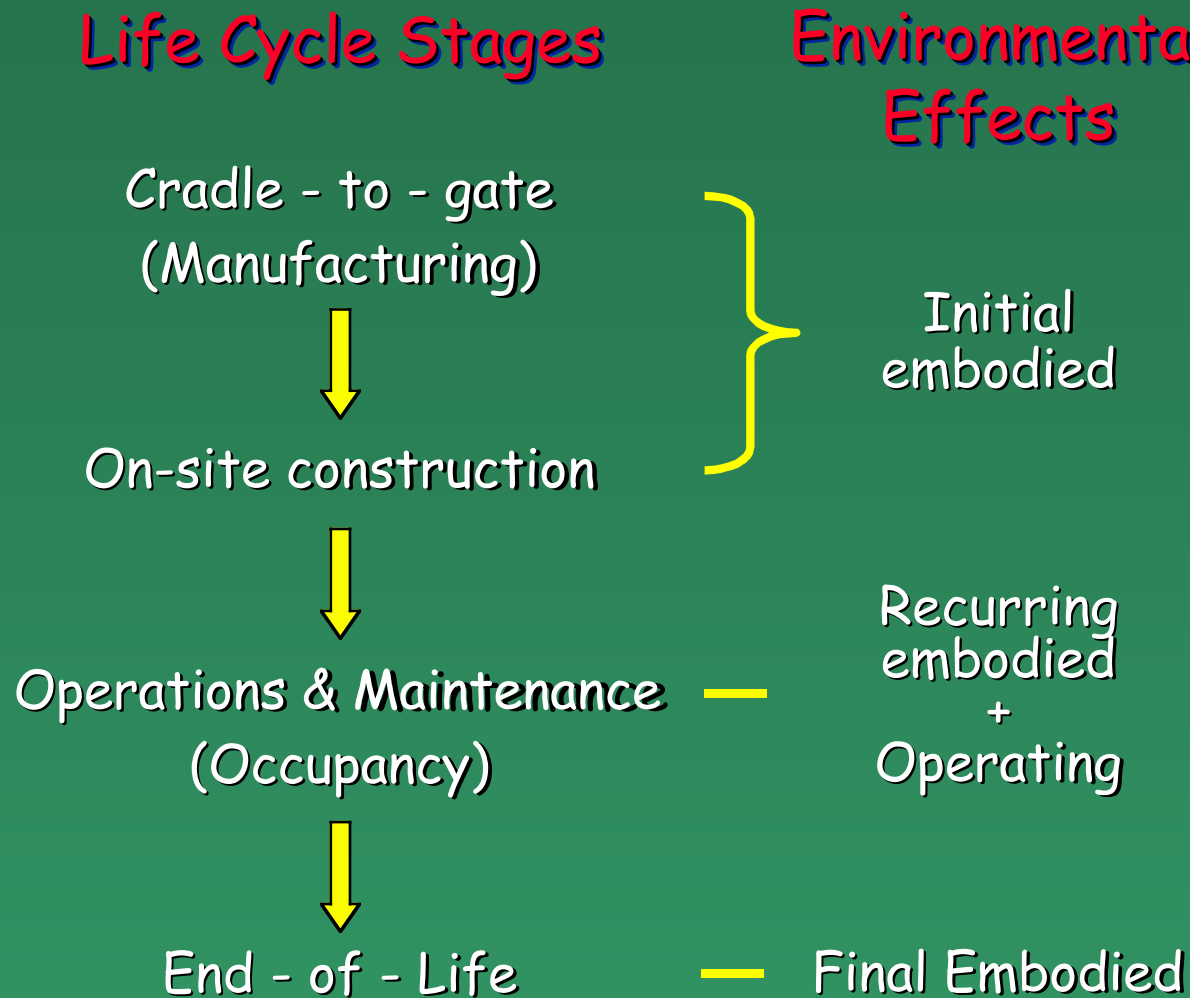
Presentation Outline

- ◆ Brief overview of life cycle assessment
- ◆ Why use LCA: the proxies problem
- ◆ Incorporating LCA in assessment systems



a methodology for assessing the life cycle environmental performance of products and processes

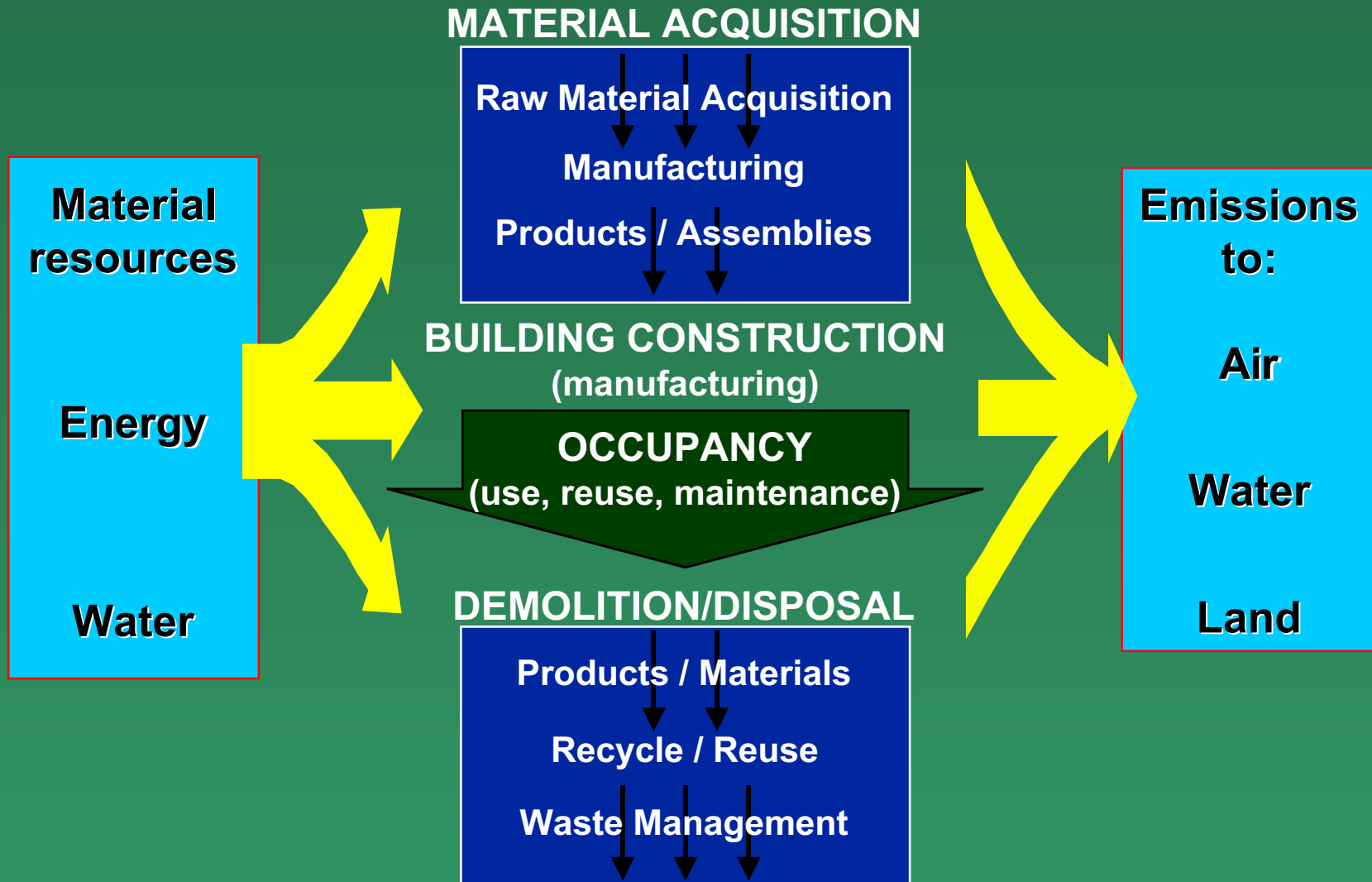
Life Cycle Stages and Effects



A Wide Range of Embodied Effects

- ◆ Embodied effects include:
 - » Resource use (raw materials, land, water, energy)
 - » Emissions to air, water and land
- ◆ Beware the common tendency to think only of embodied energy
- ◆ Energy is important, but not the whole story
- ◆ And there are embodied effects in energy itself (i.e., in making and moving energy)

Building Life Cycle Inventory



Impact Assessment Phase

Inventory



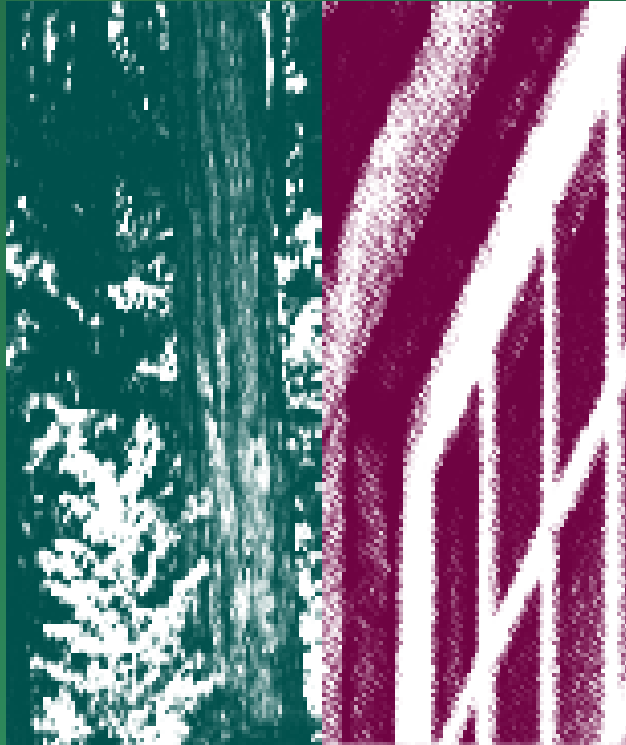
Impact Indicators



- global warming potential
- ozone depletion
- acid rain
- etc.

Impact Assessment (Valuation)

THE GOAL: to measure ultimate impacts
on human and ecosystem health



Why LCA?

The Proxies Problem

Example Proxies in LEED

- ◆ Recycled content
- ◆ Rapid rotation renewables
- ◆ Regional purchasing

... Tend to Confuse Ends & Means

Short Rotation Renewables

“Reduce the use and depletion of finite raw materials and long-cycle renewable materials by replacing them with rapidly renewable materials.”

LEED™2.1 Intent, MR Credit 6

BUT . . .

- ◆ Credit fails to consider land use & soil depletion effects
- ◆ Yet land may be the most critical non-renewable resource
- ◆ Should also take account of:
 - » the use of fertilizers, pesticides, herbicides
 - » harvesting and processing effects
 - » water use
- ◆ Credit could result in forest destruction to make way for short rotation renewables

Recycled Content

“Increase demand for building products that incorporate recycled content materials, therefore reducing impacts resulting from extraction and processing of new virgin materials.”

LEED™2.1 Intent, MR Credits 4.1, 4.2

BUT . . .

- ◆ Recycling does not always result in reduced burdens
- ◆ Tends to weight land fill concerns over energy use, global warming, etc.
- ◆ Favors metals over other potentially more benign materials
- ◆ Simply rewards business as usual practices unless the hurdle is set very high

Similarly . . .

- ◆ The focus is on operating energy at the point of use without considering:
 - » source (e.g., of electricity)
 - » type (e.g., oil vs. natural gas)
 - » pre-combustion effects (energy to make and move energy)
- ◆ No clear way to credit reductions in material use and related embodied effects
- ◆ Nor is there a way to credit intentionally higher embodied effects that lead to decreased total life cycle effects
- ◆ The use of value-based calculations can distort results and may frustrate the achievement of objectives

A Critical Shift

From
PRESCRIPTIVE APPROACH

A Critical Shift

To
**PERFORMANCE BASED
CREDITS**

Basic Credit Structure

Today

- ◆ Sustainable Sites
- ◆ Water Efficiency
- ◆ Energy & Atmosphere
- ◆ Materials & Resources
- ◆ Indoor Environmental Quality
- ◆ Innovation & Design Process

Tomorrow

- ◆ Sustainable Sites
- ◆ Water Efficiency
- ◆ Indoor Environmental Quality
- ◆ Innovation
- ◆ Design & Management
- ◆ Life Cycle Impact Indicators

Design & Management

- ◆ Integrated design process
- ◆ LEED™ Accredited Professional
- ◆ Construction IAQ Management Plan - During Construction
- ◆ Construction IAQ Management Plan - Before Occupancy
- ◆ Construction waste management
- ◆ Storage and collection of recyclables
- ◆ Energy measurement and verification
- ◆ Fundamental Building Systems Commissioning
- ◆ Additional commissioning

Life Cycle Impact Indicators

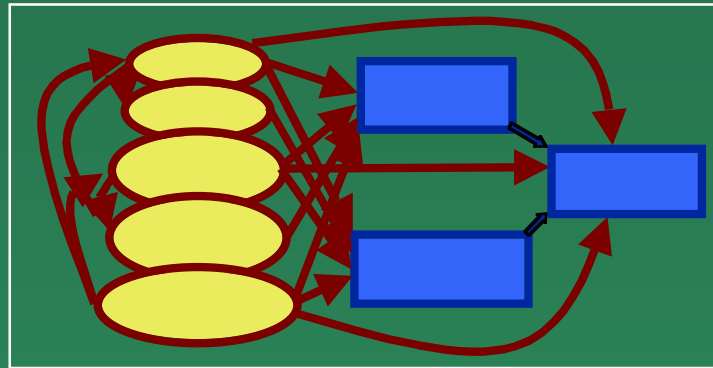
- ◆ Fossil fuel depletion
- ◆ Non-renewable resource use
- ◆ Certified wood
- ◆ Solid waste
- ◆ Global warming potential
- ◆ Stratospheric ozone depletion
- ◆ Ground-level ozone or smog
- ◆ Nutrification/eutrophication of water bodies
- ◆ Acidification & acid deposition (dry and wet)
- ◆ Toxic releases to air, water, land

Getting From Here to There: The Challenge

- ◆ Setting priorities
- ◆ Minimizing market disruption
- ◆ Developing robust tools and the essential life cycle inventory data
- ◆ Integrating tools in the assessment system
- ◆ Benchmarking and establishing hurdles

Challenges Are Already Being Met

U.S. LCI Database Project



LCA
tools

Impact Potentials
Global warming
Ozone depletion

specialized
tools

ATHENA™

BEES

Etc.

Integration: the Green Building Challenge Tool
Example

Concluding Message

- ◆ LCA is a powerful environmental assessment approach
- ◆ The only known way to replace the sometimes misleading proxies in assessment systems
- ◆ Widespread application requires reliable tools for non-practitioners based on sound LCI data
- ◆ Requires benchmarking to show when we are losing and gaining and set hurdles