

# **Buildings as Products: Issues and Challenges for LCA**

**presented to:**

***InLCA***

**International Conference on Life Cycle Assessment:  
Tools for Sustainability**

**Arlington, Virginia  
April 25 - 27, 2000**

# The Built Environment . . .



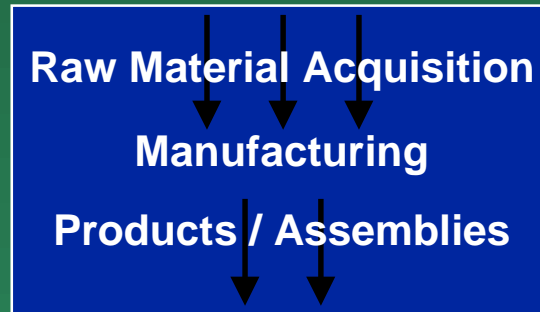
- ◆ Accounts for 10% of global economic activity
- ◆ Consumes 40% of the world's material & energy production
- ◆ Accounts for 17% of the fresh water consumption
- ◆ Uses 25% of the annual global wood harvest

# the ATHENA™ Institute

- ◆ A not-for-profit organization offering public & private memberships
- ◆ Helping the building community meet environmental challenges
- ◆ Focus on information, tools, standards:
  - consistent, comparable LCI databases
  - integrated by the ATHENA™ model
  - international scope

# Building Life Cycle Stages

## MATERIAL ACQUISITION



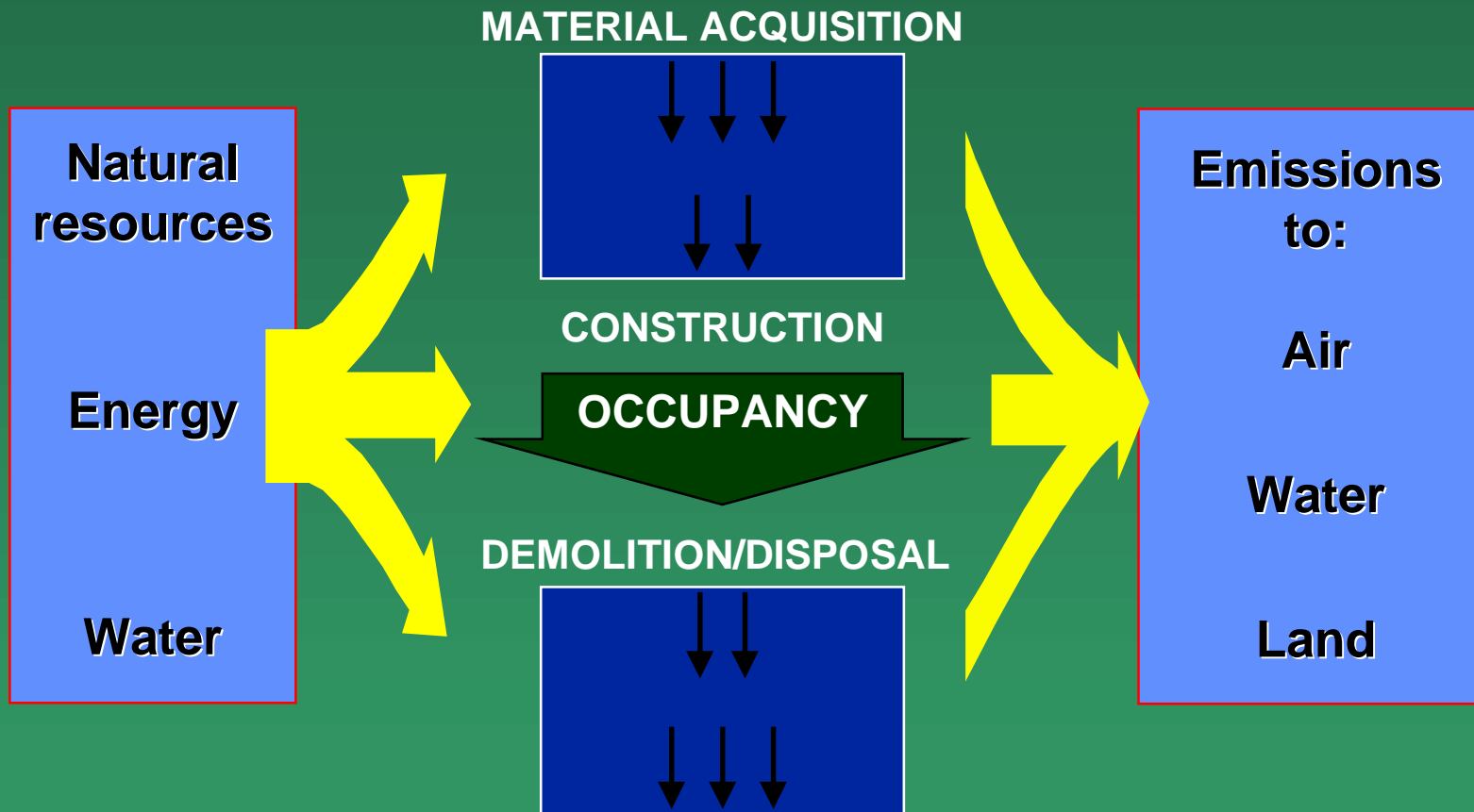
## BUILDING CONSTRUCTION (manufacturing)



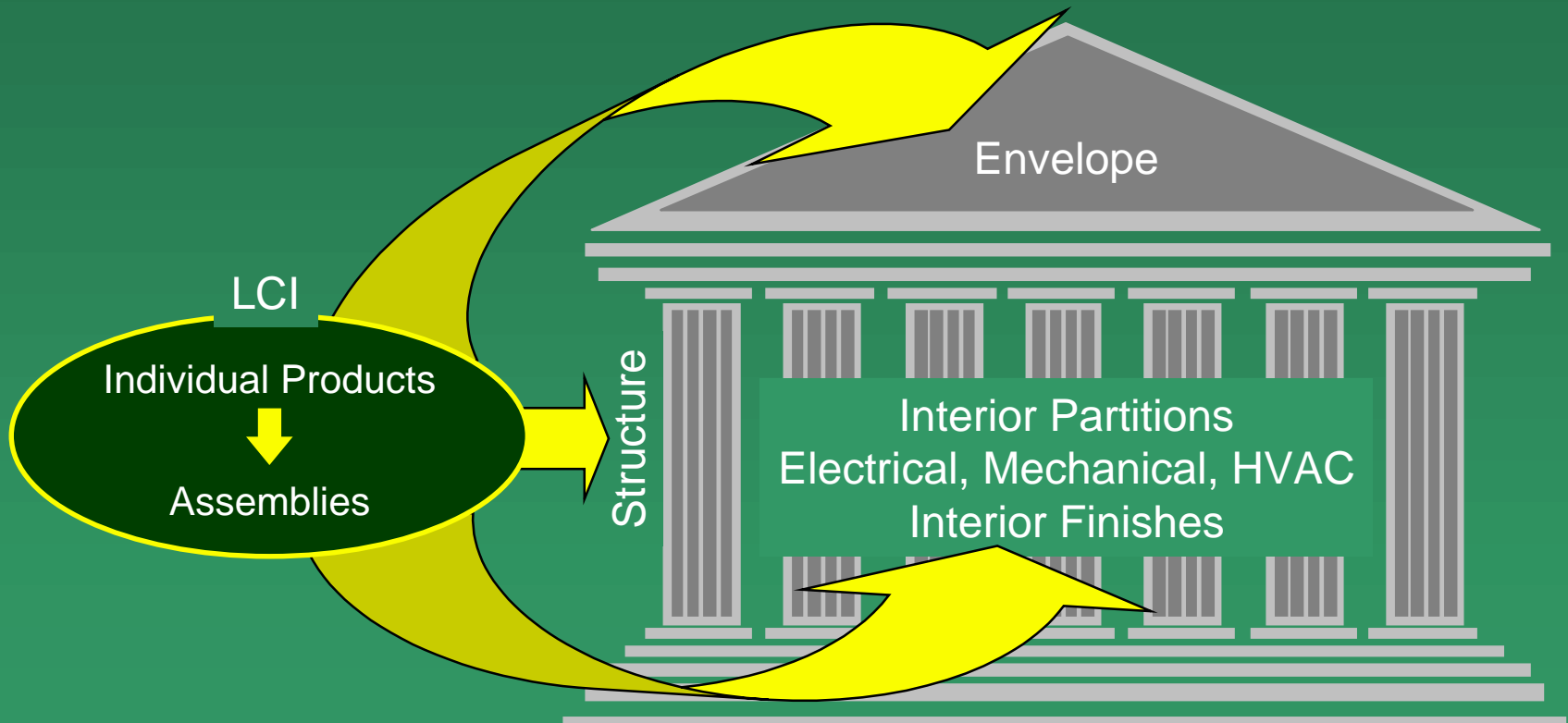
## DEMOLITION/DISPOSAL



# Inventory Analysis



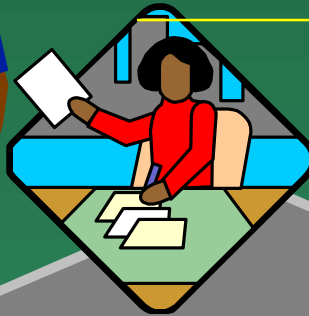
# Building LCIs: A Composite of Product LCIs



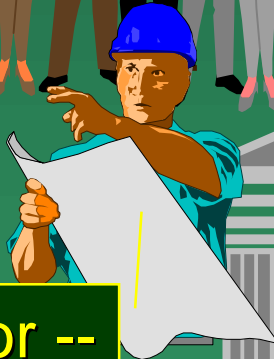
# Many players, more than 1 script



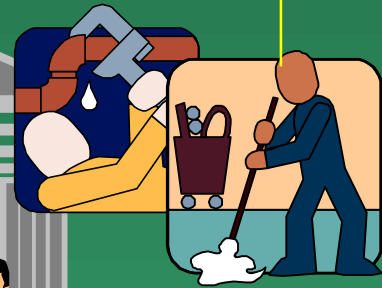
Supporting cast



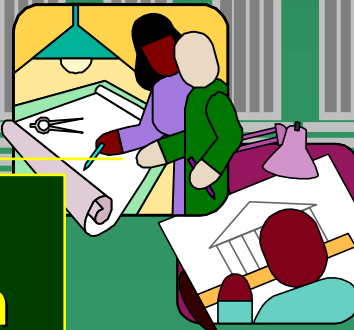
Occupants, operators -- live with and affect the outcome



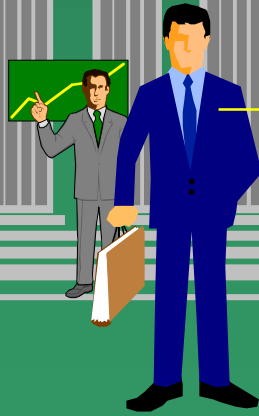
Contractor -- get it done on time



Developer & backers -- may have no long term interest



Design team -- trying to be green



# A key distinction between . . .

## Architects & Engineers

- ◆ Work at the level of the whole building
- ◆ May not understand LCA or the production processes
- ◆ Often not paid to be green

## LCA Practitioners

- ◆ Work at the level of materials & products
- ◆ Understand LCA and the relevant unit processes
- ◆ LCA is in their job description

# The Ultimate LCA Challenge

Designers with limited or no LCA experience

Assessing one of the most complex systems

With very limited resources and time

For clients who may have only a marginal interest

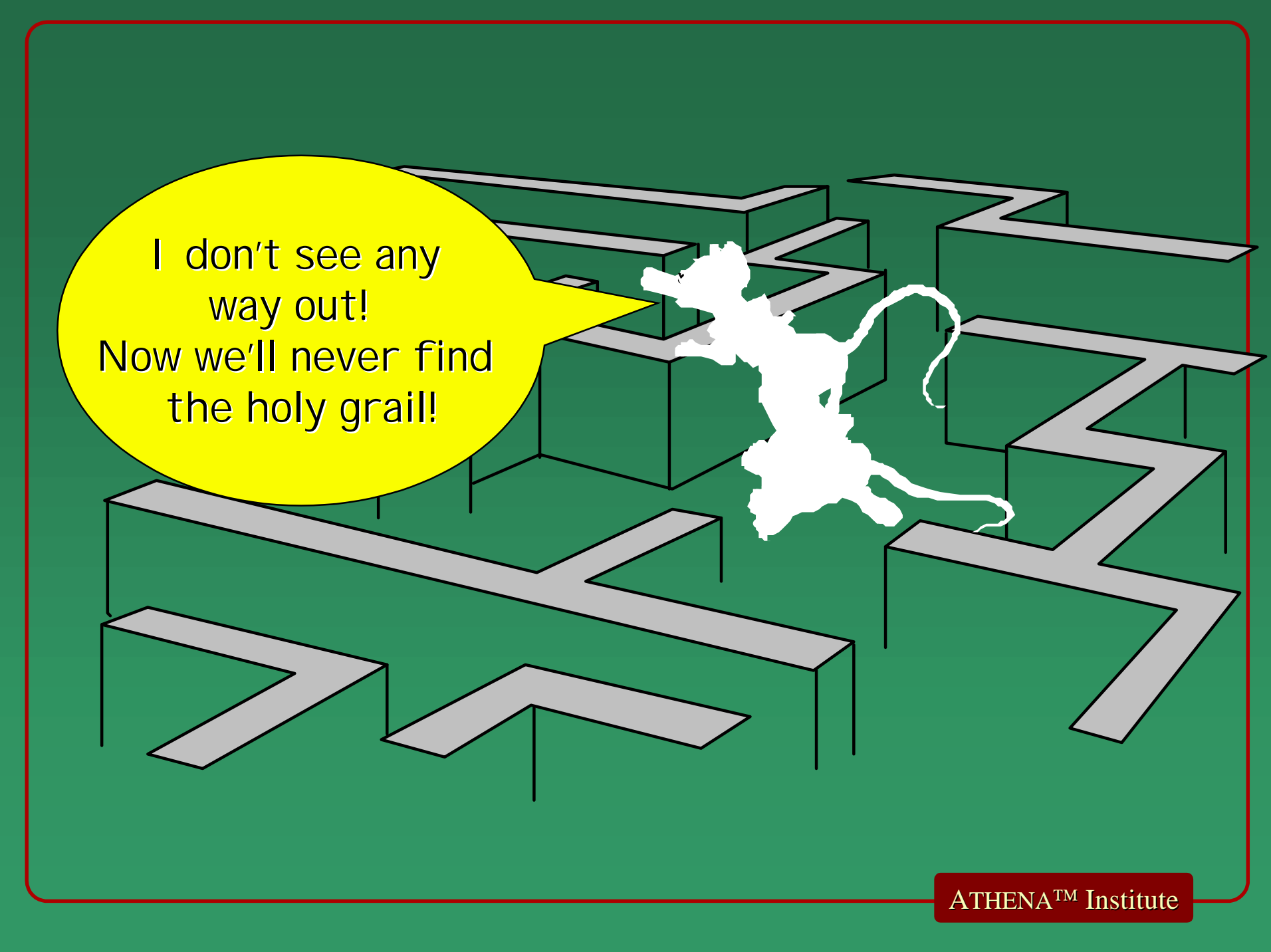
And who probably will not have to live  
with the consequences

# Specific Issues: some examples

- ◆ Maintaining comparability among materials or products
  - » consistent assumptions
  - » same boundary and scope conditions
  - » same level of detail
- ◆ Ensuring functional equivalence
- ◆ Separating ends from means
- ◆ Implications of building life cycle uncertainty, unpredictability

# Assessment Systems & Tools

- ◆ Level 1 — product comparison tools & info sources
- ◆ Level 2 — whole building design or decision support tools
- ◆ Level 3 — whole building assessment frameworks or systems
- ◆ Support systems — whole or part building priority setting tools or methods

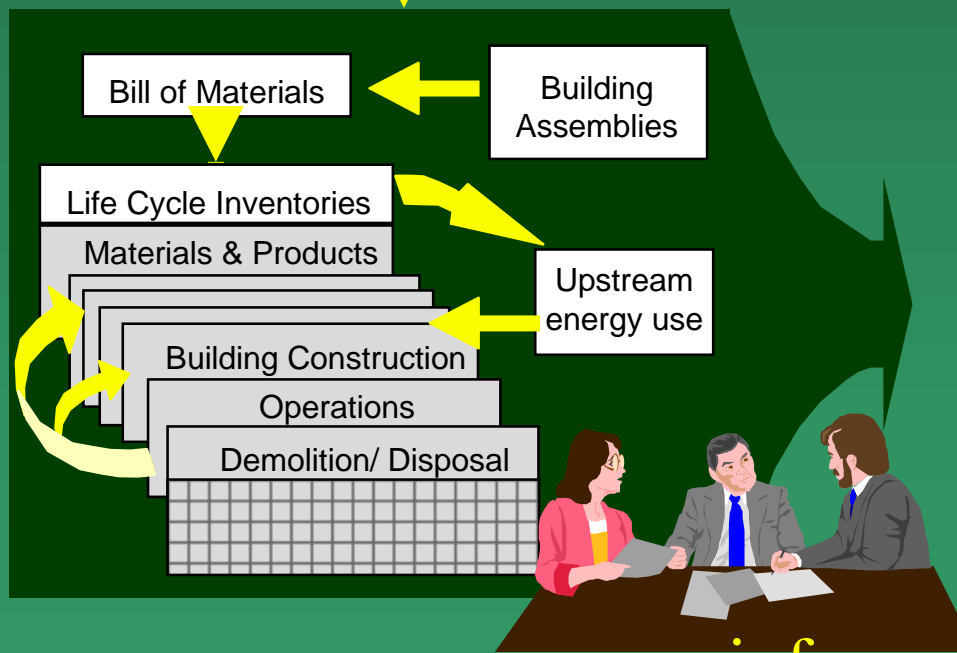
A 3D maze with grey walls and a green floor. A white unicorn is standing in the center of the maze, looking towards the left. A yellow speech bubble is attached to the unicorn's mouth, containing text. The entire scene is enclosed in a red border.

I don't see any way out!  
Now we'll never find the holy grail!

# ATHENA™ at work . . .



- Regional**
- Electricity grids
  - Transportation
  - Production Processes



- INVENTORY**
- ◆ Raw Materials
  - ◆ Energy Use
  - ◆ Water Use
  - ◆ Emissions to Air
  - ◆ Emission to Water
  - ◆ Solid Wastes

- SUMMARY MEASURES**
- ◆ Global Warming Potential
  - ◆ Air Pollution
  - ◆ Water Pollution
  - ◆ Resource Extraction Effects

. . . informed environmental choices

# Athena's Place in the Spectrum

- ◆ A level 2 tool that supports level 3 assessment frameworks like BREEAM and LEED
- ◆ A tool for the LCA layman not the practitioner
  - » all basic LCA work is in the background
  - » user cannot modify, replace or add data
- ◆ But we must then ensure data:
  - » quality
  - » consistency and comparability across products

# The LCI is Critical

Quality of LCA results = Quality of LCI data

No matter what tool is used or  
how results are presented

# Concluding Thoughts

- ◆ Users of building LCA tools unlikely to be LCA practitioners
- ◆ Should not assume users will fully understand the issues
- ◆ Model developers have a special onus to:
  - » ensure data quality
  - » state model limitations as well as strengths

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