48-749 Parametric Modeling
Lecture 2

Carnegie Mellon University
School of Architecture

Lecture 2

- Part 1
  - Sustainability and BIM capabilities
  - BIM approach to workflow
- Part 2
  - Overview of Revit 2010

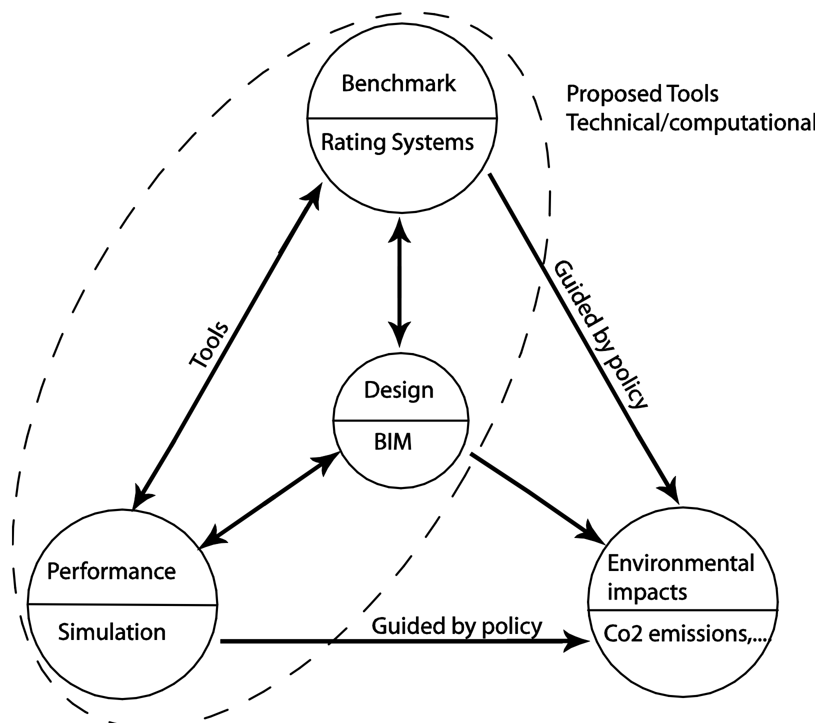
Sustainability

"Sustainable development meets the needs of the present without compromising the ability of future generations to meet their own needs."

- *World Commission on the Environment and Development, 1987*

Sustainability and BIM

- bim software have the potential to be used for integrated design approach



Sustainability and BIM

Policies

- Put a price on Carbon
- Ban the Bulb
- Net metering, Feed in Tariffs
- Localize Economies
- Shift the subsidies
- Grow trees
- Tax credits for renewables
- Profits for efficiency
- Livable communities

Sustainability and BIM

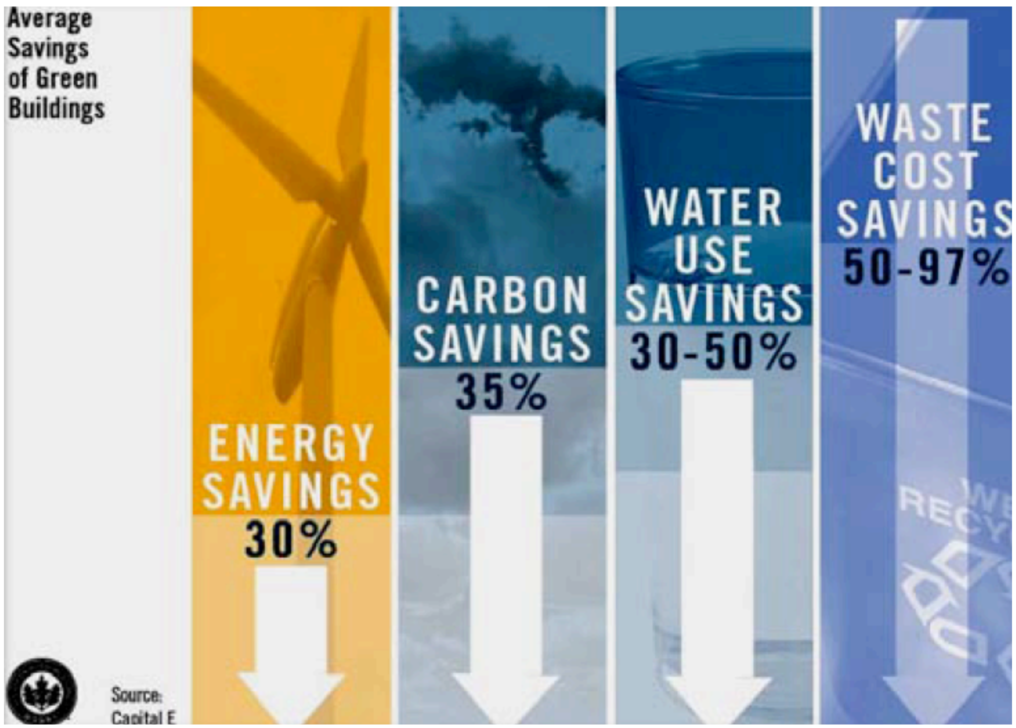
Technologies

- Make fuel from waste
- Plug ins, scooters, bikes, and trains
- Build smart grids
- Get efficient systems
- Tools?

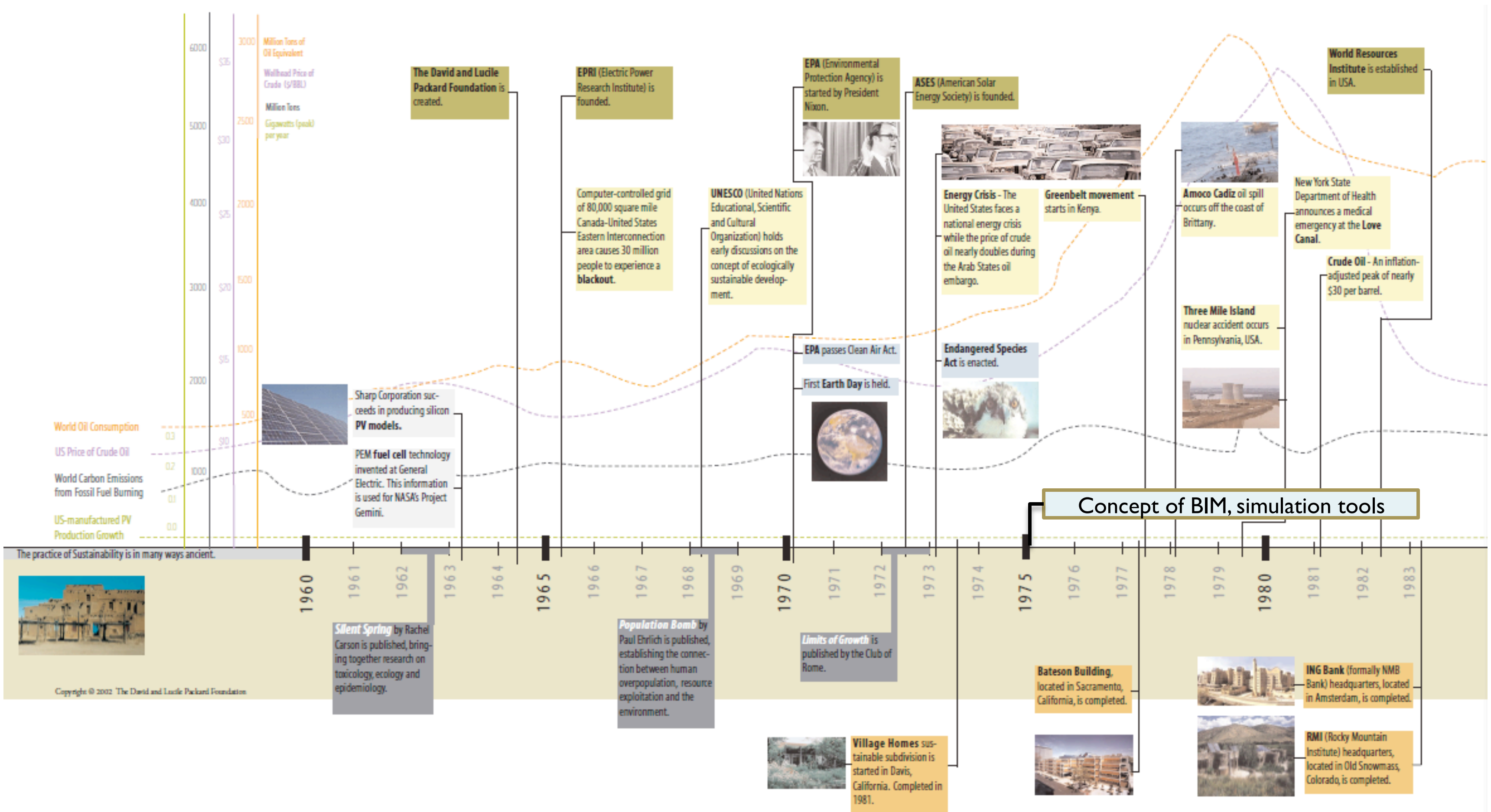
Sustainability and BIM

Sustainable Building Rating Systems- Tools that examine the performance or expected performance of a 'whole building' and translate that examination into an overall assessment that allows for comparison against other buildings

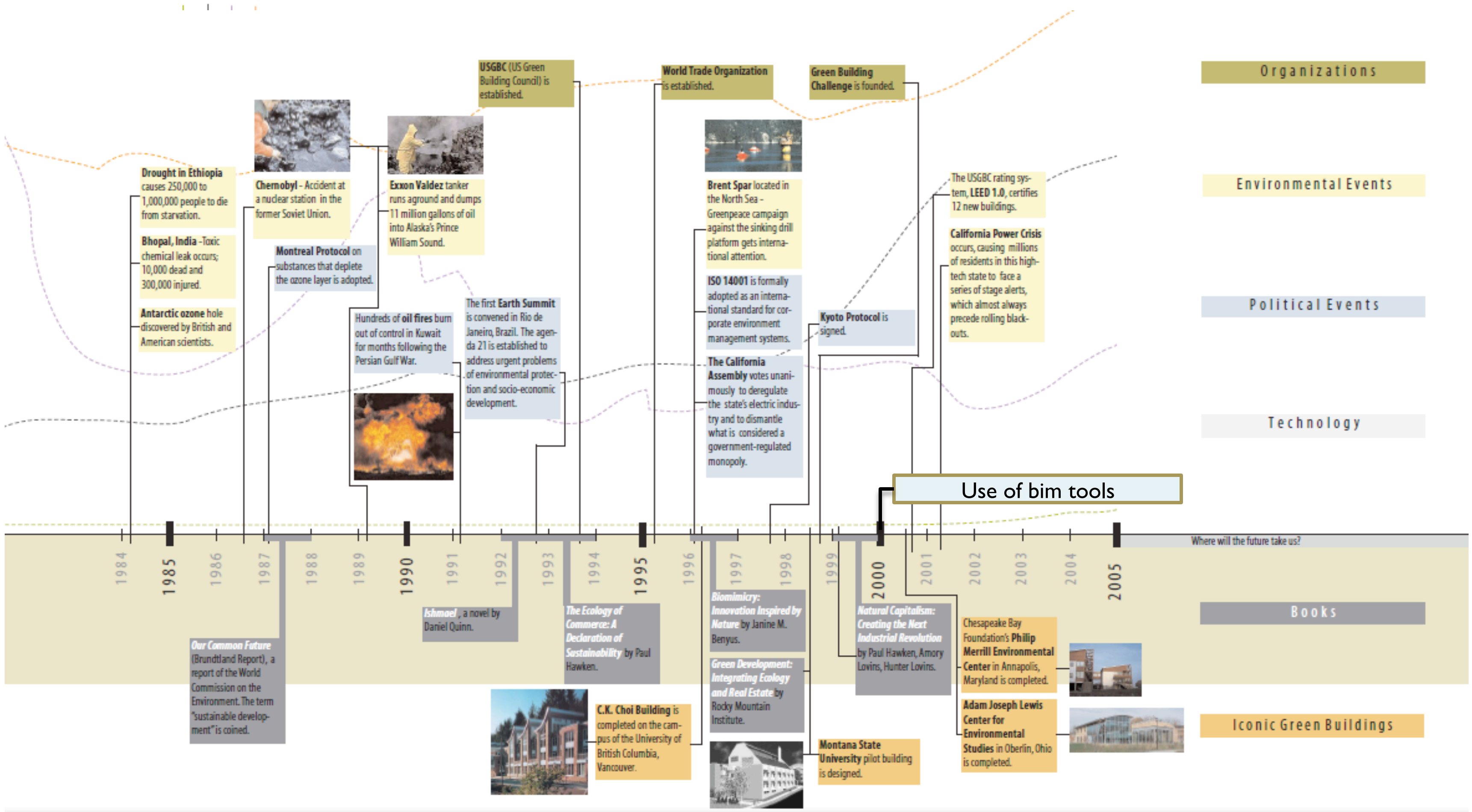
LEED (Leadership in Energy and Environmental Design) – USGBC



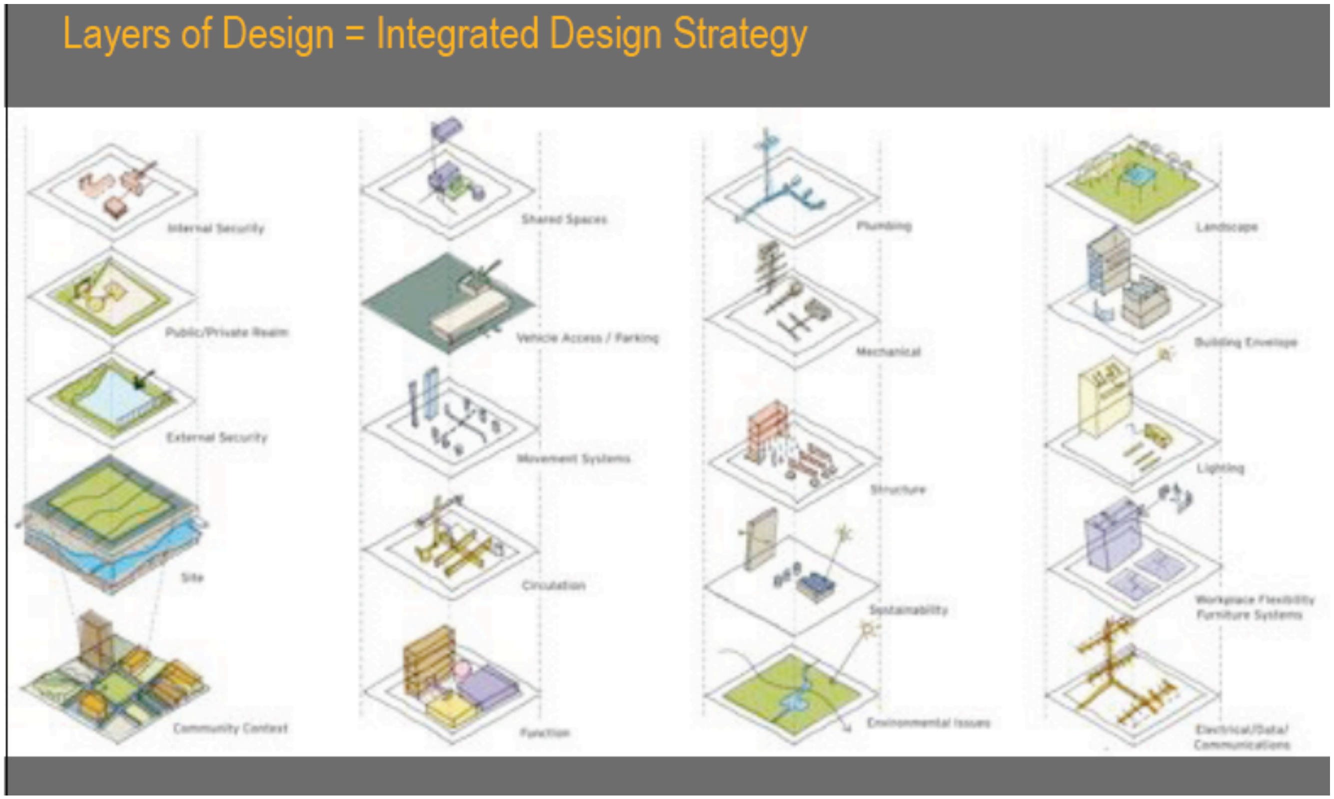
BIM in the context of sustainability timeline



BIM in the context of sustainability timeline



BIM in current building practice

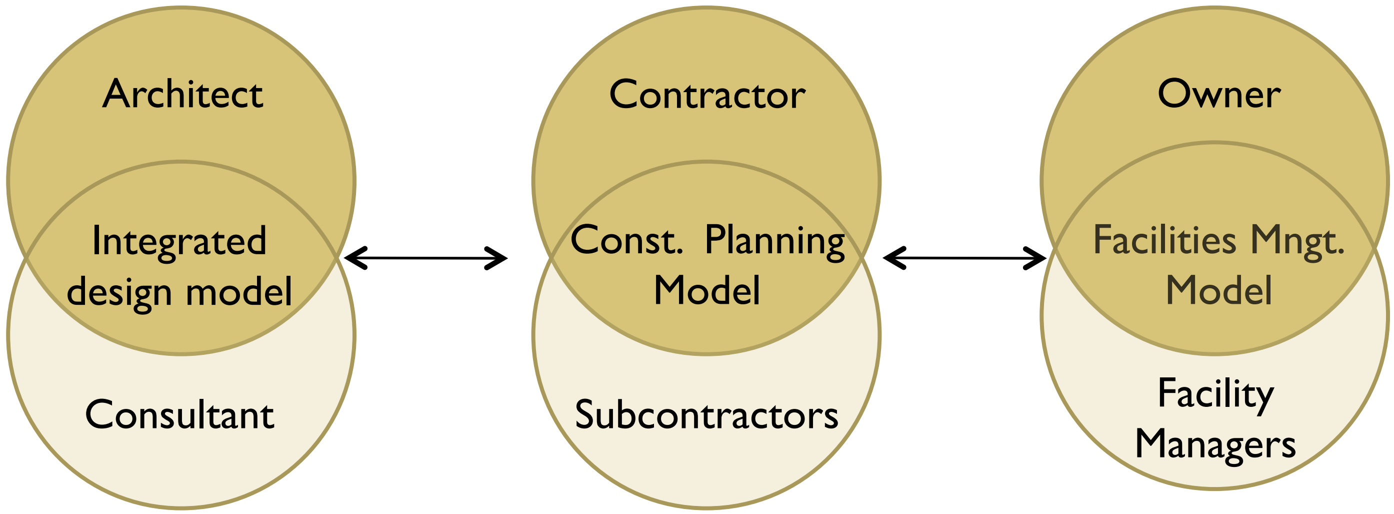


Security (internal/external)
Community context
Transportation systems
Circulation
Function

Plumbing
Structure
Electrical
Sustainability
Environmental issues

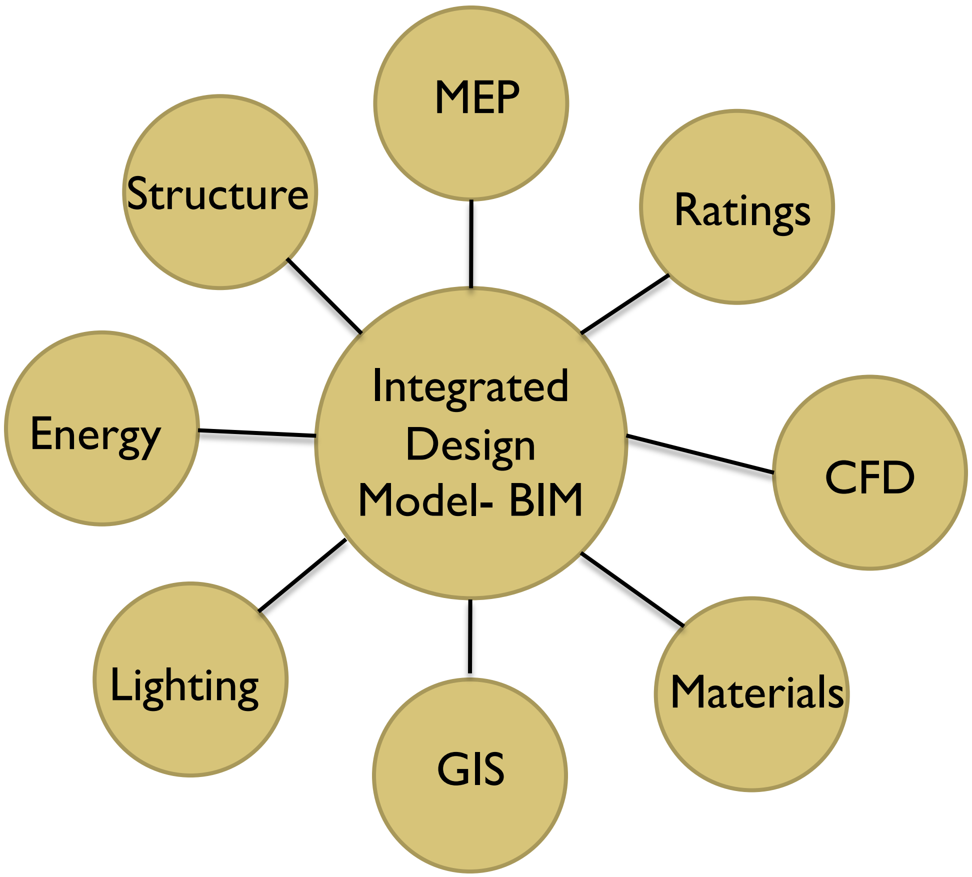
Landscape
Envelope
Lighting
Flexibility
Communications

BIM and integrated design



BIM and integrated design

- A BIM based method, is an integrated design model



BIM and integrated design

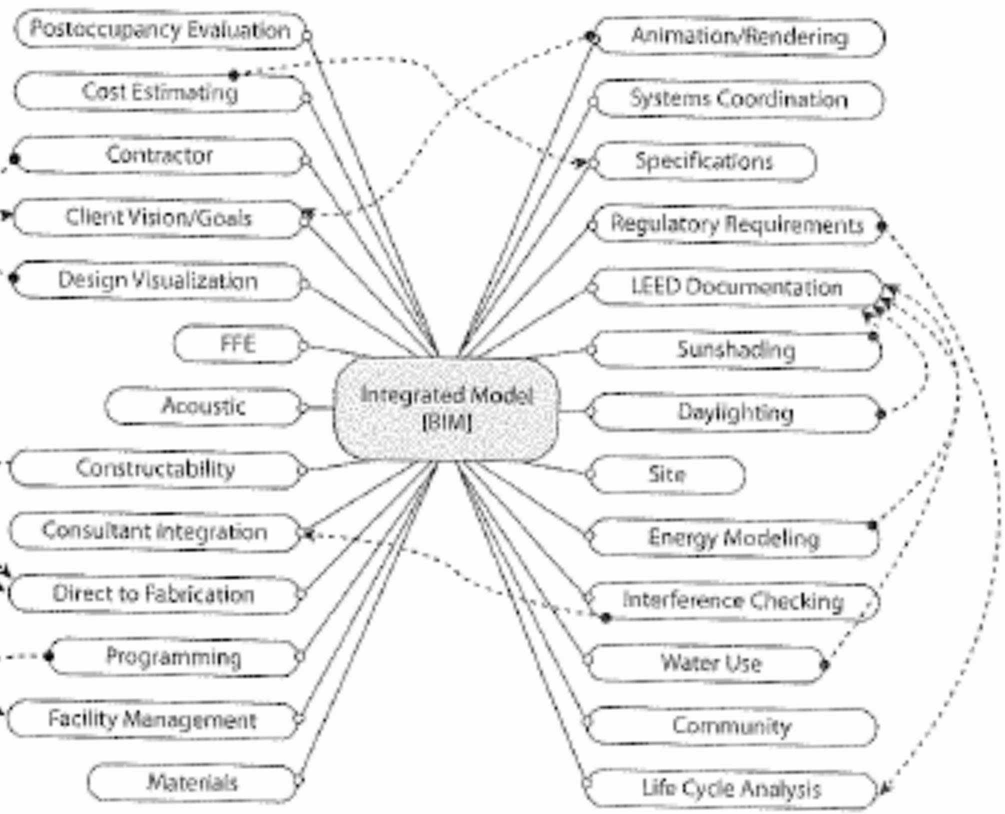


Figure 2.26 BIM roadmap

Ranges of BIM Capabilities

- BIM creates integrated documents
- Design phase visualization
- BIM creates a database of the virtual building
- Sustainable strategies
  - Solar studies for orientation and calculating roof area for solar panels and
  - Recycled content by adding custom variables and materials
  - Water harvesting and consumption by using external databases
- Construction planning
- Post occupancy and facilities management

Ranges of BIM Capabilities

- A database-driven building information model can be used to:
- Export model geometry
- Count
- Sort
- Calculate
- Communicate

BIM within the design workflow

- A good design process includes
  - Listening
  - Researching
  - Designing
  - Building
  - Occupying
  - Learning
- Our goal is to create a methodology for sustainable solutions

BIM within the design workflow (traditional)

- Using BIM is a change from the traditional design process
  - It is by nature iterative
  - It is not particularly inclusive
  - Narrow field of specialists work in relative isolation
  - The cyclical process tend to be centered on
    - Cost
    - Functionality and
    - Aesthetics
    - Architectural solutions are layered with mechanical, structural and electrical rather being integrated
    - Not towards wider implications of design

BIM within the design workflow (sustainable)

- Sustainable design approach requires changes
- Collaboration between disciplines and focus on process
- Requires a green design methodology–Order of operations
- Holistic thinking by key decision makers

BIM within the design workflow (sustainable)

- The *order of operations* is important for achieving sustainable goals
  - Example
  - (4+4) X 3 + (10-7) =27
  - Many different incorrect answers can appear
  - 4x 3= 12 +4 =16 -7 =9+10 =19

BIM within the design workflow (sustainable)

Order of operations

- Understand climate and place
- Reduce Loads
- Use Free Energy
- Use most efficient technology possible

BIM within the design workflow (sustainable)

Example

For solar panel installation- first costs 25-30k

Order of operations make dramatic changes

First examine climate and best place to position solar panels

Look at homes electrical loads and reduce them- change lights with cfl, replace refrigerator and water heater- first cost 4k

Use free energy- sun and natural ventilation and shading

Required amount for solar panels10-12K

A net reduction 9-16k

BIM within the design workflow (sustainable)

Example

The book – Natural Capitalism, provides another example- people retrofitting lights and air conditioner should retrofit the lights first so that would reduce the load for the air conditioner. If the opposite were done more would be paid for cooling capacity, which would make it less efficient and more expensive.

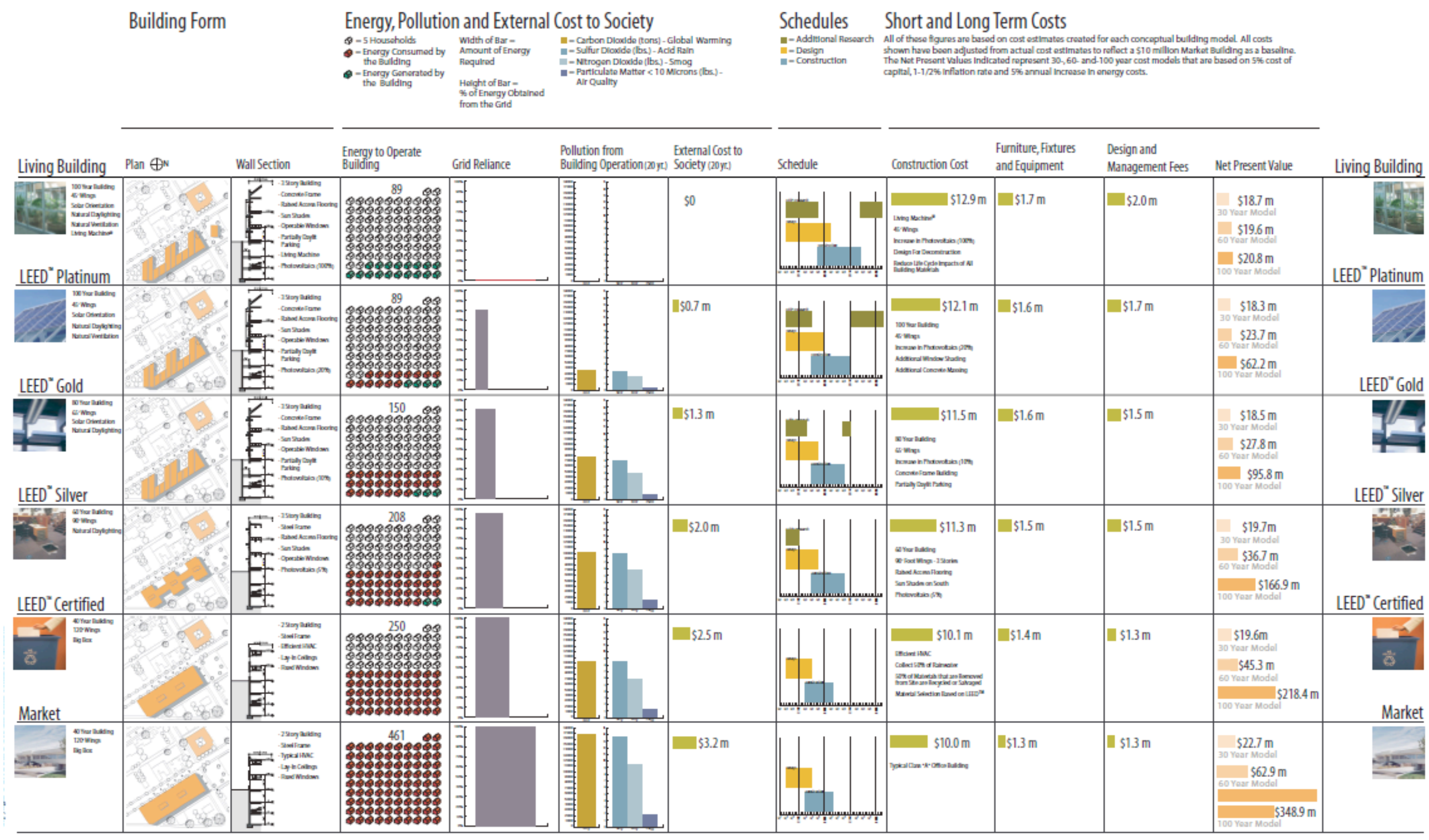
Similarly change windows before sizing heating systems for a house

BIM within the design workflow (sustainable)

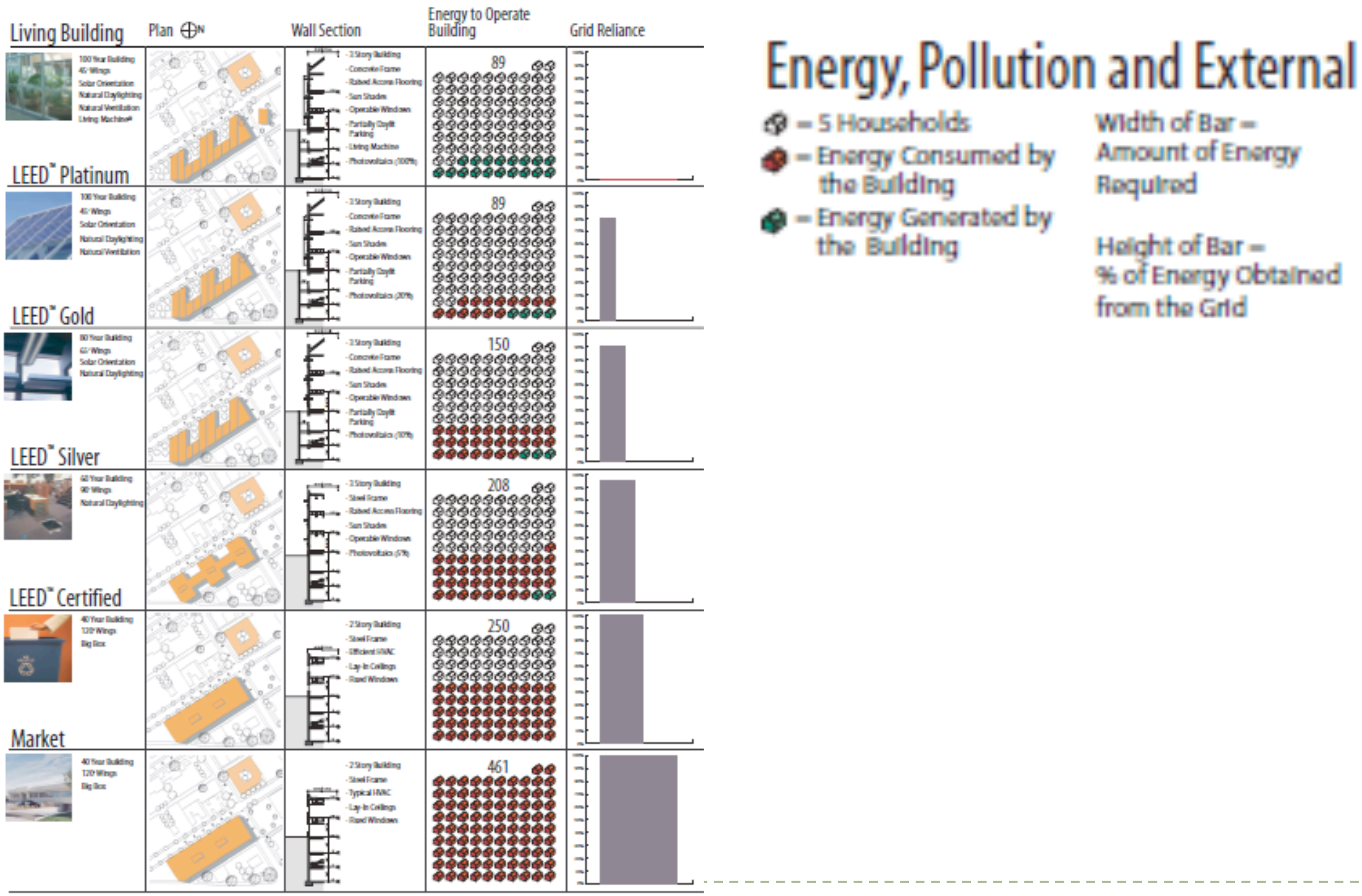
Lewis and Clark State Building

BIM within the design workflow (sustainable)

BIM within the design workflow (sustainable)



BIM within the design workflow (sustainable)



BIM within the design workflow (sustainable)