

Units 1 and 2 Learning Objectives Science and Sensibility/High Performance Buildings

Define

Ecosystem
Ecological Footprint
Ecosystem service
Natural capital
Social capital
Agenda 21
The Brundtland Commission
FIDIC

The Rio Summit
Thermal mass
Millennium Development Goals
The Triple Bottom Line
Embodied energy
R rating and U value of materials
LEED
Commissioning
Charrette

Describe/Explain

- All the items mentioned in the guided reading questions for readings 1, 2, 3 and 4
- All of the questions on commissioning in HW 8
- Some indicators that McDonough would use to measure how “good” or sustainable a design or practice was?
- How cradle-to-cradle design differs from cradle-to-grave design
- McDonough’s biological and technical cycles
- The sustainability “issue” as ASCE sees it in their Policy Statement 418
- What an ecological footprint is and what it tells us about the world’s resources
- The Tragedy of the Commons paradigm
- What the Tragedy of the Commons has to say about human behavior with respect to resources
- The length of time that humans have been on the planet and made changes to natural systems compared to the length of time that natural systems existed on the planet without humans.
- Characteristics of building materials that make them more or less sustainable
- Where the largest fraction of energy usage occurs in the life of a building
- How much of U.S. energy use is due to buildings
- How embodied energy of virgin raw material typically compares to embodied energy of recycled material
- How the “mass effect” can enhance the effective thermal performance of a material
- The kinds of climates where thermal mass in building walls can reduce energy costs and why.
- Why mass-enhanced R values are a property of a “system” rather than a property of a material
- The key features needed for a passive solar design to work properly, with a sketch included
- The year that engineers first began to play a major role in the sustainability “movement.”
- National trends in natural capital
- The rate of change in ecosystem status before humans were present and after humans were present
- Wilson’s view of what “environmentalism” should be and why
- Wilson’s view of why humans tend not to worry about long-term environmental consequences, and why this could cause problems
- Lovins’ argument against the conventional view of “value creation”
- The typical pounds of waste generated per sq ft of residential construction
- The strengths and weaknesses of a given indicator that I provide to you
- The basic way a building gets LEED certification
- What is meant by an “integrated” design? What would a non-integrated design look like?
- What is the purpose of a charrette?

List

- The three factors that have contributed to global population decline
- The four types of capital Lovins believes are necessary for an economy to succeed
- The four central strategies of natural capital that Lovins believes are a means to ensure prosperity for countries, companies, and communities in the future.
- Key historical developments in sustainable development in order of their occurrence
- Five strategies to reduce material consumption in construction
- Five characteristics that can be used to assess the sustainability of a construction material
- Four examples of non-conventional building materials
- Two ways that natural daylighting reduces building energy consumption

- Some criteria for selecting good indicators of sustainability
- The kinds of stakeholders you might include in a charrette

Potential Essay Questions (note: I will not offer answers for these in class, although you may talk them over among yourselves.) These are typical of the nature of the questions that may appear on the test.

1. What would be accomplished if governments adopted the GPI (genuine progress indicator) instead of the GNP (gross national product), which Wilson discusses on p. 28? What is indicated, in terms of the American approach to environmental responsibility, by the fact that the United States refuses for economic reasons to adopt the Kyoto Climate Protocol to reduce greenhouse gases?
2. Two of the key impediments to moving forward faster with sustainable design are (1) that both politicians and the public at large tend to think locally and for the short term. Politicians are worried about getting elected; and many people live with no savings, insurance, and even deeply in debt, which suggests they have immediate financial priorities and/or do not tend to think about the future. (2) the higher up-front costs of sustainable designs are a tremendous disincentive for engineering clients to try them. Think about two fundamental things you might do in your professional career to address these problems (assuming you advocate for more and accelerated sustainable design). Explain why you think these two practices will have maximum impact and success. If you do not advocate more and accelerated sustainable design practices, explain why.
3. Explain the concept of the Tragedy of the Commons, or the Commons Dilemma. If we see ecosystem services as the “commons,” what do you think the Tragedy of the Commons says about whether or not environmental regulations are needed to prevent ecosystem damage by humans? Do you think this is a reasonable analogy? Why or why not?
4. Explain the purpose of a charrette and describe how the way a charrette is conducted reflects that purpose.