Midterm

Thursday, May 11, in class, open note.

1. [25 points] Briefly define the following terms:

   a. Sustainable development;
   b. "The triple bottom line";
   c. Carrying capacity;
   d. Ecological footprint;
   e. Design for Environment

2. [35 points] Compare nuclear fission and coal as energy sources for future economic activity.

   a. As quantitatively as possible, evaluate the costs and benefits of converting the US economy from 50% coal powered electricity and 20% nuclear powered electricity to 70% nuclear powered electricity. Some data that may be useful: US total electric use is about 3.5×10^{12} kWh per year, nuclear fission is estimated to cost 6.7 cents per kWh, coal about 4.2 cents per kWh [based on an MIT study reported in a policy brief by Pietro Nivola, of The Brookings Institution]. (Note: Production costs, which do not consider plant construction costs, are somewhat different: 1.7 cents per kWh for nuclear fission and 1.9 cents per kWh for coal [according to the Nuclear Energy Institute web site].) These reported costs may not address all costs and benefits that you will want to consider in your analysis.
   b. In your discussion, consider the advantages and disadvantages of coal and nuclear power with regard to natural resource issues, environmental concerns, and policy.

3. [40 points] The San Diego Chargers football team currently plays in Qualcomm Stadium, but they would like to build a new stadium. On May 1st this year, the San Diego City Council agreed to allow the team to look anywhere in San Diego County for a new stadium site. Suppose that you have been asked to serve as the "green design" consultant for the new stadium. Discuss how you might use the life-cycle assessment formalism to identify:

   a. The important areas of environmental impact in the stadium site selection;
   b. The important areas of environmental impact in the stadium design itself;
   c. Potential improvements that would reduce the environmental impacts throughout the life cycle of the stadium.