Online Ethics Center
FOR ENGINEERING AND SCIENCE

Climate Action

Author(s)

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Description

This assignment is an excerpt from Riley, D. (2012). Engineering Thermodynamics and 21st Century Energy Problems: A Textbook Companion for Student Engagement. San Rafael, CA: Morgan and Claypool. It challenges students to move between a “big picture” contextual perspective and the focused, sometimes narrow world of engineering thought.

Body

This module challenges you to move between a “big picture” contextual perspective and the focused, sometimes narrow world of engineering thought. Learning to move between these frames is essential in forming sound engineering judgment. This assignment also challenges you to move between theory and action, between your life as a student and your life as a citizen of the planet. Integrating theory and action is the essence of engineering; engagement reminds us it is a false distinction we sometimes make between “College” and “The Real World,” between an academic subject like “thermo” and what we more generally refer to as our “life.”

1. **Engage** – Identify a set of significant actions that can be taken to reduce US greenhouse gas emissions [1].

Significant in this case means it must have the potential to reduce greenhouse gas emissions to 1990 levels, when the atmospheric global carbon dioxide concentration was 354 ppm. This is a significant reduction, but is also far from sufficient when one considers that global increases in CO2 emissions from fossil fuel combustion between 1990 and 2008 have been much higher, around 40% to the U.S.'s 15%[3]. Despite these emissions increases abroad, the US remains a grossly disproportionate emitter of CO2, putting out 19% of global CO2 emissions from human activity (excluding deforestation) while comprising only 4.6% of the world population [2]. On this basis one could argue that U.S. reductions need to be much deeper in order to be equitable and to allow developing economies to grow.

2. Analyze - Justify your choice by explaining what impact you expect your actions to have and put them in perspective. You must do this quantitatively, qualitatively, and in terms of ethical or moral argument.

- Quantitatively, estimate the total CO2 equivalent reductions your actions would bring about on an annual basis (see [1] for a definition of CO2 equivalents). The goal is to eliminate enough Tg of CO2 equivalent emissions per year to return the U.S. to 1990 emissions levels. Keep track of uncertainty in your assumptions and present your estimated reductions with a sensitivity analysis (carry through +/- values that extend from a critical assessment of your own assumptions used in your estimates). Your sensitivity analysis should capture the range of emissions reductions that can reasonably be expected, given the uncertainty in your assumptions.
- Qualitatively, you need to describe why your proposed action is feasible in the time allotted, and why you expect it to be effective in the long-term toward bringing about the reductions targeted.
- Make an ethics-based argument for why your proposed action is necessary or justified, referencing multiple ethical frameworks (e.g. utilitarian, deontological, social justice, morally deep world, etc. – see [3-6] for more on ethics frameworks and how to apply them).

3. Reflect – How much can individual personal actions, such as using energy efficient light bulbs impact climate change? How likely are individuals to comply with behavioral strategies? What adjustments would you make to your calculations to make sure they are realistic? What kinds of collective actions that target structural and infrastructural issues might be more likely to bring about significant change? What are the barriers to individuals acting collectively for change?

4. Change – Take some action that demonstrates the effectiveness of your proposed reduction strategy or that works toward actually making these reductions happen. For example, you might implement one strategy on a small scale, which, if implemented widely, would result in the reductions claimed. Or you may work to bring about larger structural change that brings about these reductions through collective action – for example, working to pass national legislation. Document your actions and their short-term effects on yourself, your local community, and larger society.

5. Reflect – What are your accomplishments so far? Describe results quantitatively, qualitatively and in ethical or moral terms. What impact have your actions had globally, locally, and within your self? What feedback have you received, and what new knowledge have you acquired as a result of your actions? How will you adjust your actions going forward, as a result of what you learned? What opportunities for transformation lie ahead? What do you wish you had done differently? What future actions do you recommend or commit to do next? How did this exercise change you? What have you learned? How did this project connect to your learning thermodynamics? How will you use what you've learned in your future as a student? As a professional? As a citizen of the world?

References

[1] Environmental Protection Agency. (2011). U.S. Greenhouse Gas Inventory Report. Accessed June 8, 2011 from http://www.epa.gov/climatechange/emissions/usinventoryreport.html.

[2] International Energy Agency. (2010). CO2 Emissions from Fuel Combustion Highlights. 2010 Edition. Accessed June 8, 2011 from http://www.iea.org/co2highlights/CO2highlights.pdf.

[3] Catalano, G.D. (2006). Engineering Ethics: Peace, Justice and the Earth. San Rafael, CA: Morgan and Claypool. doi:10.2200/S00039ED1V01Y200606ETS001

[4] Harris, C. E., Pritchard, M.S. and Rabins, M.J. (2005) Engineering Ethics: Concepts and Cases. 3rd ed. Stamford, CT: Thomson Wadsworth.

[5] Martin, M.W. and Schinzinger, R. (1996) Ethics in Engineering. 3rd Ed. New York: McGraw-Hill.

[6] Whitbeck, C. (1998). Ethics in Engineering Practice and Research. New York: Cambridge University Press.

Rights

Resource Type

Educational Activity Description

Topics

Climate Change
Controversies
Social Justice

Discipline(s)

Computer, Math, and Physical Sciences
Engineering
Meteorology