Sustainability in Engineering Systems

ESD.83 Discussion

Lecture 12

Outline

- ☐ **Preliminary comments**

- ☐ **Hardin reading**
  - ■ Biography and Major Works
  - ■ *Tragedy of the Commons*

- ☐ **Banister Reading**
  - ■ Biography and Major Works
  - ■ *The Sustainable Mobility Paradigm*

- ☐ **Discussion**

What *is* Sustainability?

Table 1: Principles of Sustainable Transportation removed due to copyright restrictions. Original image can be viewed here (page 7): http://esd.mit.edu/symposium/pdfs/monograph/sustainability.pdf

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Hardin, *The Tragedy of the Commons* (1968)

Garrett Hardin (1915-2003)

- Degrees:
  - B.S., Zoology, 1936, U. Chicago
  - Ph. D., Microbiology, 1941, Stanford
- Major focus of his career: *human overpopulation*
- One of the first members of the Society for General Systems Research (now the International Society for the Systems Sciences, isss.org)

Hardin's Major Works

- On Ethiopia: *Living on a Lifeboat,* BioScience magazine, 1974
- Summation of his works: *Living within Limits*, 1993.
    - Natural sciences: grounded in limits
    - Social sciences: things *without* limits
    - This is the source of argument
- Last book: *The Ostrich Factor: Our Population Myopia*, 1999
    - Argues for coercive constraints on "unqualified reproductive rights"

The Tragedy of the Commons (1968)

☐ Premise:
1. There exists a class of problems without a purely technical solution.
2. One of these is the problem of overpopulation.

☐ Problem:
1. The Earth has finite physical space and resources.
2. Individuals, left to their own devices, over-consume limited, shared resources.
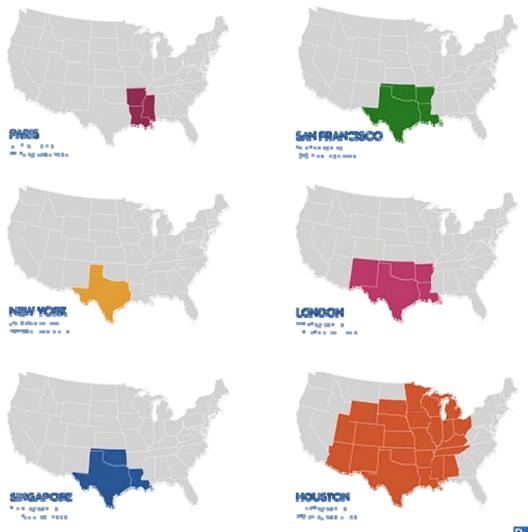
☐ Solution:
■ There should be some form of "mutual coercion" to force individuals to take the actions that are beneficial for the aggregate (population control).

THE WORLD'S POPULATION, CONCENTRATED

If the world's 6.9 billion people lived in one city, how large would that city be if it were as dense as...

PARIS

SAN FRANCISCO

NEW YORK

LONDON

SINGAPORE

HOUSTON

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PER SQUARE MILE

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http://persquaremile.com/2011/01/18/if-the-worlds-population-lived-in-one-city/

Banister, *The Sustainable Mobility Paradigm*

David Banister, Biography

- Director of the Transport Studies Unit at Oxford
- Degrees:
  - B.A., Geography, Univ. of Nottingham, 1971
  - Ph. D., Univ. of Leeds, 1975
- This paper won the "Transport Policy Prize" for this paper, published in 2008 at the 12th World Conference on Transport Research

The Sustainable Mobility Paradigm

- □ Premise:
  - ■ Questions two common principles of transport planning.
  - ■ What are the necessary conditions for change?
- □ Problem:
  - ■ This is not a technical problem – the methods work.
  - ■ How do we effectively promote *public acceptability* of sustainable transport measures?
- □ Solution
  - ■ Seven different methods (next slide)

Generating Public Acceptance

1. Provide the right information
2. Include the public when discussing policy
3. Provide the right packaging
4. "Sell" the benefits
5. Implement radical changes slowly
6. Work holistically
7. Policies must be adaptive to the unknown future

Discussion

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Authority and Information

- ☐ Moral vs. Political Authority
- ☐ There is a need to inform and educate the public concerning their actions.
- ☐ As we know, people are irrational, biased, and do not consider all information.

Questions:

1. Attacking Hardin's position – is this truly a problem with no technical solution? Is there such a thing as net-zero existence? Now add one more person…

2. Is this a problem of information? Is educating the population the solution? What about the people that just don't care, ever?

3. What about the "scientist who cried wolf?" Is this a role that the scientific community should play?

4. In a response, Crowe described some of these issues as "value problems" and that the fragmentation of societies into tribes was destroying common values. Do you think that Banister's ideas can overcome this?

Individuals, Morality, and Decision-making

☐   At the root of each lies the individual human being.

☐   Both Banister and Hardin believed that legal architecture, as supported by the majority, should "coerce" the unruly public.

Questions:

5.   A question of scale and scope: if this is truly a moral consideration – that we must do this for the sake of mankind – should be wait for the majority? *Quis custodies ipsos custodes*?

6.   Can we afford the long view? What if our policies are solely to affect social and moral change?

7.   Can we make moral judgments about future conditions of which we are not certain? (see Ehrlich, *The Population Bomb* in this same year)

8.   Can we make systems robust to choice? What would this look like?

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Global thinking…

Going back to Selin: what to do about the third world?

Questions:

9. Thresholds: what is the critical mass? In Mort Webster's work, how do we account for the fact that $X\%$ of nations *won't* agree to the standards?

10. Enforcement: if we enforce rules on the Third World that we did not follow at a similar point in our history, how do we answer critics? (see: China)

11. Imperialism: Is it our responsibility to do so "for their own good?" Are we then not politically and scientifically imperialist, and can you imagine the pushback that would occur?

Questions?

Revisiting *Tragedy* (Crowe, 1969)

☐ Beryl Crowe wrote a response to *Tragedy* in 1969 (published in *Science*).

☐ Points out the "two cultures" of natural and social sciences and references Snow.

☐ "…Both sciences can thus avoid responsibility $_{and}$ protect their respective myths of competence and relevance, while they avoid having to face the awful possibility that each has independently isolated the same subset of problems and given them different names…"

☐ Eroding the myths of
- Common Values
- the Monopoly of Coercive Force
- Administrators of the Commons

Revisiting *Tragedy*, again (Oostrom, 1999)

☐ Points out the power of information: public goods games, etc.

☐ People are generally good at self-organizing, once they recognize the need

☐ Four types of people:

  1. those who always behave in a narrow, self-interested manner (free-riders)

  2. those who are unwilling to cooperate with others unless assured that they will not be exploited by freeriders;

  3. those who are willing to initiate reciprocal cooperation in the hopes that others will return their trust

  4. perhaps a few genuine altruists who always try to achieve higher returns for a group.

☐ The example of Nepalese Farming

Publications and Research Foci

☐ Foci:

1. Policy Scenario Building
2. Reducing the Need to Travel
3. Climate Change, Energy, and Environmental Modeling
4. Transport Investment and Economic Development
5. Rural Transport and Employment

☐ Publications:

■ 2010, *Integrated Transport: from policy to practice*

■ 2007, *Land Use and Transport Planning – European Perspectives on Integrated Policies*

■ 2005, *Unsustainable Transport: city transport in the 21st Century*

"Mutual Coercion"

- ☐ "The morality of an act is a function of the state of the system at the time it is performed."
- ☐ "legislating temperance."
- ☐ "Conscience is self-eliminating." (*Idiocracy, anyone?*)
- ☐ "Mutual coercion mutually agreed upon."
  - ■ Coercion via social arrangements
  - ■ Compares his desired course to taxes and parking meters
- ☐ Very fatalist view; feels that "coercion" and somewhat extreme measures are needed.
- ☐ Why not incorporate a rewards structure?

What *is* Sustainability?

☐ Merriam-Webster:

1.

   a. of, relating to, or being a method of harvesting or using a resource so that the resource is not depleted or permanently damaged; *sustainable* techniques or *sustainable* agriculture

   b. of or relating to a lifestyle involving the use of sustainable methods; *sustainable* society

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