

# Cleaner Production 19.659 Fall 2011

Class discussion notes  
September 14, 2011

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## DEFINITIONS

<b>SUSTAIN (v)</b> <ul style="list-style-type: none"><li>→to support, hold or bear up from below</li><li>→to bear a burden or change</li><li>→to undergo without yielding</li><li>→to keep a thing from giving way</li><li>→to keep up or to keep going as an action or process</li><li>→to supply with food, drink and the other necessities of life</li></ul>	<b>ABILITY (n)</b> <ul style="list-style-type: none"><li>→power or capacity to act physically, mentally, legally, morally, financially, etc.</li><li>→competence in an activity or occupation</li></ul>
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Your definitions of sustainability



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### Some definitions of sustainability

*"Development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland Commission)*

*"Economic growth that will benefit present and future generations without detrimentally affecting the resources or biological systems of the planet" (President's Council on Sustainable Development)*

*"Sustainable design is the careful meshing of human purposes with the larger patterns and flows of the natural world..." (David Orr)*

*"Sustainability is equity over time...think of it as extending the Golden Rule through time...do unto future generations as you would have them do unto you" (Robert Gilman - Context Institute)*

*"Sustainability means using the essential products and processes of nature no more quickly than they can be renewed and discharging wastes no more quickly than they can be absorbed" (Our Ecological Footprint p.7)*

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### Some more definitions of sustainability

*"Sustainability involves moving from linear to cyclical processes and technologies" (Dr. Karl Henrik- Robert, MD)*

*"Sustainable growth is a contradiction in terms: nothing physical can grow indefinitely. 'Sustainable use' is applicable only to renewable resources: it means using them at rates within their capacity for renewal" (International Union for the Conservation of Nature)*

*"A sustainable society is one that lives within the self-perpetuating limits of its environment. That society is not a "no growth" society--it is, rather, a society that recognizes the limits of growth and looks for alternative ways of growing" (James Coomer)*

*"Leave the world better than you found it, take no more than you need, try not to harm life or the environment, make amends if you do" (Paul Hawken)*

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### Even more definitions of sustainability

*"Sustainability or sustainable development means that economic systems should meet the needs of existing populations without endangering or stealing from future generations. It means that consumption must be balanced with the rate at which the ecosystem can renew resources. And disposal of wastes must be balanced with the ability of natural systems to absorb or neutralize them" ("Facing the Future: People and the Planet")*

*"A sustainable society is one that can persist over generations, one that is far-seeing enough, flexible enough, and wise enough not to undermine either its physical or its social systems of support...From a systems point of view a sustainable society is one that has in place informational, social and institutional mechanisms to keep in check the positive feedback loops that cause exponential population and capital growth" (Beyond the Limits p.209)*

*"To achieve sustainability, a system must be ecologically sound, economically viable, socially just and humane - embodying our highest values— how we treat animals, people and the Earth" (Alliance for Sustainability)*

*"In every deliberation we must consider the impact on the seventh generation" (Great Law of the Iroquois)*

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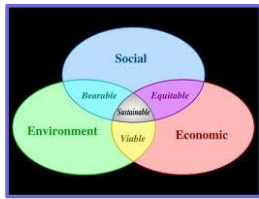
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### Common elements in sustainability definitions



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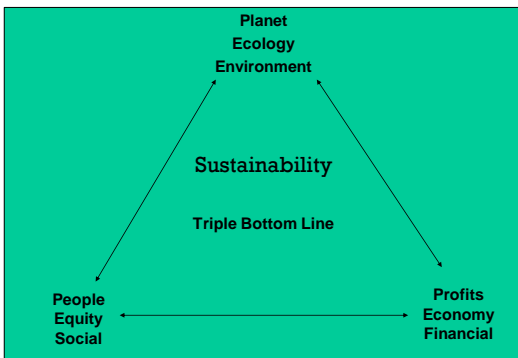
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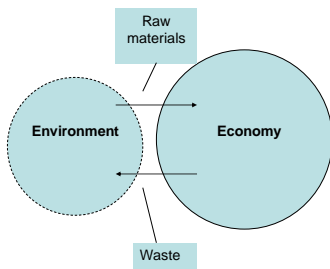
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### Traditional economics worldview (maximize growth)



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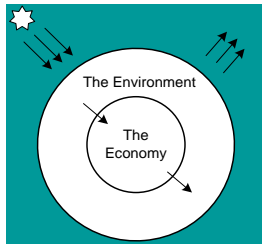
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Ecological economics worldview




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Jackson chapter

- Open and closed systems
- First and second laws of thermodynamics
- Anti-entropic cycles
- Global entropy pump
- Pollution and entropy
- Carrying capacity

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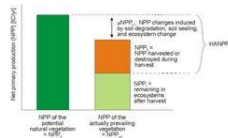
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Global human appropriation of net primary production




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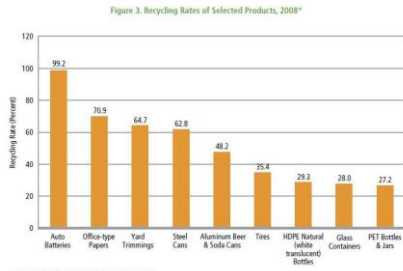
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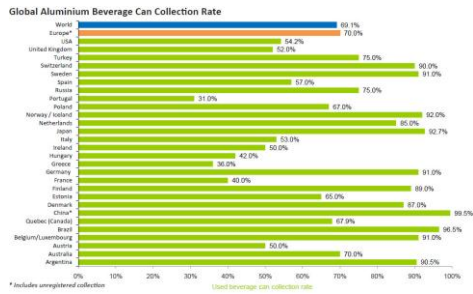
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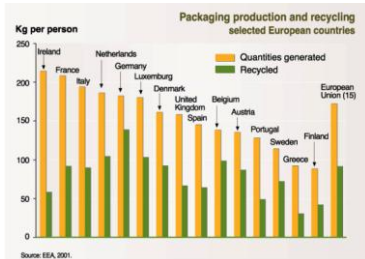
## Recycling rates – US (2008)



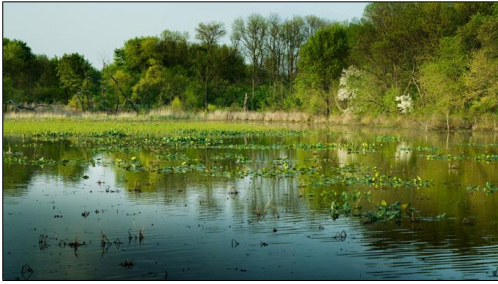
## Aluminum can recycling



## Package recycling



What is an ecosystem service?



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Valuing ecosystem services



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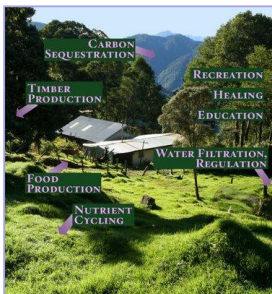
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Findings of Millennium Eco-System Assessment report



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A compass for sustainable development



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The character of environmental problems has changed:

Local ----- Global  
Few Large Sources ----- Diffuse Sources  
Short Time Delay ----- Long Time Delay  
Low Complexity ----- High Complexity

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Science principles:

- Matter and energy cannot be created or destroyed (the Conservation Law, or 1st Law of Thermodynamics)
- Matter and energy tend to spread spontaneously (Entropy, or the 2nd Law of Thermodynamics)
- Biological and economic value (quality) is in concentration and structure (order) of matter (this is what we consume)
- Green cells are essentially the only natural net producer of concentration and structure (Photosynthesis)

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### A systems perspective emphasizes:

- Focusing "upstream"
- Principles rather than details
- Shared framework and a common language
- Necessary (non-negotiable) system conditions

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The tree is a metaphor for a systems perspective

Trunk & Roots-  
fundamental  
principles



Foliage-details

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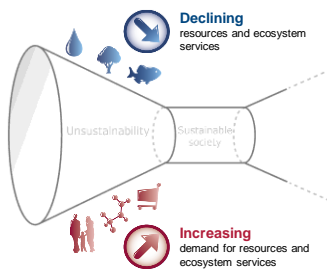
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### Funnel reality



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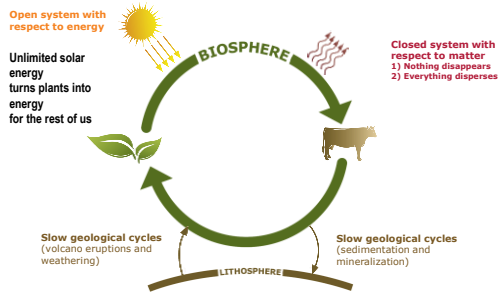
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## Cycles of nature



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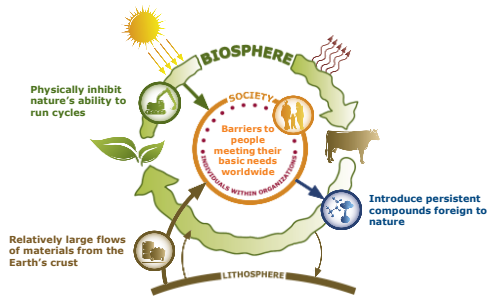
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## How we influence cycles



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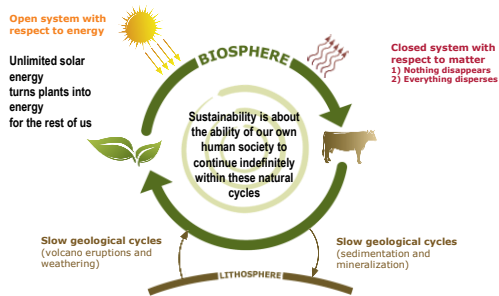
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## Success in the system



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## 4 system conditions

In a sustainable society, nature is not subject to systematically increasing...



...concentrations of substances extracted from the Earth's crust,



...concentrations of substances produced by society,



...degradation by physical means, and, in that society...



...people are not subject to conditions that systematically undermine their capacity to meet their needs.

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### Applying the System Conditions

↻ How can we reduce our dependence on mining and fossil fuels?

✂ How can we reduce our dependence on persistent, unnatural substances?

✂ How can we reduce our dependence on nature-consuming activities?

✂ How can we increase our resource efficiency (do more with less)?

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