

ENVIRONMENT

THE SCIENCE BEHIND THE STORIES

Jay Withgott • Scott Brennan

Ch 23

Sustainable Solutions

Part 2: Environmental Issues and the Search for Solutions

PowerPoint® Slides prepared by
Jay Withgott and Heidi Marcum



Third Edition

This lecture will help you understand:

- University campus efforts to promote sustainability
- The concept of sustainable development
- How environmental protection and economic welfare can be compatible
- Approaches to designing sustainable solutions
- How time is limited but human potential to solve problems is tremendous



Copyright © 2008 Pearson Education, Inc., publishing as Pearson Benjamin Cummings

Central Case: Ball State University aims for campus sustainability

- Colleges are microcosms of society and must reduce their ecological footprint
- BSU, in Muncie, Indiana, is a leader in the movement for campus sustainability
- BSU has initiated a wide variety of sustainable activities and serves as a model for other schools



Copyright © 2008 Pearson Education, Inc., publishing as Pearson Benjamin Cummings

Sustainability on campus

- If we are to attain a sustainable civilization, we will need to make every effort from individual households to nations to the world
- Governments, corporations, and organizations must get involved
- Colleges and universities are centers of lavish resource consumption, so these institutions must also be involved

Why strive for campus sustainability?

- Reducing the ecological footprint of a campus can make a huge impact
- It make students aware of environmental problems
- Students who engage in sustainability efforts learn and grow
- Success and failure can be valuable preparation for similar efforts in transforming other inertia-bound institutions
- Students often initiate change because they feel freer than faculty
- They are also less attached to tradition and come up with new ideas and perspectives

Campus efforts may begin with an audit

- Campus efforts may begin with a quantitative assessment of the institution's operations
 - Provide baseline information on the institution's activities
 - Includes energy use, pollutant emissions, waste management, transportation issues
- Audits should lead to specific recommendations
- Once changes are made, progress must be monitored

Recycling and waste reduction



Copyright © 2008 Pearson Education, Inc., publishing as Pearson Benjamin Cummings

- The most common campus efforts
 - 46 - 85% of schools had recycling services in place
 - Easy to start and maintain
 - Students can competition among schools to see who can recycle the most
- Students run events to promote the recycling
- Recycling saves colleges thousands of dollars each year

Green building design is the key

- Dozens of campuses now boast “green” buildings
 - Constructed from sustainable, energy efficient building materials
- Agreed-upon standards are the *Leadership in Energy and Environmental Design* (LEED) standards
- The movement of “green buildings” continues to grow
 - The University of Florida has started construction on 18 green buildings since 2003
 - Landscaping uses native plants and reclaims irrigation water

Two examples of green buildings

- Adam Joseph Lewis Center for Environmental Studies at Oberlin College in Ohio was one of the first green buildings on a college campus
 - Materials were recycled, energy efficient, locally produced
- Bren Hall at the University of Santa Barbara, California became the only laboratory building in the U.S. to achieve a “platinum” LEED ranking



(a) Lewis Center at Oberlin

Copyright © 2008 Pearson Education, Inc., publishing as Pearson Benjamin Cummings



(b) Bren Hall at UC Santa Barbara

Copyright © 2008 Pearson Education, Inc., publishing as Pearson Benjamin Cummings

Efficient water use is important



Copyright © 2008 Pearson Education, Inc., publishing as Pearson Benjamin Cummings

- Water efficiency is a key element of sustainable campuses
- Rainwater can be redirected to nourish plants and recharge aquifers
- Water conservation is important indoors
 - Water-saving technologies are being installed on campuses
 - Universities save millions of dollars and drastically reduce water use

Energy conservation is achievable

- Energy efficiency includes turning down thermostats, sleep-mode settings for computers and shutting off unused lights
 - Students at SUNY-Purchase in New York saved the school \$86,000/year by turning down hot water temperatures by 5 degrees
 - The University of British Columbia's extensive retrofits are reducing energy use by 20% and greenhouses by 80%
- Williams College students made energy conservation fun
 - Their "Do It in the Dark" competition pitted residential houses against one another to reduce energy consumption
- Powering down empty buildings saves energy, money, and greenhouse gas emissions

Students can promote energy efficiency

- Campuses can reduce energy consumption and greenhouse emissions by altering the type of energy they use
 - Switching from fuel oil to carbon-neutral wood chips
- Student initiative influences energy used on campuses
 - Competition building solar-powered homes
- Solar and wind power plays roles on many campuses
 - Universities have installed wind turbines
 - Institutions can buy “green tags” that subsidize renewable energies

The Solar Decathlon

In 2005, 18 college teams from around the U.S. competed in Washington, D.C., building solar houses of the student's own designs



Copyright © 2008 Pearson Education, Inc., publishing as Pearson Benjamin Cummings

Carbon neutrality is a new goal

- Reducing greenhouse gas emissions from fossil fuel combustion is a top priority for campus sustainability
- Some universities are complying with the Kyoto Protocol
 - Purchasing carbon offsets from a nonprofit organizations that funds energy efficiency and revegetation projects
- Student pressure has nudged reluctant administrators to set targets to reduce greenhouse emissions

Dining services let students eat sustainably

- Food services can promote sustainable practices
 - Buying organic food
 - Composting food scraps
 - Purchasing in bulk with less packaging
- **Zero waste dining** = replacing plastic utensils with compostable ones
- Some campuses have gardens where students can grow food used in dining halls



Copyright © 2008 Pearson Education, Inc., publishing as Pearson Benjamin Cummings

Intentional purchasing matters

- Campuses can support green initiatives by purchasing
 - Recycled paper
 - Certified sustainable wood
 - Energy efficient appliances
 - Goods with less packaging
 - Using other ecolabeled products
- Campuses can also switch to nontoxic cleaning supplies and save up to \$10,000 a year
- Students can also work with ground staff to eliminate the use of herbicides and pesticides

Transportation alternatives are many



Copyright © 2008 Pearson Education, Inc., publishing as Pearson Benjamin Cummings

- Many campuses struggle with traffic congestion, parking shortages, commuting delays, and pollution
- Solutions include:
 - Expanding bus and shuttle systems
 - Encourage bicycling, walking and carpooling
 - Introducing alternative vehicles to university fleets

Campuses are restoring natural environments



Copyright © 2008 Pearson Education, Inc., publishing as Pearson Benjamin Cummings

- Universities have been making an effort to:
 - Remove invasive species
 - Restore native plants and communities
 - Improve habitat for wildlife
 - Enhance soil and water quality
 - Reduce pesticide use
 - Create healthier, more attractive surroundings

Sustainability efforts include curricular changes

- Schools are offering new courses and integrating sustainability issues into previously established courses
 - Miami – Dade college in Florida generated an innovative green curriculum
- Faculty are trained in sustainability workshops, courses, conferences, and outdoor programs
 - Professors “green their curricula” in a wide variety of courses
- At many schools, activities and teaching are linked
 - Students removed invasive plants and planted native ones for part of their class

Organizations are available to assist campus efforts

- Many campus sustainability initiatives are supported by organizations
 - University Leaders for a Sustainable Future
 - Association for the Advancement of Sustainability in Higher Education
 - National Wildlife Federation's Campus Ecology program
- These organizations act as information clearinghouses for campus sustainability efforts
 - The NWF program annually recognizes the most successful campus sustainability initiatives
- Now it's easier than ever to start sustainability efforts on your own campus

Sustainability and sustainable development

- Sustainability efforts on campus parallel efforts in the rest of the world
- More people are beginning to appreciate the earth's limited capacity, and are voicing concerns about our current behaviors
- What do people mean by *sustainability*?
 - Usually they mean to sustain human institutions and ecological systems in a healthy and functional state
- The contributions of biodiversity and ecosystem goods and services to human welfare are priceless

Sustainable development aims for a bottom line

- Sustainability does not mean just protecting the environment from humans
- **Triple bottom line** = the new goal for sustainability
 - Finding ways to promote social justice, economic well-being, and environmental quality at the same time
 - This goal is most pressing in developing nations, although the whole Earth is in need

The UN's *Millennium Development Goals*

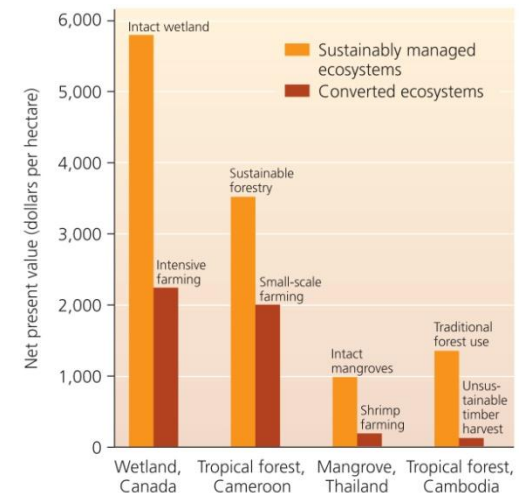
- The Millennium Project and the Millennium Ecosystem Assessment have determined that:
 - Environment degradation is a major barrier to achieving the Millennium Development Goals
 - Investing in environmental assets and management is vital to relieving poverty, hunger, and disease
 - Reaching environmental goals requires progress in eradicating poverty
- Actions by many people and institutions are showing that sustainability is possible

Environmental protection enhances opportunity

- Reducing consumption and waste saves money
- New jobs arise
 - People think that protecting the northern spotted owl costs loggers their jobs
 - But, jobs are at more risk when companies log unsustainably, then leave
- Environmental protection actually helps economy
 - And leads to increased value of property and homes



Copyright © 2008 Pearson Education, Inc., publishing as Pearson Benjamin Cummings



Copyright © 2008 Pearson Education, Inc., publishing as Pearson Benjamin Cummings

The economy-versus-environment divide

- What accounts for the view that we cannot protect the environment and provide for people's needs?
 - Economic development has clearly diminished biodiversity, decreased habitat, and degraded ecological systems
 - Many people believe command-and-control environmental policy poses excessive costs for industry and restricts rights of private citizens
 - Historically, we lived with abundant resources, and exploited them
- Philosophers have said that the perceived dichotomy between humans and nature is the root of all our environmental problems

Humans are not separate from the environment

- We feel disconnected from nature
 - Industrialization, large cities, houses, shuttered building, vehicles, and ignorant about wildlife
- A few centuries or even decades ago, most of the world could name and describe in detail the species that lived near them
 - Modern life has made it difficult to keep maintain ties with the natural environment
 - Once we learn to consider where things come from, it is easier to see how people are part of the environment

Even a banana split has ties to the environment

Maraschino cherry

Royal Ann cherry from Washington, treated with food coloring, lemon juice, brine, alum, and almond extract from many other locales

Walnuts

Grown in California's Central Valley

Chocolate sauce

Cocoa grown in Latin America or West Africa, with butter, sugars, salt, milk, and extract from many other locales

Strawberries

Grown in coastal California

Banana

Grown in Ecuador or Panama

Ice cream

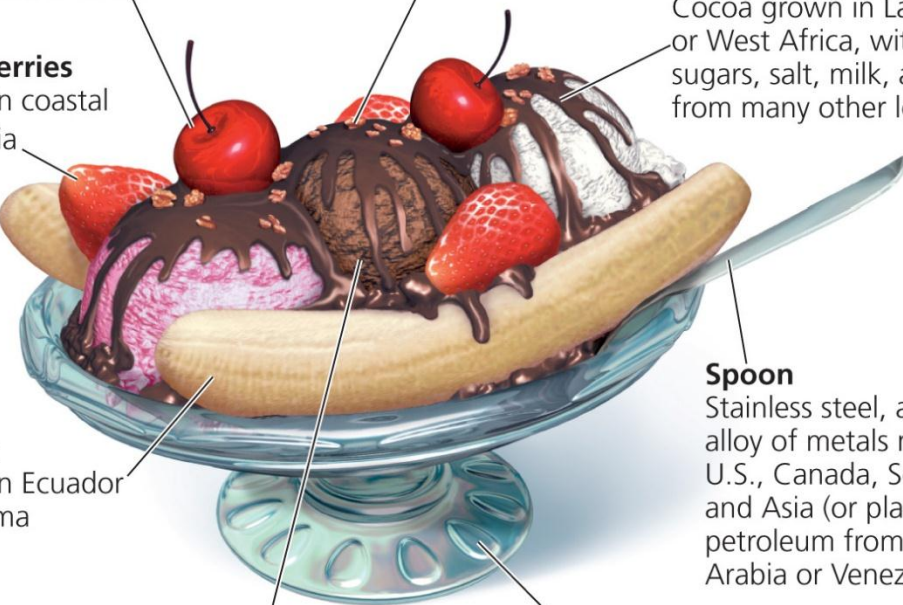
Milk from dairy cows in Vermont or Wisconsin; sugar from sugarcane in Florida or Hawaii; eggs from hens in Indiana or Georgia; vanilla extract from Mexico or Tahiti

Bowl

Glass, from silica sand, soda ash, limestone, etc., from U.S. Midwest

Spoon

Stainless steel, a complex alloy of metals mined in the U.S., Canada, South Africa, and Asia (or plastic from petroleum from Saudi Arabia or Venezuela)



Copyright © 2008 Pearson Education, Inc., publishing as Pearson Benjamin Cummings

Strategies for Sustainability

- Sustainable solutions to environmental problems are numerous
- Challenges to sustainability:
 - Being imaginative enough to think of solutions
 - Being shrewd and dogged enough to overcome political and economic obstacles

Strategies that spawn sustainable solutions

- We can refine our ideas about economic growth and quality of life
 - Economic growth is merely a tool to attain the real goal of maximizing human happiness
 - We cannot attain long-term happiness by endlessly expanding our economy
 - We need to incorporate external costs into market prices of goods and services
 - Green taxes and phasing out harmful substances could encourage sustainability

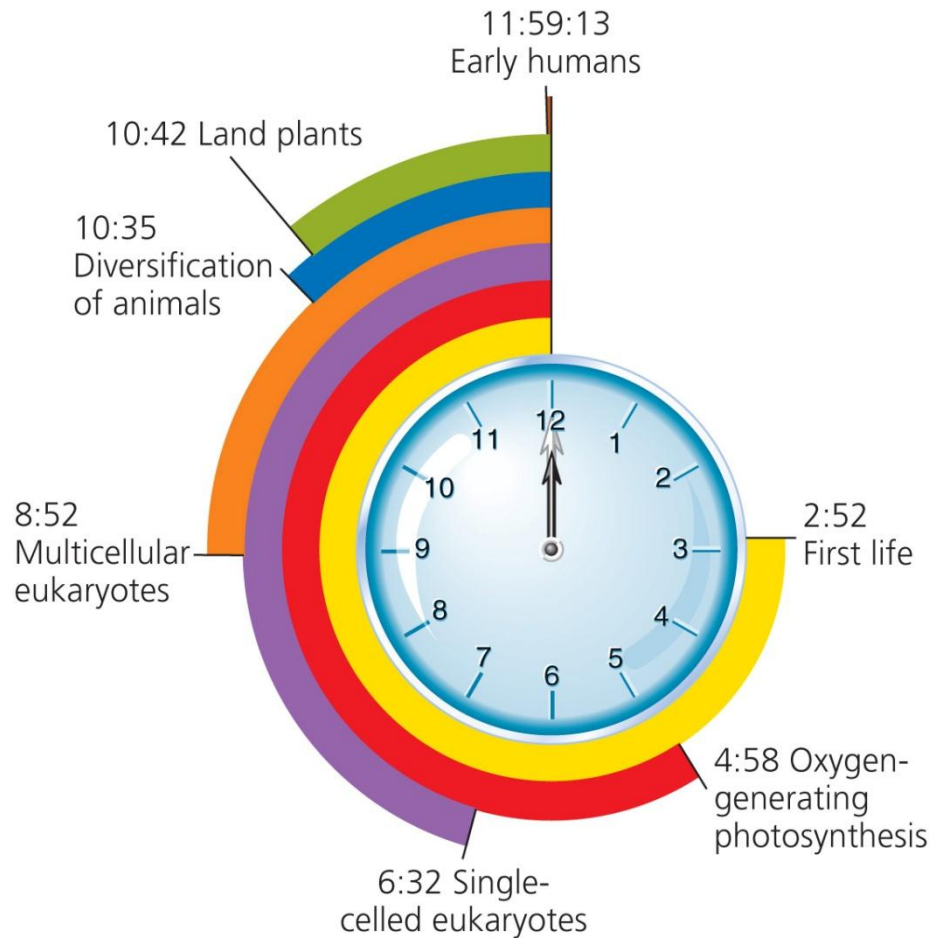
Sustainable strategies: we can consume less

- Economic growth is driven by consumption
- We believe that more is better
 - The U.S., with 5% of the world's population, uses 30% of the resources
- Consumption of limited resources cannot continue
 - It is taking place in a tiny slice of time in the long course of history



Copyright © 2008 Pearson Education, Inc., publishing as Pearson Benjamin Cummings

Humans have existed for only 1 or 2 seconds

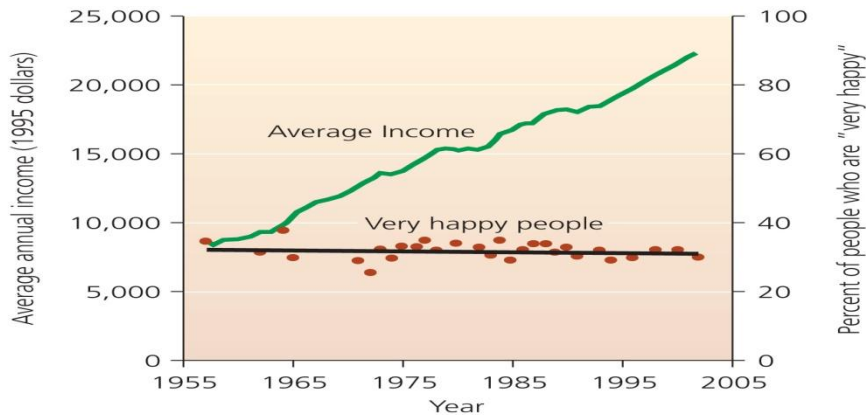


Copyright © 2008 Pearson Education, Inc., publishing as Pearson Benjamin Cummings

True progress is not economic growth, but happiness

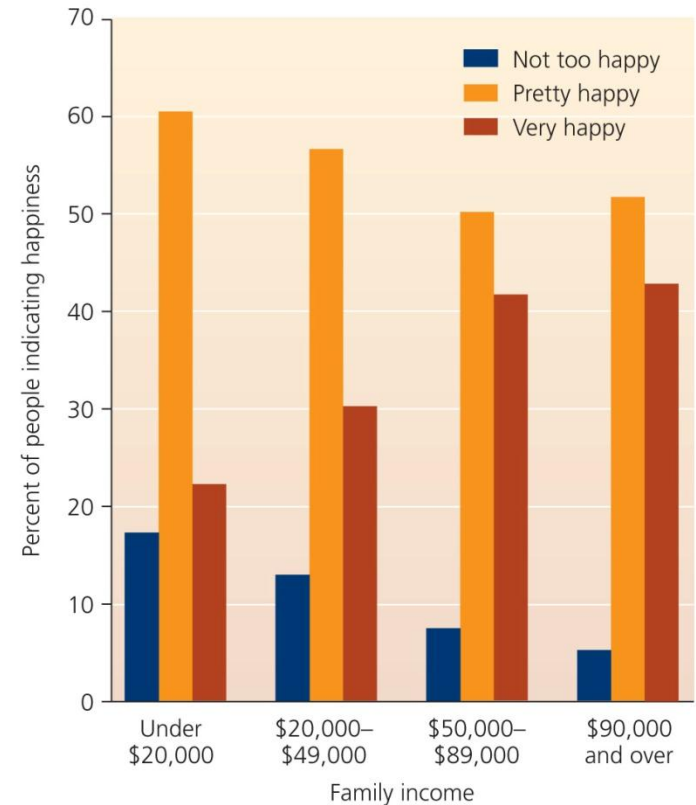
- We can reduce consumption while enhancing our quality of life by:
 - Improving technology and efficiency in industry
 - Developing a sustainable manufacturing system
 - Modify our behavior, attitudes, and lifestyles to minimize consumption

Money cannot buy happiness



(a) Happiness versus income, through time

Copyright © 2008 Pearson Education, Inc., publishing as Pearson Benjamin Cummings



(b) Happiness versus family income

Copyright © 2008 Pearson Education, Inc., publishing as Pearson Benjamin Cummings

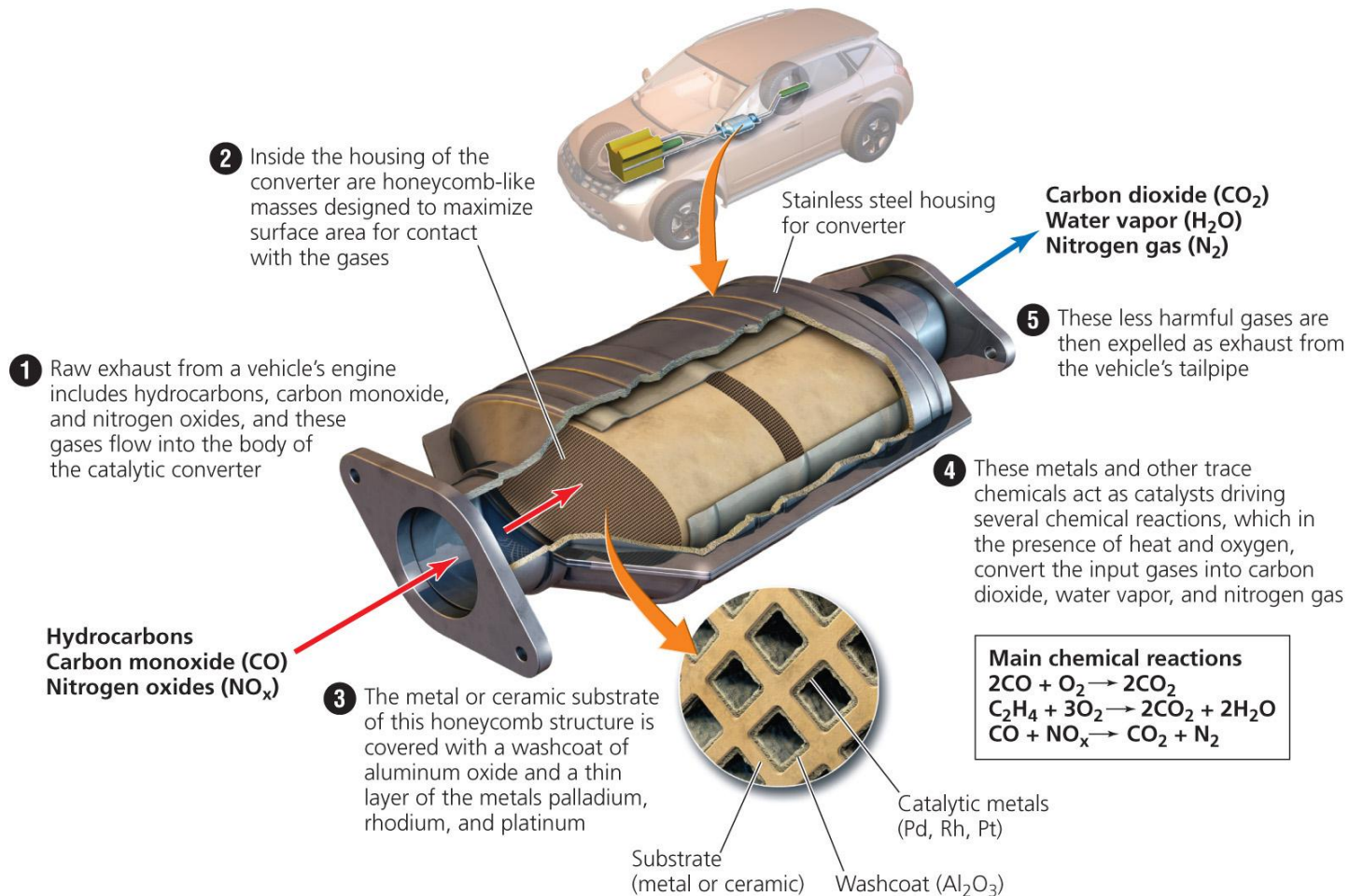
Population growth must cease

- Continued human population growth is not sustainable
- Technology has expanded the Earth's carrying capacity
 - Sooner or later, growth will end, but how?
- The demographic transition may help developing countries, as it helped developed countries

Technology can help us

- Technology has spurred population increase
 - Agricultural revolution, advances in medicine and health
- Technology magnifies our impact on Earth
 - The $I = PAT$ equation
- Short-sighted uses of technology have created a mess
 - But wiser use of green technology can help us get out
- Developed countries have exported technologies to developing countries

The catalytic converter: green technology



Copyright © 2008 Pearson Education, Inc., publishing as Pearson Benjamin Cummings

Industry can mimic natural systems

- Environmental systems operate in cycles
 - Feedback loops and circular material flows
 - Output is recycled into input
- Human systems are linear
 - Raw materials are processed, which generates waste
- Virtually all products can be recycled, given the right technology
 - The ultimate vision is to generate no waste

We can think in the long term

- Short-term plans appeal to many policy makers
 - They offer immediate results to help them get reelected
- Unfortunately environmental problems can be resolved only by long-term periods
 - Costs of addressing problems are short term
 - Benefits are long term
- Businesses may act according to either short or long term
 - A business committed to long-term operations has an incentive to sustain environmental quality

We can promote self-sufficiency

- When people feel closely tied to an area, they value it and try to protect it
- Globalization has positive and negative impacts
 - Positive: increased communication leads to greater respect of cultural differences
 - Negative: homogenization of cultures
- People have reacted against homogenization and the growing power of multinational corporations



Copyright © 2008 Pearson Education, Inc., publishing as Pearson Benjamin Cummings

Citizens exert political influence

- Democracies offer a compelling route for pursuing sustainability: the power of the vote
 - We can guide our political leaders to enact policies for sustainability
- A person can exercise power by:
 - Voting
 - Attending public hearings
 - Donating to advocacy groups
 - Writing letters and making phone calls

*“Never doubt that a small group of thoughtful, committed people can change the world. Indeed, it’s the only thing that ever has.”
(Margaret Mead)*

Consumers vote with their wallets

- We wield influence in the choices we make as consumers
- Consumers can buy ecolabeled products
 - Promote “green” purchasing at work and school

Promoting research and education is vital

- Nothing will succeed if the public is not aware of their importance
- Individual actions have little impact, unless many others do the same thing
- Individuals can influence others by educating them and serving as role models

Precious time

- It can be hard to give attention to problems we don't need to attend to on a daily basis
- The sheer number of environmental problems can be overwhelming
- However, natural systems are changing rapidly
- Human impacts are intensifying
 - Overfishing, deforestation, land clearing, resource extraction
- We need to find solutions before we do irreparable harm

We need to reach again for the moon

- President Kennedy created NASA in response to the prospect of “losing” the race to the moon
- Humanity faces a challenge more important than any previous one
 - Achieving sustainability
 - Larger and more complex than going to the moon
- Human ingenuity is capable; we merely need to rally public resolve and engage everyone in the race



Copyright © 2008 Pearson Education, Inc., publishing as Pearson Benjamin Cummings

The environmental bottleneck

- We can achieve sustainability, but we must be realistic about the challenges
 - We are giving ourselves less room to maneuver
- Until we implement a sustainable solution, we will be squeezing ourselves through a progressively tighter space, like being squeezed through the neck of a bottle
- It would be terrible to let the entire world turn into Easter Island and use up all of our resources completely

We must think of Earth as an island

- Earth is, indeed, an island
 - Islands can be paradise, or they can be destroyed
- Some people speak out for conservation and finding ways to live sustainably amid dwindling resources
 - Others ignore those calls, and continue environmental destruction
- It would be a tragic folly to let the planet be destroyed

The Earth is an island



Copyright © 2008 Pearson Education, Inc., publishing as Pearson Benjamin Cummings

Conclusion

- In any society facing dwindling resources and environmental degradation, there will be those who raise alarms and those who ignore them
- The challenge for our society today is to support that science so that we may judge false alarms from real problems and distinguish legitimate concerns from thoughtless denial

QUESTION: Review



Which of the following is not a reason to strive for campus sustainability?

- a) Reducing ecological footprint of a campus can really make a difference
- b) Campus sustainability efforts make students aware of the need to address environmental problems
- c) Campus sustainability efforts are required for college graduation
- d) Students who engage in sustainability efforts learn and grow as a result

QUESTION: Review



Which of the following ways is not helpful towards reaching sustainability?

- a) Use water efficiently
- b) Conserve energy
- c) Promote renewable energy
- d) Use many fossil fuels

QUESTION: Review



What does “sustainable development” mean?

- a) Finding ways to promote social justice
- b) Economic well-being
- c) Environmental quality at the same time
- d) All of the above

QUESTION: Review



Which of the following is NOT a major approach to sustainability?

- a) Reduce unnecessary consumption
- b) Limit population growth
- c) Discourage research and education
- d) Think in the long term

QUESTION: Review



Which is NOT an intense human impact on our natural systems?

- a) Resource extraction
- b) Wetland draining
- c) Overfishing
- d) Planting excess trees
- e) Land clearing

QUESTION: Review



Which of the following is NOT a strategy for sustainability?

- a) Encourage green technologies
- b) Think in the long term
- c) Voting with our wallets
- d) All of these are strategies for sustainability

QUESTION: Weighing the Issues



What would you like your university to do regarding sustainability?

- a) As much as it can, even if it means spending money
- b) As much as it can, as long as it does not raise my tuition
- c) A bit more than it does now, but not much more
- d) Nothing else; my university already does a lot