Why Sustainability?
Real Challenges
Real Opportunities
- The Truth -

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Sustainability

“Meeting the needs of the present without compromising the ability of future generations to meet their own needs”

UN Brundtland Report
Why Sustainability?

Better a cruel truth than a comfortable delusion.

Edward Abbey (1990)
Why Sustainability?
Lots of people; many deserving a better life
Unsustainable Growth

• How many “planet Earths” do we need to sustain our current growth rates?

• Right now the land and water area we need to produce the resources we consume and absorb our waste, using prevailing technology, is about 1.5 Earths.

Having only one planet makes this a rather significant problem.

Why Sustainability? Global Warming
Get Real, The Truth

• 1.5°F increase globally (warmer at poles)
  • Alaska, Antarctica
• Hottest decade: 2000-2009; 2010
• Longer summers, warmer winters
• Warming very fast (100X)
• 8-10°F by 2100 (usual business)
  • 5,000 land based stations, 1000 buoys, ships, satellites

The ultimate challenge
Global Warming

Summer heat index:
How hot summers will “feel” in
Upstate New York
Evidence:
Rocky Mts., the Amazon
Carbon sinks to sources
More severe weather events

Droughts in Australia, floods in Pakistan, severe storms in US
Glaciers and Artic Sea Ice Retreating

Glacier National Park will not have glaciers in 2020
Artic ice free in 2030 vs. earlier predictions of 2100
Artic Tundra

With warming and less snow cover
Enormous releases of carbon dioxide and possibly methane
Fires may be result of more woody brush
Greenland
- One Big Ice Cube -

- 660,000 square miles of ice
  - Gravitational Force
  - 47 cubic miles melting/yr.
  - Los Angeles uses 1 cubic mile/yr.
- Gone in 50,000, 1,000, 78 yrs.?
- Adds 22 ft. to sea level
Absorbs 30 million tons CO2/day
Cause is Us

- Tyndall (1857)
- Carbon$^{12}$

Carbon Dioxide (ppm)
- 1800: 270
  - A good thing
- 2012: 394*
- 2050: 450
- 2100: 900+
- 350 is important!
- Inertia

*Highest in 2 million yrs.
Scale

- Ave. car in US - 1.5 tons CO\textsubscript{2}/yr
- Cars, 800 million > 2 billion 2050
- Number of airline flights per day in
  - U.S= 30,000
  - World= 93,000
- 120 millions gallons of fuel used/day by flights worldwide
- Carbon footprint for the world
  - About 2 billion pounds of CO\textsubscript{2}/yr.
- Total greenhouse gases
  - 45 gigatons/year
  - 50% into atmosphere
  - 50% into nature
Dubai - the world's tallest building, two million residents, depends on desalinated seawater and air-conditioning.

Saudi Arabia uses 1 million barrels of oil/day in the summer months to run air conditioners. Another 27 desalination plants for drinking water requires 1.5 million barrels of oil/day.

U.S. – 19 million barrels/day; China - 8.3

World – 86 million barrels/day
National Security: Near Term Impacts

• Water
  • India-Pakistan (nuclear states) border region; changes in seasonal glacial melt and monsoons
  • Electricity generation shortfalls; lack of cooling water – Venezuela, Egypt, Turkey...
  • Mekong River water; persistent drought, increasing demand for outflow from China where dams are under construction to manipulate diminishing glacial melt from high Asia

• Opening of the Arctic
  • Increased Russian and emergent Chinese presence, impact on US maritime forces.
National Security: Near Term Impacts

• Food Security
  • China - Depletion of ground water and drought, China turns to others for food (Brazil, Russia, Africa) overall increasing competition for available ag. lands
  • Canada and Russia – ag. boon with warmer conditions for more northerly land, but!
  • Eurasian grain belt (Russia, Ukraine, Kazakhstan ...) – large wheat area, with major exports to N. Africa, Middle East. 500 year drought in 2010 yields greatly reduced. Food shock wave worldwide. Heightened political tensions within the region.

• Sea Level Rise
  • Mass migrations – Bangladesh, Vietnam, Egypt, Maldives...
IC is Vigilant in Face of Possible Threats
- Experts Determine the Risks -

Warming increases risk

Agriculture

- Major decline in crop yields
- Increased hunger
- Increased food prices
- Losses in critical food sheds
- Yield growth decline

Temperature/Water

- Extreme precipitation
- Persistent heat waves
- Many 100°F days & droughts
- Significant glacial retreat
- Stream flow changes

Biosphere

- Major species extinction
- Forest diebacks
- Biodiversity decline
- Biomes shift
- Wildfires increase 2-4x

Oceans

- Sea level rise >2m
- Fisheries collapse
- Acidified ocean & coral bleaching
- Reduced ocean phytoplankton
- Sea level rise >1m

Policy

- Business as usual
- Enlightened energy policy
- Cancun trillion ton CO2e budget
- Ban fossil fuels
- Careless disregard

Policy influences atmospheric CO2e

- 1800
- 2011
- 2100

CO2e concentrations:
- 340 ppm
- 430 ppm
- 540 ppm
- 670 ppm
- 840 ppm
Are You Depressed, Overwhelmed?

- Options
  - Deny?
  - Ignore?
  - Avoid?
  - Move?
- The Truth
  - Take a first step – get real, face the truth, let it sink in.
  - A really big challenge
When asked if I am pessimistic or optimistic about the future, my answer is always the same:

If you look at the science about what is happening on earth and aren't pessimistic, you don't understand data. But if you meet the people who are working to restore this earth and the lives of the poor, and you aren't optimistic, you haven't got a pulse.

*Paul Hawken (2009)*
Do they deserve the truth?
Real Challenges! Real Opportunities!

- We Need a Great Awakening, A Sense of Urgency -
  We all can lead
We have a greater purpose
Why Sustainability at Cornell?
- Incredible Capacity -
Operations & Academic
Cornell’s Commitment - Operations -

• Climate Action Plan
• President's Sustainable Campus Committee
• Recyclemania and R5
• Energy Conservation Initiative
• Smart Growth
• Take Back the Tap
• And much much more
Sustainability Across Cornell
- Academic -

- Agriculture: local to global
- Energy: biofuels, geothermal, fuel cells...
- Water: quality and quantity
- Climate: extreme weather, global transport
- Social issues: poverty, hunger, equity
- Biodiversity: ladybeetles to frogs
Atkinson Center for a Sustainable Future

- ACSF advances multidisciplinary research in Energy, the Environment and Economic Development, and cultivates innovative collaborations within and beyond Cornell to foster a sustainable future for all.
- $80 million Atkinson gift makes ACSF permanent
- Academic Venture Fund (grants)
  - Novel, high risk, multidisciplinary research
- Faculty cluster hires
- Making connections – topical lunches
Collaboration – E. Canada, NE US and Climate Change – 2012-2025

• Real Challenges
  – Extreme weather: floods, droughts, storms
  – New pests, high temp stress
  – Agriculture, no longer business as usual

• Real Opportunities
  – Adequate water
  – Longer and warmer growing seasons
  – Shifts in productivity elsewhere
    • Reduced glacial melt – Alberta, Andes
    • Changes in precip. patterns in Sierras
    • Ag-urban competition for water
    • High temps and grapes/wine - CA
Real Opportunities
- Agriculture in the Region -

• 474,000 farms, 89 million acres, $58 billion
  – Dairy, vegetables, field crops, fruit, ornamentals...

• Potential to expand and diversify agriculture
  • New crops, new varieties - winter canola, wine grapes

• Markets
  • Great cities to feed, 116 million people
  • Local grown, lower carbon footprint food supply
  • Job creation, economic development

• Canada – U.S. MOU signed 4/17/2012
Cornell University Agricultural Experiment Station, Ithaca (CUAES)

- Seven farms – 2400 acres
  - Vegetables, field crops, ornamentals, organic...
  - Student run farm
- 55 staff
- Greenhouses – 4 acres
- Plant growth chambers – 130
- Forested properties
- 4 acre compost facility, 6,000 tons/yr
- Supports research, teaching, extension
CUAES – Funds for Applied Research
(Mike has money and friends)
CUAES Adopting a Culture of Sustainability

- Emphasis on cost reductions, efficiencies, carbon footprint
- Staff empowered (generate ideas, implement)
  - Sustainable Action Team - inspiring
  - Promote professional development/leadership
- Partnerships with faculty and Cornell operations
- A model that is being shared
Growth Chambers

• $3,400 Investment
• Idea from Sustainable Action Team

Results:
• $567,000 grant – NYSERDA
• Retrofit 22, plus 35 coolers
• ROI < 4 years
• $157,000 savings/yr
• Drastic labor savings
• CO₂ reduction – 520 tons/yr
• Improved quality of service
• More to come
Greenhouses

- $2.1 million – Cornell Energy and Sustainability
- Retrofit 47 units – heating, lighting, controls
- ROI < 4-6 years
- $258,000 savings/yr
  - 40% reduction - electricity
  - 35% reduction – steam
- Improved plant care conditions
  - Only needed benches lit
  - Adjust light intensity
  - Optimal temperatures
- Another $2 million
August 2011
CALS Green Competition Update

Barton Lab

As part of CALS Green, the college is sponsoring a year-long competition amongst Bradfield, Plant Science, Comstock, Morrison, Wing and Barton Lab to see which building can maximize participation in the program while minimizing energy consumption.

Barton Lab’s Savings

Total Pledged Carbon

Total Pledged Dollars

Percent Participation in CALS Green

First building to reach 50% gets free coffee and breakfast goodies!

Sign up today!

The total pledged CO₂ savings of Barton Lab is equivalent to the CO₂ emissions from the electricity use of 27 homes for one year!

Total pledged savings (as of 9/16/11): 2 million lbs CO₂, $230,000 savings
Sustainability
- Thoughts to Take Home -

• Earth is getting hotter & more crowded
• More people deserve their share
• There is not much time
• Not enough people understand the challenge
• Opportunities are unlimited

We need leaders like never before!
Thank you!
Be Sustainable!