Sustainable Management

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Natural systems

We depend on Nature for life

- For oxygen
- For water
- For food

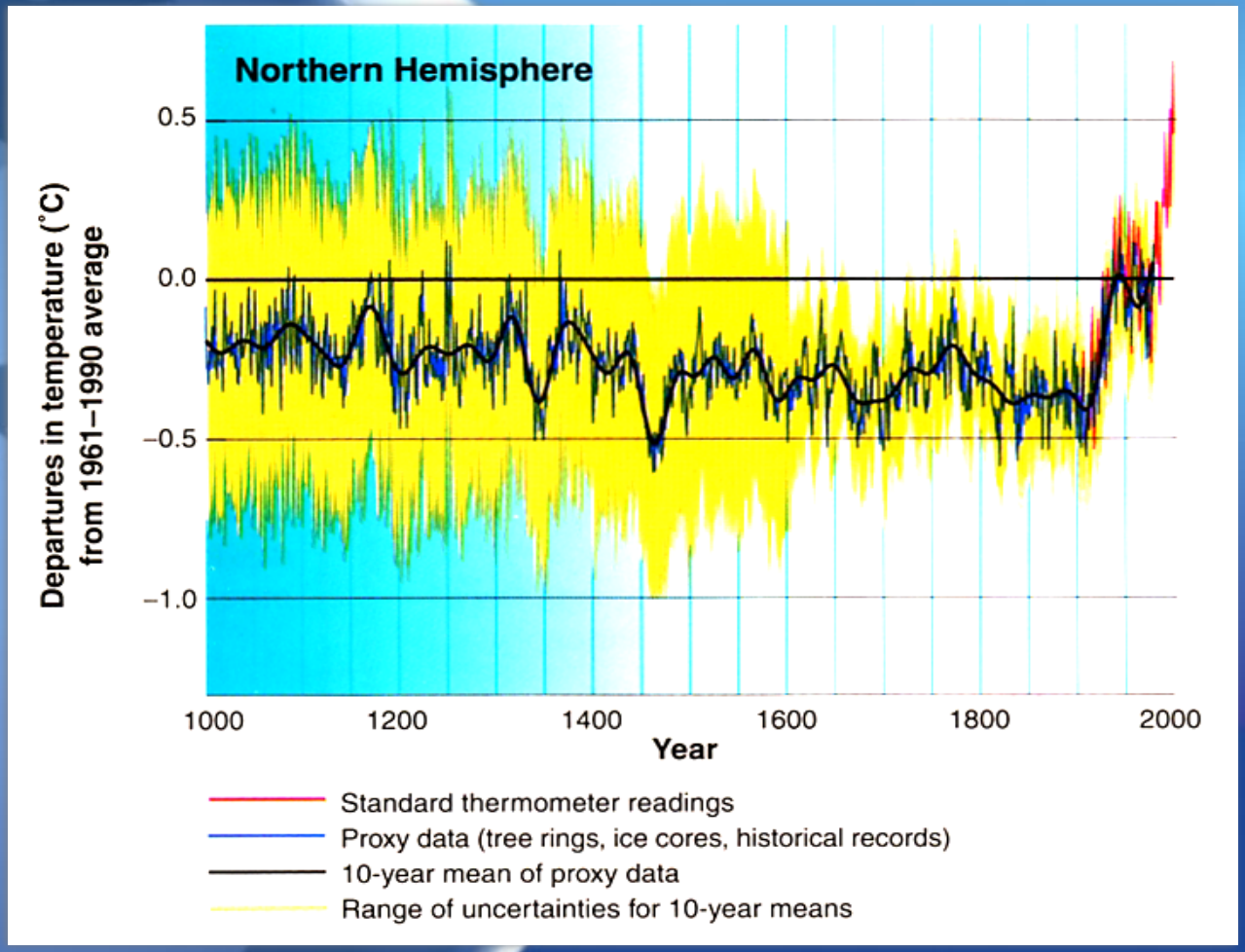
Most of us assume that the complex Earth ecosystems will continue to function despite abuse

Global heating

But this assumption may be in error

- Fossil fuels and industrial chemicals are causing global heating
- Resource use outstrips recovery for water, fish, soil, fuelwood and timber - this is **mining not harvesting**
- We rely on non-renewable resources for most of our energy

Chart of global temperature



Other gases ppb

Year		1900	2000
Methane	Rice fields, cows, oil production	848	1850
Nitrogen Oxides	Fuel burning, agriculture	285	386
CFCs	Air conditioners, refrigerators	0	1.2

True cost

- We have failed to count the true costs of our way of living
- Ecological economists have begun calculating the value of Natural Capital and Nature's Services
- New measures of economic health are replacing GNP - including Genuine Progress Indicator and Gross National Happiness

Truly "Gross National Product"

- GNP measures money flow
- The Exxon Valdez oil spill shows up as a good thing - more money is spent for cleanup
- GPI looks at the value of natural and human capital
- GNH measures happiness

Triple bottom line

The new metric - is becoming

- Economic health
- Human well-being
- Ecological health

These are the new goals for responsible business

Sustainable

- Arose from work for the UN by a group headed by Gro Harlem Brundtland of Norway
- **Our Common Future** 1987
  - To live today in ways that will not compromise future generations!
  - To create equitable, enjoyable societies that can endure and prosper

Ecological Footprints

- What is the cost of your life in land, water, energy, etc.
- Go online and find an **EF calculator**
- How many hectares or acres do you require?
- How many more planets do we need for everyone to live the same way?

Food Footprint

- How big a footprint does your food make?
- The US food system has big impacts
- Energy 10 calories in per calorie out
- Millions of pounds of pesticides
- Billions of gallons of water
- Destruction of ecosystem structure and function
- Global warming gases

Wheat flakes

Wheat 0.1 kg day/36.5 kg yr = 0.14 ha

Sugar 0.02 kg day/7.3 kg yr = 0.002 ha

Milk 0.2 kg day/73 kg yr = 0.027 ha

Total = 0.043 ha year

Not bad! But wheat is a low cost leader. People who eat unprocessed grain and vegetables (and fruit) are more earth friendly than meat eaters and fans of highly processed junk, frozen or packaged food

Meat

- Beef is more costly - 16 kg feed per kg of meat (grass fed is better than corn fed)
- 21,000 liters of water per kg meat
- Major problems with waste
- Global warming gases - belches and ...
- Severe rangeland desertification
- Only 125 kg produced per ha per year

(versus 2,600 kg/ha wheat)

Other meats

Kg feed per kg product

- Pork 6
- Turkey 4
- Chicken 3
- Eggs 3
- Milk 1

Footprints of farms and factories

- We can calculate the ecological footprint of farms
- Factories
- Products
- Cities
- Nations

Nation	Footprint ha/pcapita	Available land ha/pcapita	**Deficit**
Japan	6.3	1.7	**-4.6**
Belgium	5.0	1.6	**-3.4**
Germany	4.6	2.1	**-2.5**
Switzerland	5.0	2.6	**-2.4**
United States	8.4	6.2	**-2.1**
Mexico	2.3	1.4	**-0.9**
World	**2.3**	**1.8**	**-0.5**
Ethiopia	1	0.9	**-0.1**
Sweden	5.8	7.8	**2.0**

The ecological footprints of materials and stuff

The European Environment Agency recommends counting all:

- **Inputs**: raw materials, energy, water, land requirements
- **Outputs:** greenhouse gases, acidification, ozone depletion, hazardous waste, chemical pollution
- True cost accounting

MIPS

- The Wuppertal Institute and Bio Schmidt Bleek developed **Material** (including energy) **Intensity Per unit Service** (utility or function) as a tool to estimate the **ecological stress potential** of materials, goods and services

Energy kwh/ton

Platinum	26,370,000
Aluminum	16,000
Copper	3,000
Plastic	1153
Steel	441
Glass	157
Wood	113

Impact Equation

# of users
x times used
x use per time
x impact per unit used

= Total impact

ENERGY true cost kwh

• Solar integrated design	-$2 to 5¢
• Clothes line	0.001¢
• Integral solar hot water	1-6¢
• Active water heater	4-11¢
• Wind electric	5-7¢
• Natural gas	10¢
• Big hydroelectric	12¢
• Coal	20¢
• Nuclear	20+¢
• Photovoltaics	20-40¢

Chernobyl

Why is nuclear energy so costly?

- Risk - cost for the 1986 disaster in Ukraine estimated at $300+ billion
- Time for waste to decay (10,000+ years)
- Although the chance of an accident is very small it could be very costly
- Insurers would not cover U.S. industry - so the industry had taxpayers assume risk

Little things add up

- People in the US
- Clocks per person in America
- Energy use per clock
- Use per day/year

Total impact

Big impact from small things

- 300 million people
- 3.3 clocks per person
- 1 watt per clock
- 365 days/24 hrs = 8760 hours
- 1 billion watts per hour
- 8.8 trillion watt hours per year
- 8.8 billion kwh x 12¢ kwh = $1 billion

Moving to sustainability

Make the market complete (true cost)
Make the market as free as possible
Make prices clear and transparent
Eliminate subsidies
Be conservative in assessing risk --
   the precautionary principle
Live within your means

The challenge

- Focus resources on issues that matter
- *The goal is always to add value!*
- *Ensure new projects are sustainable, start the enormous task of retrofitting*
- *Millions of green collar jobs, jobs that cannot be outsourced!*

An example

- Solar hot water
  - Israel 90% of all homes
  - China 15 million square meters installed last year
  - U.S. today, almost none
  - San Diego, almost none

  Needed: one for every home in the Sun Belt and half of the homes in the central and northern states

Now

We have waited long enough

- It is time to take action
- But it has to be smart, effective, efficient and productive
- High quality-high performance, not subsidy farming junk, improperly installed
- Built to last
- Healthful, joyful and beautiful