Urban Population

At the end of 2007, more people were living in cities than in rural areas for the first time in history.

Energy Consumption

How much does a Gj of electricity cost?

Energy conversions

What are the energy costs per person?

Energy Costs

\[ $0.16 \text{ hr} \times \frac{kW}{3600s} \times \frac{1000W}{J} = \frac{4.4 \times 10^{-6}}{GJ} \]

If all of our energy use was electricity our annual energy cost would be

\[ 350GJ \times \frac{44}{Capita GJ} = \frac{15,600}{person} \]

• Electricity is the most expensive form of energy.
• We pay for our energy at many different places.
  Taxes, gasoline, firewood, anything we purchase!

Population, Our Footprint, Energy, Transportation, Water

Global Resources 2025

Population Pyramids (by country)

Prediction of future population based on current population.

http://www.census.gov ipc/www/idb/country.php

Per Capita Energy Consumption (GJ)

Energy Sources

Africa
Asia and the Pacific
Europe and Central Asia
Latin America and the...
North America
West Asia

Per Capita Energy Consumption (GJ)

Total Energy Consumption (Pj)

Energy Costs

$0.16 \text{ hr} \times \frac{kW}{3600s} \times \frac{1000W}{J} = \frac{4.4 \times 10^{-6}}{GJ}

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ENGRI 1131: Water Treatment Design
Monroe Weber-Shirk

August 25, 2012
Transport: Passenger Cars

- Transport now accounts for _______ of world energy use
- Motor vehicles account for nearly _______% of all transport-related energy
- Transport is a major contributor to greenhouse gas emissions
- Pollutes urban air
- Uses substantial land
- Degrades and fragments habitat

Today...

- Teams
- Field trip reflections
- Our footprint...
- Food aid and development assistance
- CO2 footprint
- Water Supply and Wastewater treatment
- Global Priorities
- Next steps (slash and burn, sustainability, happiness, and hope)

The Footprint of the Developed World

- North America, Europe and parts of East Asia consume immense (unsustainable) quantities of energy and raw materials, and produce high volumes of wastes and polluting emissions...
- That cause environmental damage on a global scale (notably climate change) and widespread pollution and disruption of ecosystems, often in countries far removed from the site of consumption.
- Wealthy industrialized countries control pollution locally but the wider-scale impacts (apart from ozone depletion) have yet to be tackled effectively.

US Fuel Economy

- CAFE standards: Corporate Average Fuel Economy
- 20 year decline!
- Light duty trucks (SUVs)

Congestion from transport choices

- CAFE standards do not apply to vehicles above 8,500 lbs GVW. Many pickup trucks and some of the largest SUVs which belong to this category are excluded from CAFE data.

Ecological Footprint

- Who is overextended and what does this mean about strategy?
Who is providing the resources?

Food Aid for Africa: Who is providing the money?

- As a result of inadequate food production, Africa spends US$15–20 billion on food imports annually, in addition to receiving US$2 billion/year in food aid.

Wealth transfer: Who is providing the money?

- Even though Africa has only 5 per cent of the developing world’s income, it carries about two-thirds of the Global South’s debt burden – over US$300 billion.
- Despite extreme poverty, sub-Saharan Africa transfers US$14.5 billion a year to rich nations in external debt repayments.
- The average sub-Saharan African country, therefore, spends three times more on repaying debt than it does on providing basic services to its people.

The US is 21st in development assistance...

- Official Development Assistance as % of Gross National Income in 2006
Temperature rise

Chicago on Lake Michigan

Chicago Sanitary and Ship Canal

London

We are Chicago before the canal

- For our untreated wastegas there is no “Chicago Sanitary and Ship Canal”
- The primary problem with fracking gas, tarsands oil, mountaintop coal is not the destruction of our soil and water.
- The core problem is that all of those energy sources produce a wastegas that we are dumping in our Lake Michigan.
Freshwater

- The declining state of the world's freshwater resources, in terms of quantity and quality, may prove to be the dominant issue on the environment and development agenda of the coming century.
- About 28% of the world's population lacks access to improved drinking water and about 50% lacks adequate sanitation.
- Worldwide, polluted water is estimated to affect the health of about 1.8 billion people and to contribute to the death of about 1.5 million children under five every year.

Are the Water Supply Stats Accurate?

- Determining the coverage figures for water supply and sanitation in the developing world is a difficult if not impossible task. There are a number of reasons for this. These are primarily:
  - Political: Governments do not wish to be identified as providing inadequate services so figures are often inflated.
  - Technical: To accurately establish service levels requires an ongoing process of information gathering and analysis which requires resources and capacity which are generally not available.
  - Standards: Everybody is drinking water of some form (death from thirst is rare) and using some form of sanitation practice. Coverage figures are only relevant if the same standard of service is counted in all cases - this is unlikely to be the case.
  - Dereliction: Most coverage figures are based on construction projects and institutional/agency figures which generally will not account for high dereliction rates as the sustainability of services is generally a major problem.

Water Supply in the Largest Cities

In the Global South a significant fraction of the water in household connections is untreated river water.

Treated Urban Wastewater

Mexico City Wastewater Irrigation

"Canal Central": one of the three trunk canals carrying untreated waste and storm water from Mexico City to the Mezquital Valley (Tula) where it is used for irrigation.
Our Global Priorities

- 1.7 million people die every year from water borne diseases
- 180 million children are hungry

The Challenge

- All population growth is expected to occur in developing nations
- Rural population is expected to stabilize at around 3.2 billion
- The growing population will settle in urban areas
- The challenge is to provided the basic infrastructure required by nearly 2 billion new urban residents in the developing world by 2025

Reflections

- Slash and burn
- Agriculture
- Pump to the slump – oil, water, fish, trees
- NASA - 2004 saw NASA continue to go "beyond" the frontiers of Earth orbit. Combining that technology with the experience gained on long-term expeditions to the moon will allow humans to one day travel to Mars and beyond.
- Have we adopted a global slash and burn world view?
- Is it ethical to drive an SUV?
- Vision of Sustainable Human Development
  - What does it look like?
  - How can I help move us toward that goal?

Where are we at?

- Global Human Population
- Resource Utilization
  - Currently unsustainable
  - Wealthy industrialized countries cause environmental damage on a global scale
  - Unjust and likely basis of future conflicts
- Water
  - Challenge of providing clean drinking water and treating wastewater as population grows, resources are stretched, and global climate changes
- Energy…Our information technology revolution will fail if it continues to run on coal and oil

Where do we go from here?

- How do you maintain hope?
- Where do you put your energy?
- What changes have you made to how you live?
- In making life choices about consumption, which direction do you look?
- Do we lose happiness?