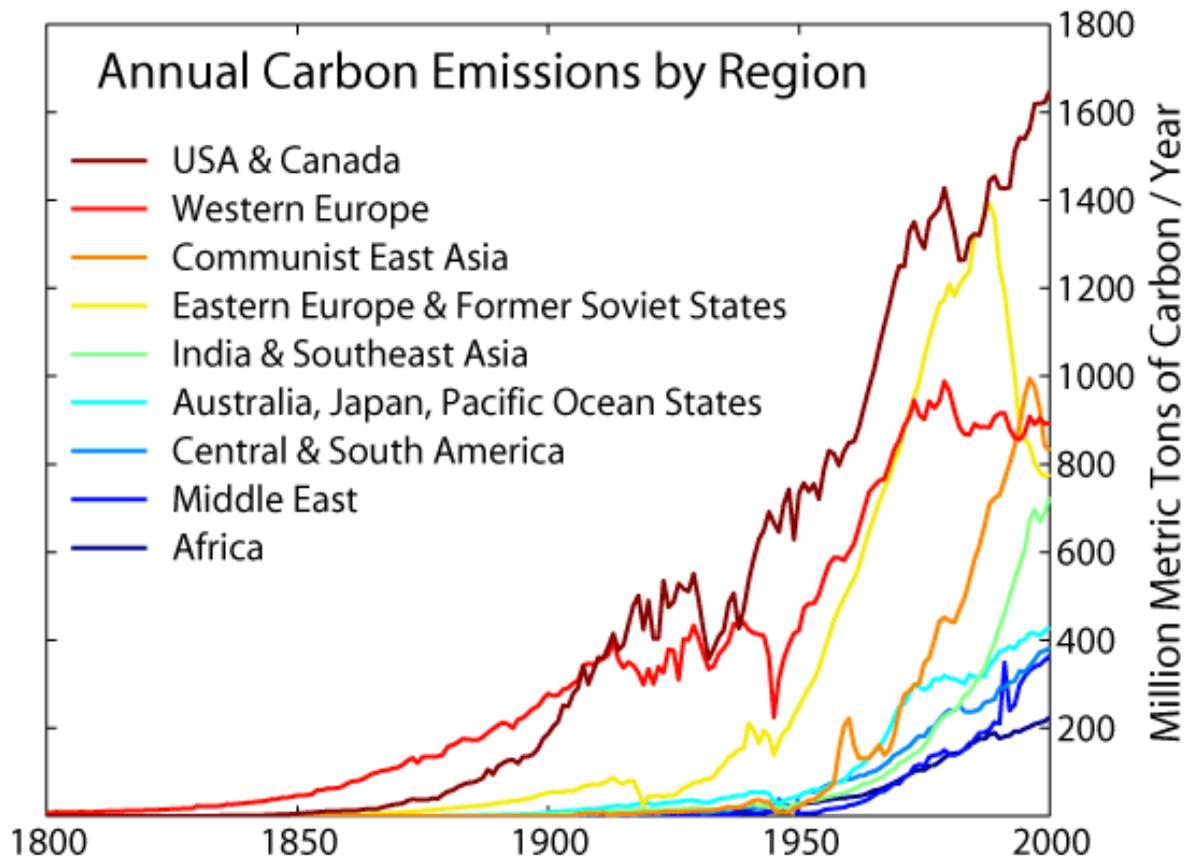


The Human Earth (MAE 124/ESYS 103)

Lecture 4

Treaties, buildings

Carbon Emissions



Agreeing to the Kyoto Protocol?



Time Magazine, July 27, 2001, www.time.com/time/cartoons/20010727/

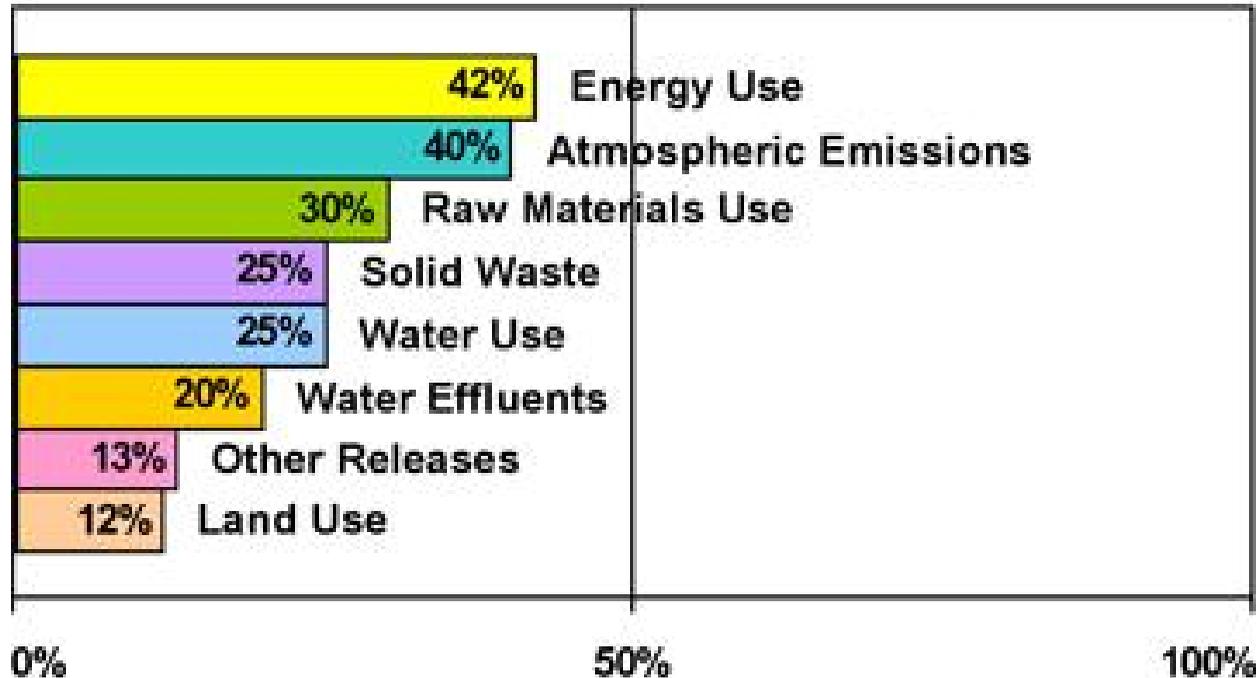
Agreeing to the Kyoto Protocol? (2)

cartoon: <http://cagle.msnbc.com/news/KyotoProtocol/2.asp>

Buildings and Resource Use (1997 statistics)

Environmental Impact of Buildings

Percentage of U.S., Annual Impact



4 Time Square Building Design

Low-energy design and renewable energy at 4 Times Square

Water reuse
The Super-Design implemented a novel, self-sufficient water reuse system. The building's rainwater is collected and treated on-site to provide non-potable water for irrigation, toilet flushing, and other uses. The system also includes a greywater recycling system that captures water from sinks, showers, and laundry to be used for similar purposes. This reduces the building's reliance on municipal water supply.

Lighting/WINDOWS
The building's facade is designed to maximize natural light while minimizing heat gain. Large windows are equipped with low-emissivity (Low-E) coatings and operable louvers. The building also features a sophisticated lighting control system that adjusts light levels based on occupancy and natural light availability. This reduces the need for artificial lighting and air conditioning.

Cooling/Warming
The building's HVAC system is designed for high efficiency and flexibility. It features a combination of chilled water and variable refrigerant flow (VRF) systems. The VRF system allows for precise temperature control in different zones of the building, reducing energy waste. Additionally, the building utilizes a geothermal system for heating and cooling, which is a highly efficient and renewable energy source.

High performance facade
The building's facade is a key component of its energy efficiency. It features a high-performance glass curtain wall with a low solar heat gain coefficient (SHGC). This helps to reduce the amount of heat entering the building, which in turn reduces the need for air conditioning. The facade also includes operable windows that allow for natural ventilation, further reducing the need for mechanical cooling.

Photo facade
The building's facade is designed to maximize natural light while minimizing heat gain. Large windows are equipped with low-emissivity (Low-E) coatings and operable louvers. The building also features a sophisticated lighting control system that adjusts light levels based on occupancy and natural light availability. This reduces the need for artificial lighting and air conditioning.

Equipment
The building's equipment is designed for high efficiency and low energy consumption. It includes high-efficiency motors, variable frequency drives (VFDs), and energy-efficient lighting fixtures. The building also features a comprehensive energy management system (EMS) that monitors and controls energy usage in real-time, allowing for optimization and reduction of energy waste.

Air Quality
The building's air quality is a top priority. It features a comprehensive ventilation system that provides fresh air to all occupants. The system includes a combination of outdoor air intake and recirculation of filtered indoor air. Additionally, the building uses low-VOC materials and paints to reduce indoor air pollution. This ensures a healthy and comfortable environment for all building occupants.

Typical Floor
A detailed diagram of a typical floor shows the layout of various systems. Key components include:

- Photovoltaic panels on the roof for renewable energy generation.
- Water reuse tanks and distribution systems.
- Lighting fixtures and control systems.
- HVAC units and ductwork for heating and cooling.
- Energy storage and management systems.

Floor Cell
A circular inset diagram illustrates the energy flows within a single floor cell. It shows the interaction between various systems:

- AC power and lighting power entering the cell.
- Heat recovery from the HVAC system being used for other purposes.
- Energy storage and management systems.
- Renewable energy inputs from photovoltaic panels.

Other Callouts:

- High performance facade**: Points to the building's exterior glass and louvers.
- Water reuse**: Points to the rainwater collection and treatment system.
- Lighting/WINDOWS**: Points to the building's facade and lighting controls.
- Cooling/Warming**: Points to the HVAC system.
- Equipment**: Points to various mechanical and electrical systems.
- Air Quality**: Points to the ventilation system.

http://www.eere.energy.gov/buildings/highperformance/projects_list.html

Congress Going Green?

cartoon: <http://www.cartoonistgroup.com/store/add.php?iid=13314>