Co-Benefits Training Module (Wheel of Emissions)

17th AP Seminar on Climate Change
Bangkok, THAILAND
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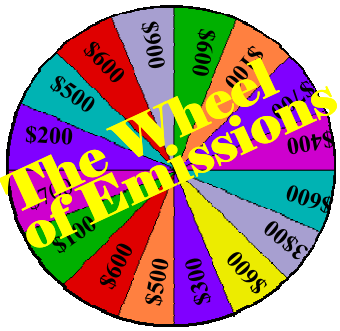
Overview

- Linkages between buildings, energy use and carbon emissions
- Global picture of commercial buildings
- Co-benefits
- Energy use and buildings in China
- Building energy improvements/opportunities
- eeBuildings
- Take-away thoughts

Today's Program



Your Host...

Katherine Sibold

Guest Contestant...

May Ajero

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Question: Why buildings, energy and carbon?

A Asia is rapidly urbanizing and there is enormous growth in construction.

B Energy, generally fossil fuels, is used to heat, cool and light these buildings.

C Fossil fuels emit carbon dioxide during the combustion process.

D All of the above

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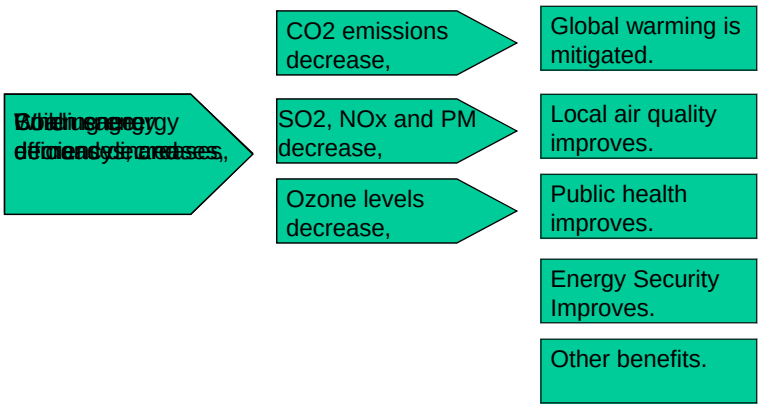
Linking Building Energy Use to Emissions



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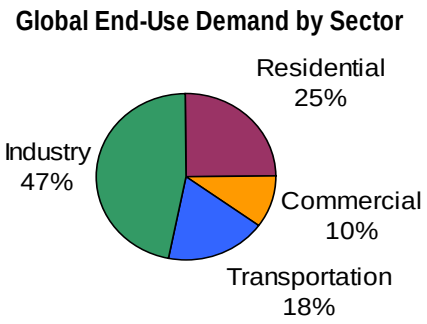
Global- Commercial Sector

- Commercial sector includes: buildings such as hospitals, schools, restaurants, retail operations, warehouses, offices
- Globally, commercial sector amounts to approximately 10% of total energy demand.



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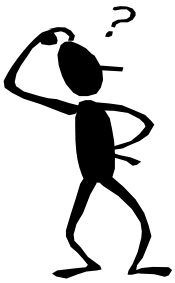
Buildings, Energy, and Carbon



Listed below are several statements about buildings, energy use and the associated Greenhouse Gas (GHG) or carbon emissions. Are they TRUE or FALSE?

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Buildings can use very different amounts of energy on a per square meter basis.

True, Buildings have many different purposes (such as hospitals with 24 hours/day versus a school with 9-12 hours/day, many computers with high lighting density, the amount of lighting, heating, equipment, etc. demand.

True!

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The newest buildings, using the most advanced building materials and construction techniques, are always the most energy efficient.

False, New buildings if not [op]erated and maintain[ed] well, [can] use[] more energy than older [ones]. [Building] managers who "und[erstand]" [bu]ildings intelligen[tly]

False!

Current construction rates are relatively stable in most developing countries.

False, As developing countries develop their econ[omies] and [tr]ansition from agricultural base to indust[rial] [e]conomies, their energy [use] [will] The average life of [buildings] For example, China's [construction] to be the fastest grow[ing] [is] timated at 50 million m^2/[year].

False!

Other benefits of energy efficiency

Beside saving energy, there are other benefits associated with building energy efficiency improvements.

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Co-benefits of energy efficient buildings

- Improved air quality for local conventional pollutants such as SO_2, NOx, and Particulate Matter (PM)
- Reduced greenhouse gas emissions
- Greater public health as a result of lower levels of PM and ozone
- Assist in meeting sustainable development objectives
- Improved energy security/less reliance on imported resources and imported fuel OR better utilization of indigenous resources (i.e., coal)
- Energy efficiency savings frees up resources to be spent on other investments

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Assessing co-benefits

Co-benefits of energy efficient building can be assessed in a number of ways

- Measure the energy used before and after the changes to calculate:
  - **$** Cost savings
  - Changes in the mix of fuel inputs (e.g., fuel switching)
  - Impact on emissions– conventional and GHGs

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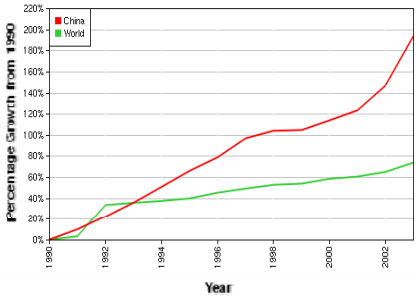
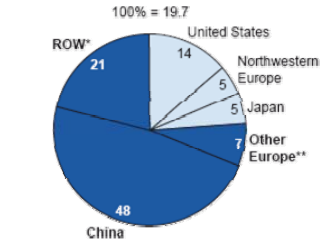
Why China?

CO2 Emissions from Electricity and Heat, 1990-2003



Breakdown of growth in commercial sector, 2003-2020



* Rest of world.
** Including Mediterranean Europe and North Africa, and Baltic/Eastern Europe.
Source: MGI Global Energy Demand Model

WRI's Climate Analysis Tool
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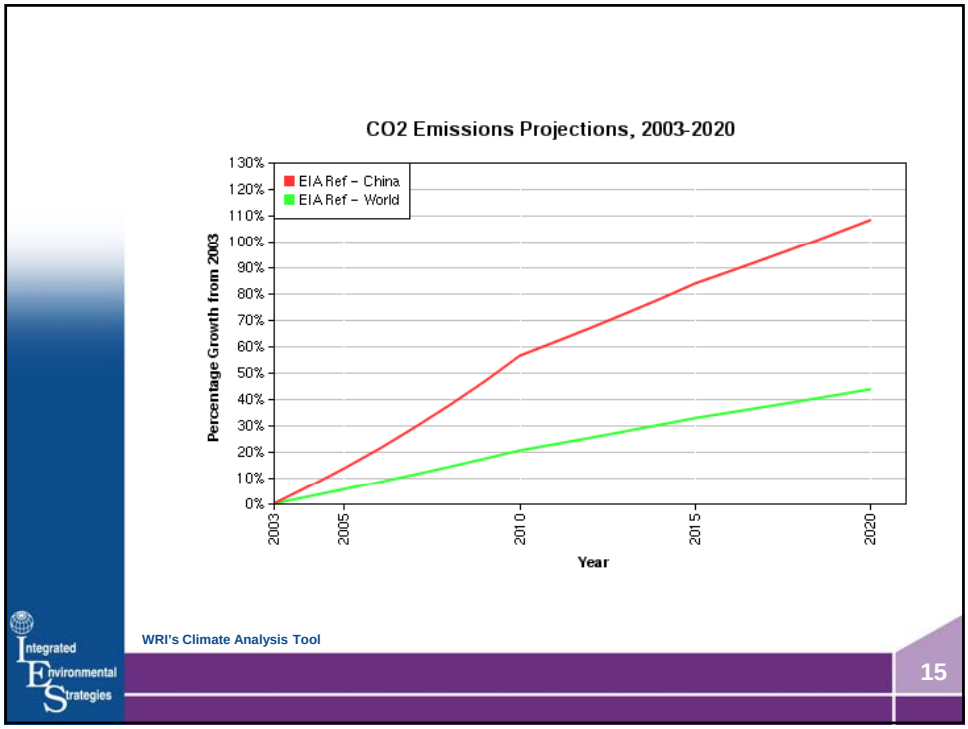

WRI's Climate Analysis Tool

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Energy Statistics in China

Electricity production	2.5 trillion kWh (2005)
Total Energy Consumption By Source	Coal: 69% Oil: 22% Natural Gas: 3% Hydro 6% Nuclear 1% Other 0%
Average annual increase in energy consumption through 2030	3.5%

Energy Information Administration

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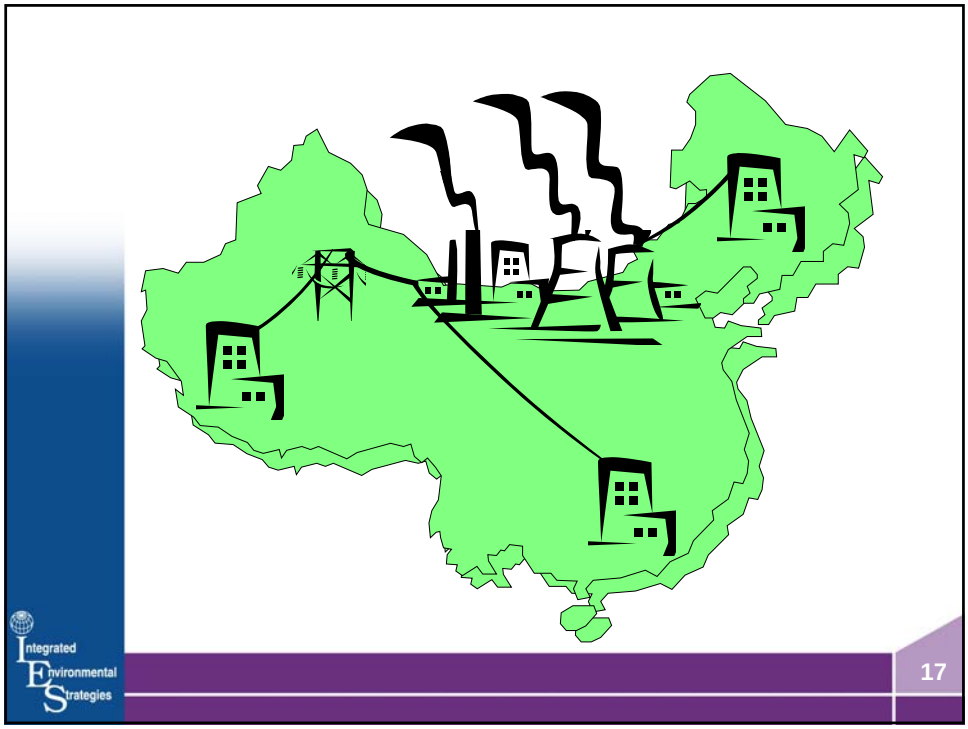

What we *think* we know about buildings in China

- In 2020, 75% of commercial sector energy demand will come from developing countries. China will lead with 7.1% annual growth in commercial energy sector demand.
- Coal is China's primary fuel used for heating and district heating
- In the future, demand for energy services will shift from space heating to power intensive end uses such as AC, lighting, office equipment

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What we *think* we know about buildings in China (continued)

- In China, shift is expected from heavy reliance on coal boilers to natural gas fired boilers, electric heat pumps, and district heating plants.
- Changes in standard of living will cause more heating in historically lesser heated areas (southern China), more air conditioning to about 55% of all buildings.

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Question: What energy use is not accounted for in commercial building statistics that may be very important?

A. Water heating

B. Decorative lighting

C. Computers and other equipment

D. Energy used to build the building

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Name the most likely types of energy saving measures in the buildings sector for China

Recycling?

Space heating?

Water heating?

Cooling?

Lighting/other appliances?

Increased daylighting?

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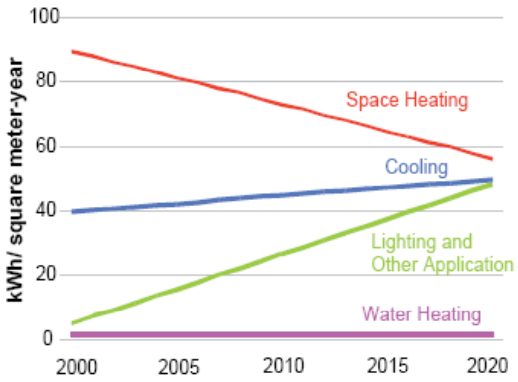
The most likely types of energy saving measures in the buildings sector for China



End Use Energy Intensities in Office Buildings in China

Florian Bressand

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Quantifying Potential Emissions Reduction

In 2005, the commercial sector of the US ENERGY STAR™ Program avoided…

Energy Star 2005 Annual Report
Climate Protection Partnerships Division, US EPA

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One Potential Approach: eeBuildings

The eeBuildings program shares and implements the best lessons of the ENERGY STAR™ program and applies it overseas

- The most energy efficient buildings are NOT the buildings with the most advanced or efficient technologies.
- Building owners and managers in developing countries are very receptive to ***no-cost / low-cost*** strategies for reducing energy use.
- Studies in the US and developing countries demonstrate that savings of 10% - 25% in annual energy use are possible using ***no-cost / low-cost*** measures to improve building management, *without impacting key operations or tenant comfort*.
- Engages key groups– stakeholders

eeBuildings

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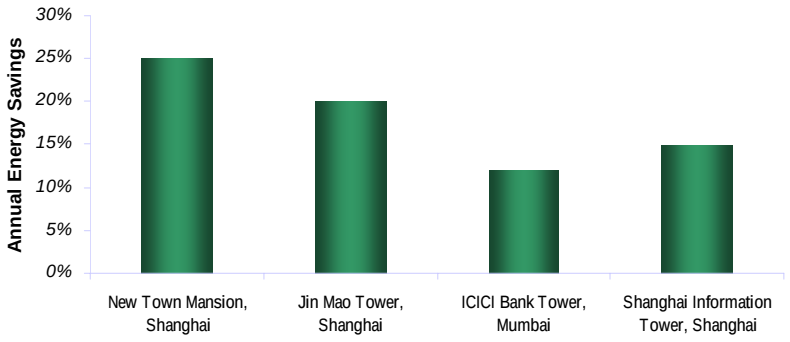
Who are some of the key players/stakeholders in China at the local and national level to engage in building efficiency discussions?

- Ministry of Construction
- National Development & Reform Commission (NDRC)
- China Government Offices Administration (GOA)
- Provincial DRCs
- Shanghai Center for Energy Conservation (SECSC)
- Local Electricity Utility
- Commercial Building Owners/Managers
- China Center for Standard Certification (CSC)
- Association of Shanghai Property Managers (ASPM)
- Commercial Building Owners/Managers
- Investment Bankers

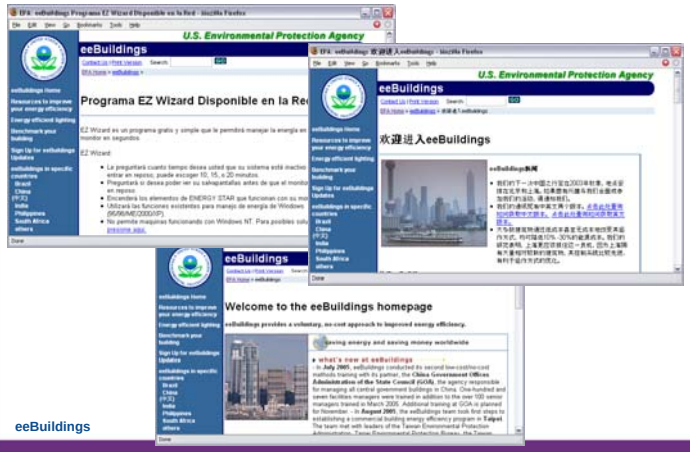
eeBuildings Results

eeBuildings Partners Save Energy with No Cost / Low Cost Measures

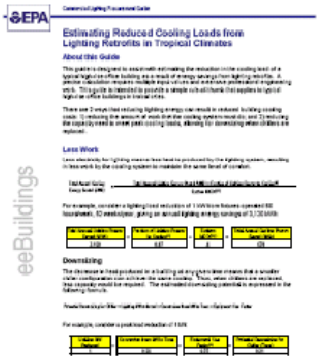


eeBuildings Tools & Resources

eeBuildings Provides Training, Tools & Resources in multiple languages



ee Building Factsheets



Final Question:

How many compact fluorescent light bulbs are in your office?

Changing one 60 watt incandescent bulb to an equivalent compact fluorescent can save 833 pounds of CO2 emissions over the lifetime of the bulb.

ENERGY STAR™ "Savings Calculator"

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Take Away Points

- Many no cost/low cost opportunities await to improve energy efficiency in existing buildings, especially in operation and management issues
- Future demand will come in "services"– more space heating and cooling; brighter lights, more hot water, more office equipment
- Aggressive energy efficiency improvements are needed to offset the increase in demand and intensity of end-use of energy in commercial buildings … and greenhouse gas emissions
- Significant need for better data on buildings and energy end use, especially in construction

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Acknowledgements

- Bressand, Florian, Nan Zhou, Jian Lin. “Energy use in commercial building in China: Current situation and future scenarios.” *ECEE 2007 Summer Study*. European Council for an Energy Efficient Economy June 2007: 1065-1070.
- “Curbing Global Energy Demand Growth: The Energy Productivity Opportunity.” McKinsey Global Institute May 2007: 105-140.
- eeBuildings Program
  - Web site: www.epa.gov/eebuildings
- ENERGY STAR™
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- Claire Roby

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