

Mitigation options in the building sector

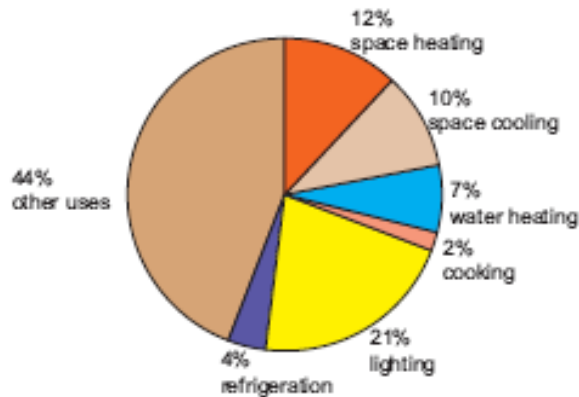
What is energy used for in buildings?

	US residential	China residential	US commercial	China commercial
Heating/cooling	40%	30%	20%	60%
Appliances	35%	20%	40-50%	10%
Lighting	10%	10%	20%	10%
Water heating	10%	30%		20%
Cooking	3%	7%		

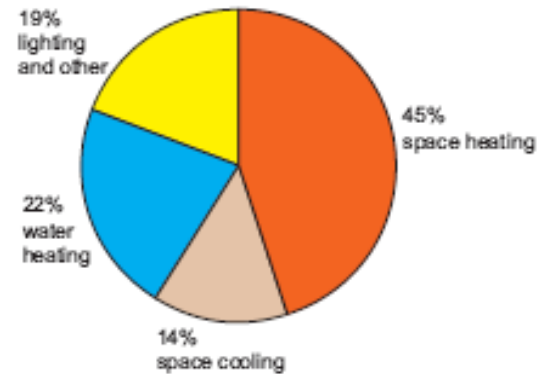
Source: IPCC, Fourth Assessment report, WG III, fig.6.3

Energy use in buildings

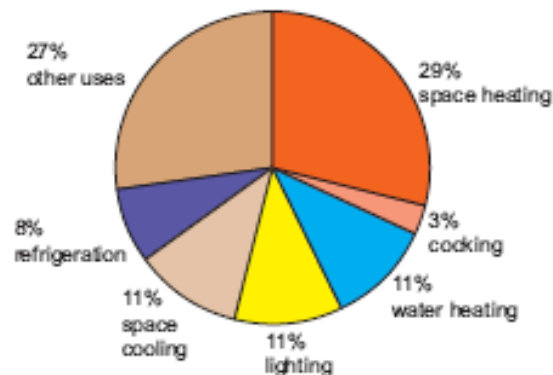
U.S. commercial building energy use 2005



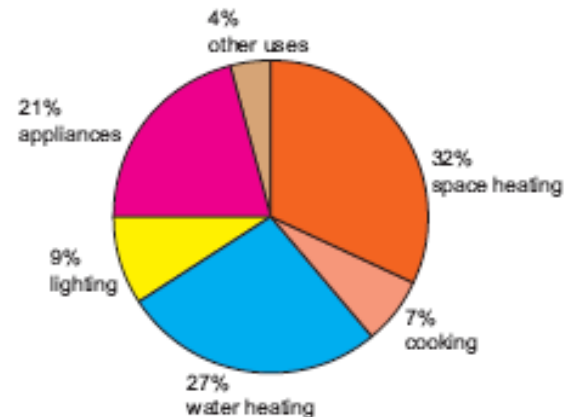
China commercial building energy use 2000



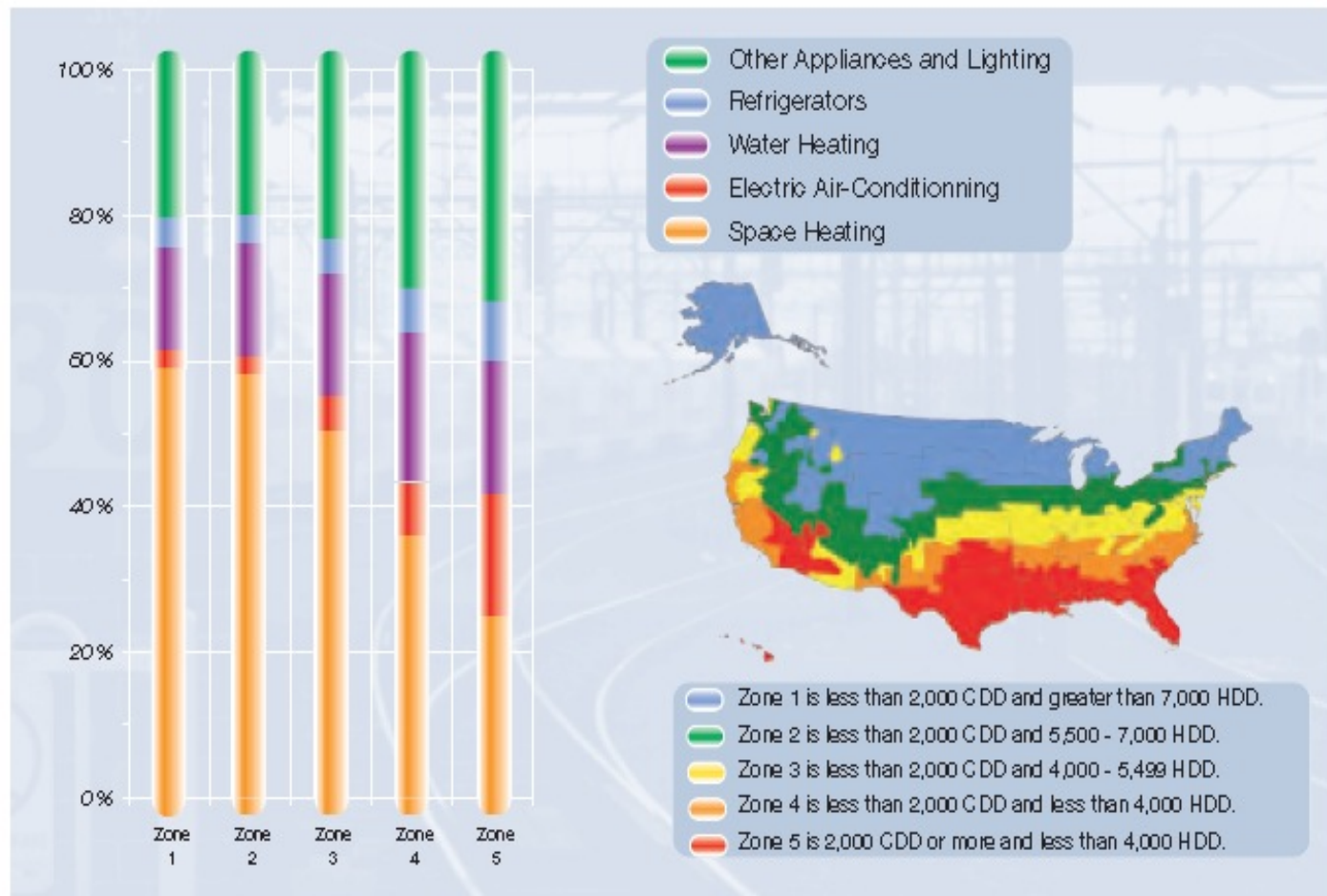
U.S. residential building energy use 2005



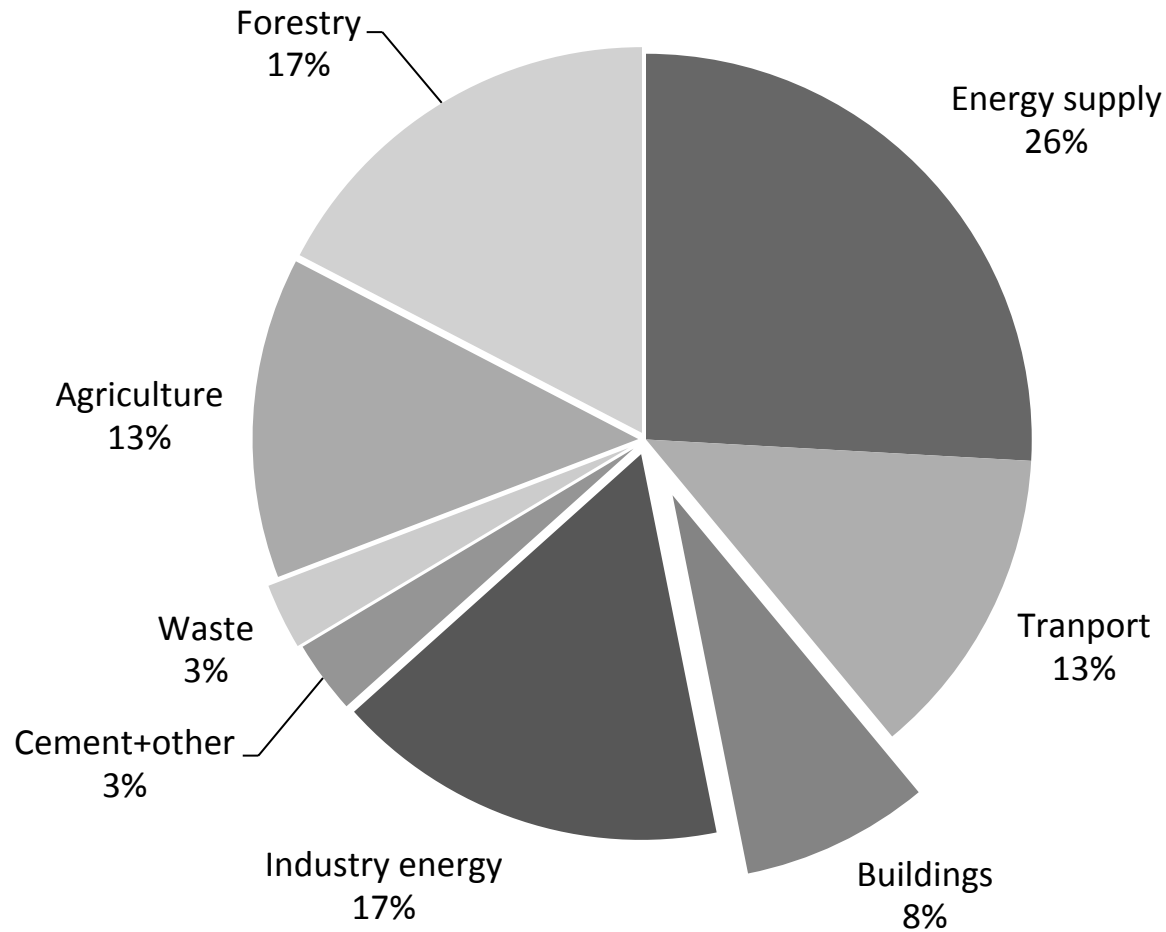
China residential building energy use 2000



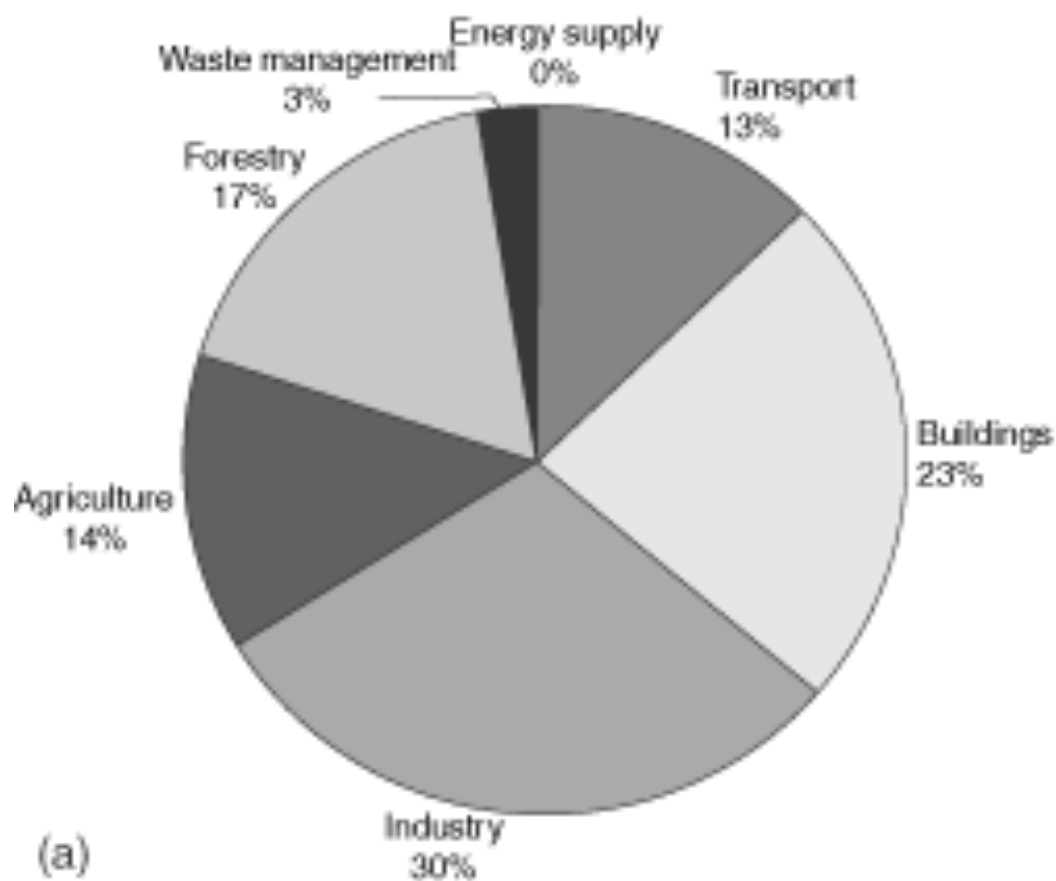
Energy use as a function of climate



Direct GHG emissions from the building sector, 2005



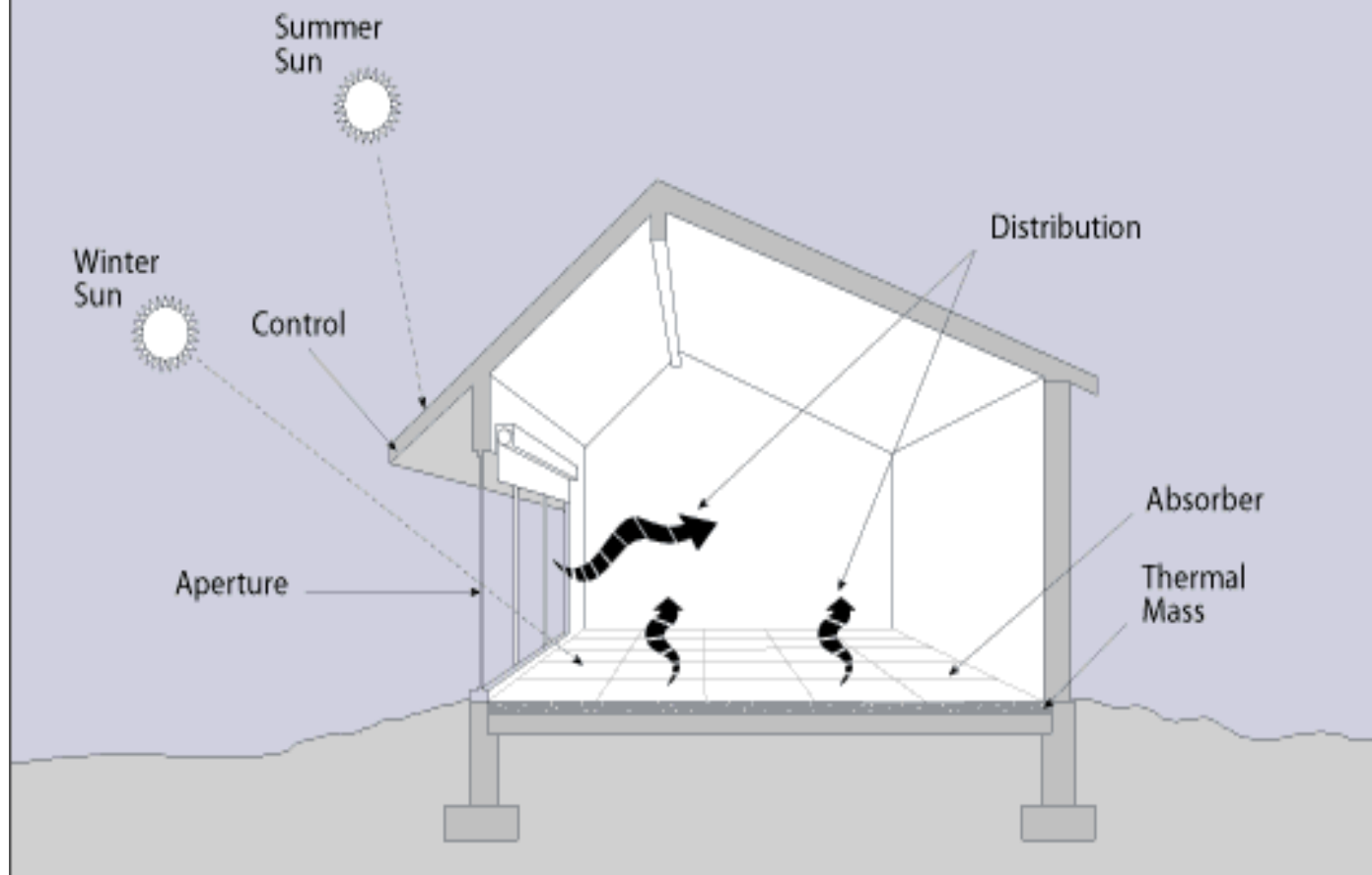
Indirect GHG emissions Building sector



Ways to reduce GHG emissions from buildings

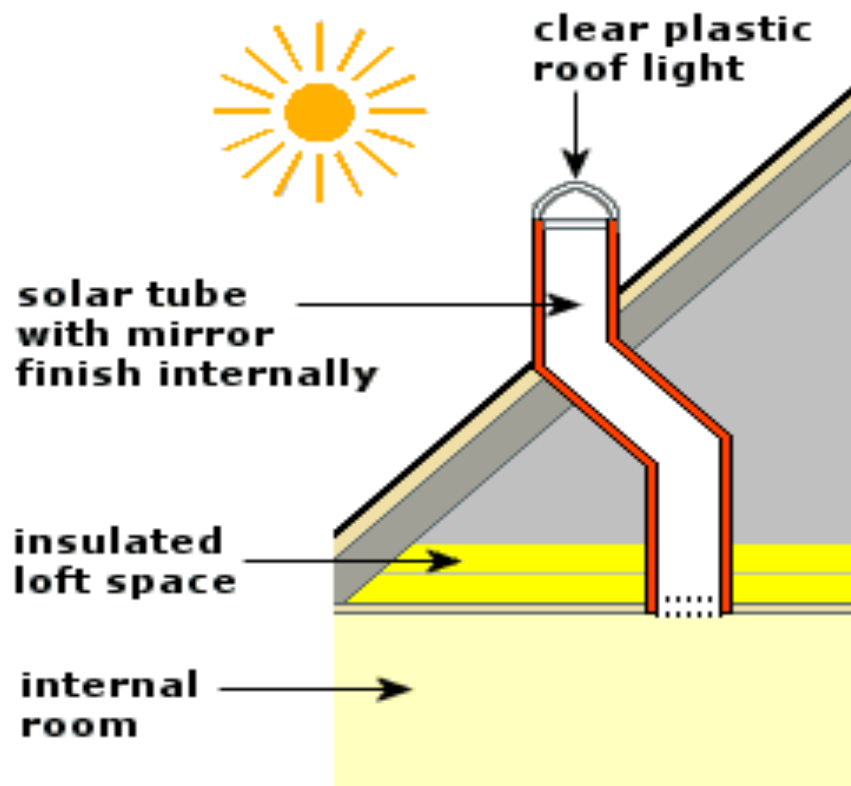
- Reduce energy needs
- More efficient energy use
- Low carbon energy sources

Five Elements of Passive Solar Design



Use daylight in stead of electric lights





SOLAR TUBE LIGHT



Heating energy use in current buildings

Location	Energy use kWh/m2/yr
Germany residential average	220
Eastern Europe residential average	250-400
Sweden multidwelling average (+hot water)	180
Sweden best practice passive house (+ hot water)	30
Passive house Germany	15 (120 total energy)

SAVE ^{UP TO} 75%

ON YOUR ENERGY BILLS

Treat your home to a brand new heating system that can **save you up to 75%** on your fuel bills and get loft and cavity insulation absolutely free**

Style of boiler	SAP rating	Flat	Bungalow	Terraced	Semi-detached	Detached
Old boiler (heavy weight)	55%	£267	£341	£354	£397	£550
Old boiler (light weight)	65%	£231	£293	£304	£340	£470
New boiler (non-condensing)	78%	£197	£249	£258	£289	£396
New boiler (condensing)	88%	£178	£224	£232	£259	£355

District heating

OPTIMIZE THE ENERGY MIX

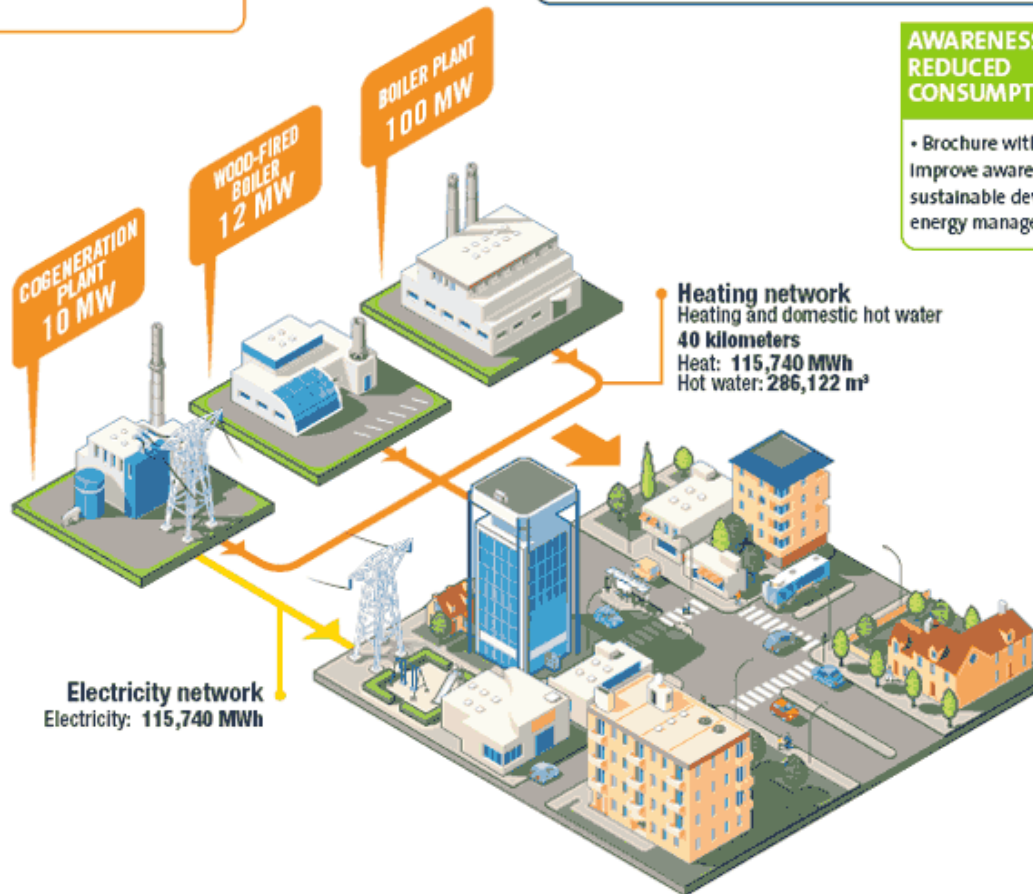
- Fuel used:
 - Heating oil: 43%
 - Gas: 42%
 - Wood: 15%
- Reliance on heating oil: 100%
In 2000, only 40% In 2006

REDUCE ENVIRONMENTAL IMPACTS

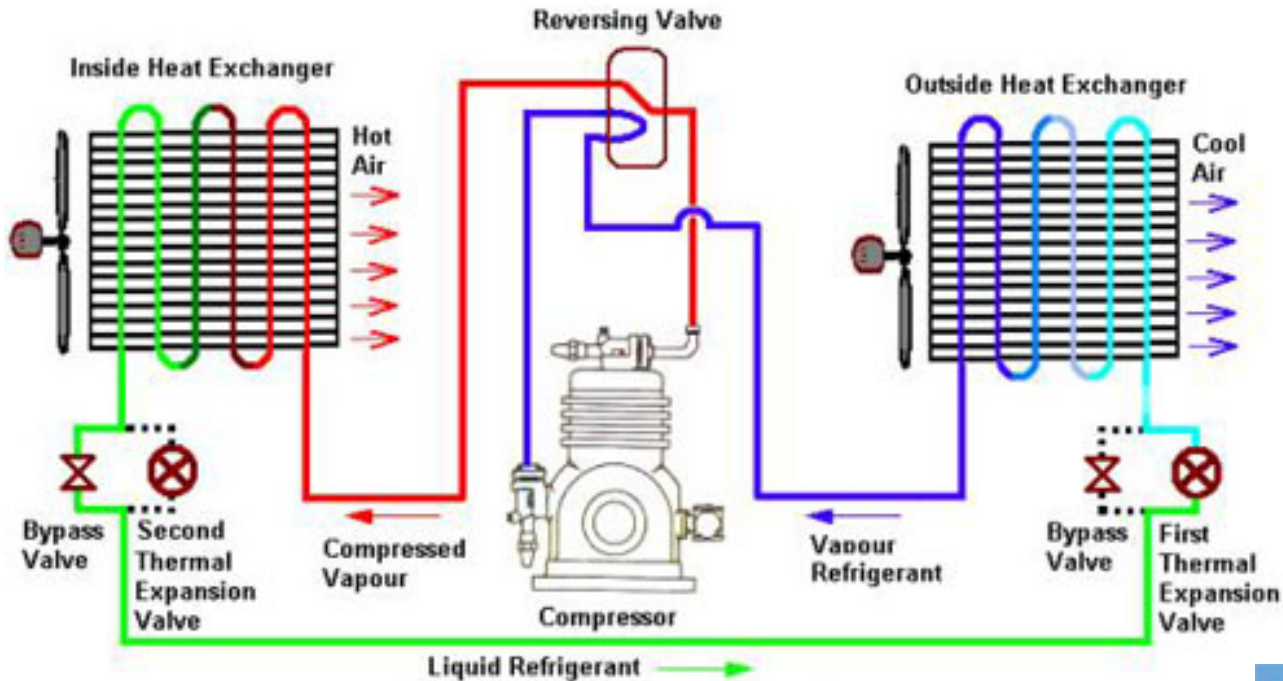
- In 2000, installation of continuous emission measurement and analysis equipment
- Renewable energy as a percentage of the total energy consumed: 15%
- Emissions avoided:
 - 6,880 metric tons of CO₂ In 2002; 19,700 metric tons of CO₂ In 2006
 - 30% less dust particles compared with 2002
 - 44% less sulfur dioxide compared with 2002

AWARENESS OF REDUCED CONSUMPTION

- Brochure with information to improve awareness of sustainable development and energy management



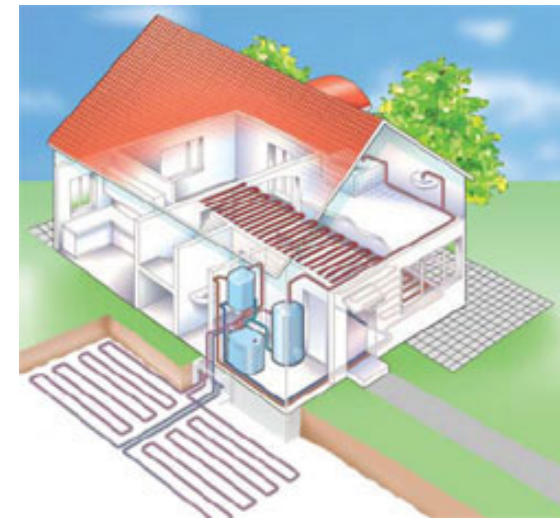
Heat pump in heating mode



Air source

Fig. 2 - Heat Pump in Heating Mode

Ground source



Heat pump in cooling mode

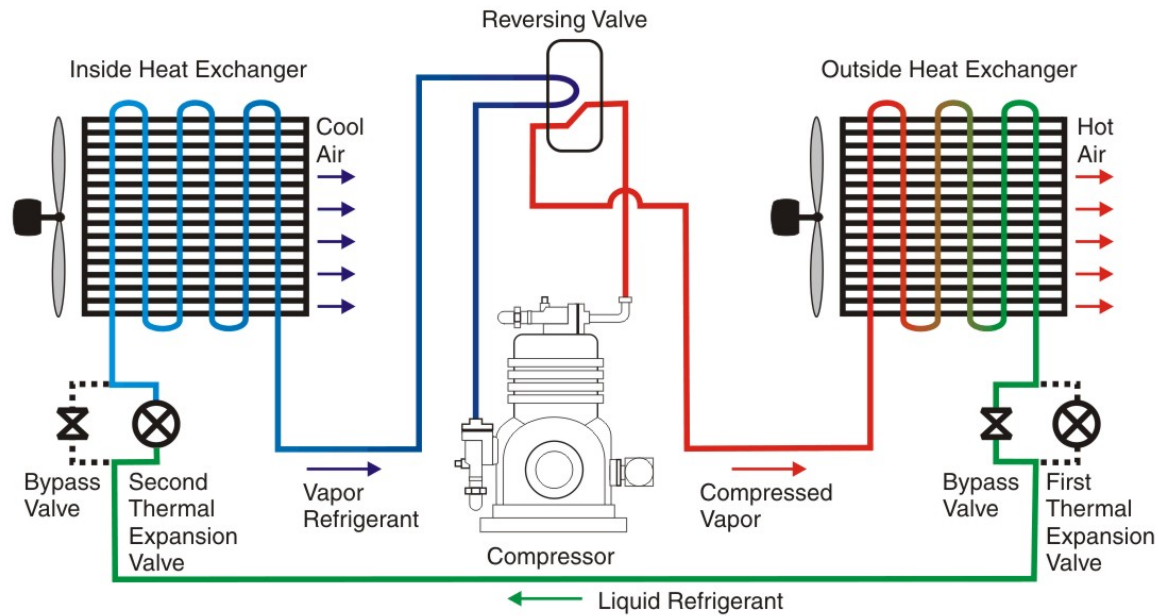
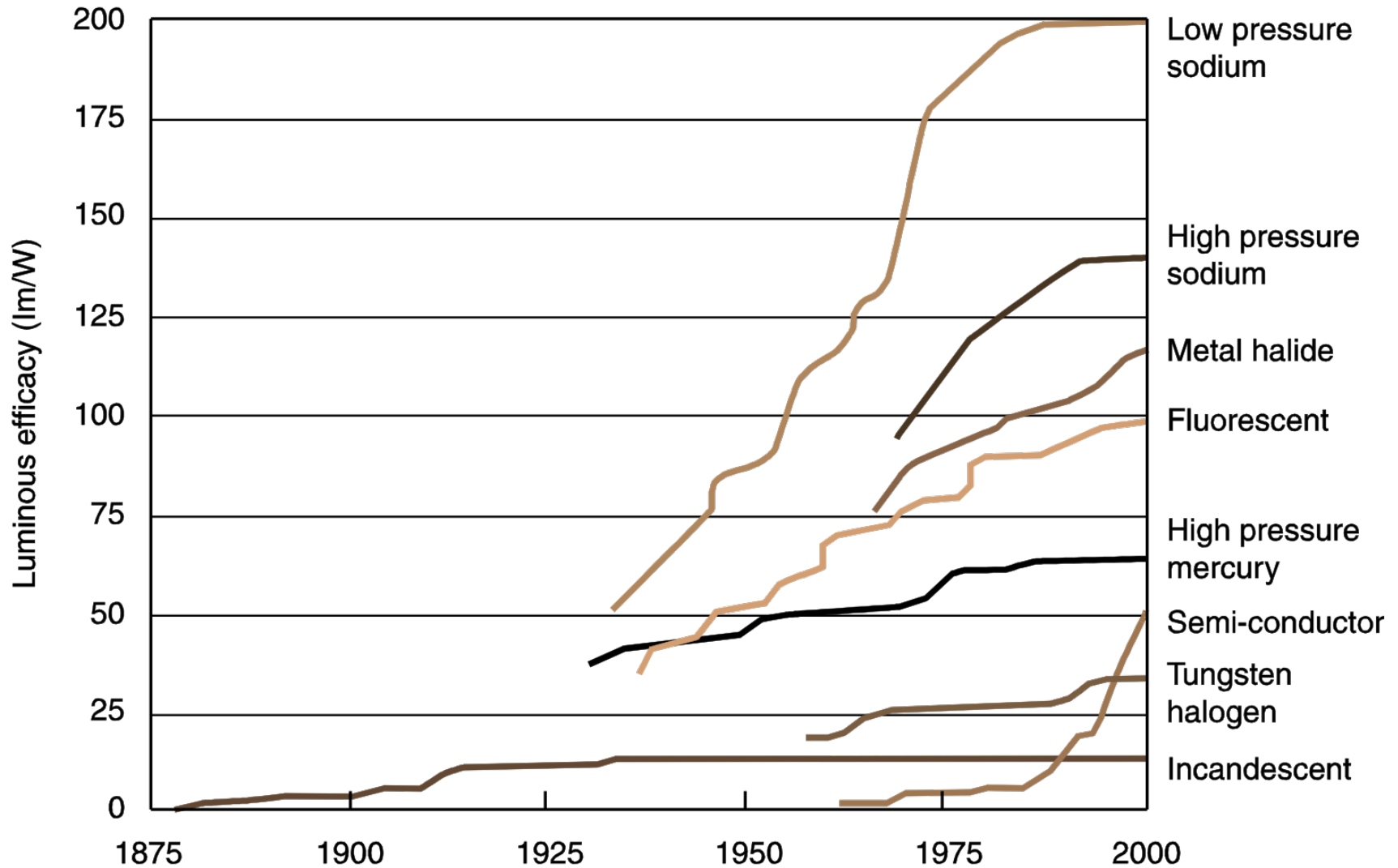


Figure 11.3. Heat Pump in Cooling Mode

Air conditioning

- Strong increase in use of airconditioners
- Large central units 2-3 * as efficient as small room units; further improvement possible
- Shift to HFC coolant happening
- Low/zero GWP alternatives available

Efficiency of lamp types



LED lamps



Osram Parathom



Osram Parathom GU10



Osram LED Parathom



Osram Parathom Classic



Osram Parathom Globe

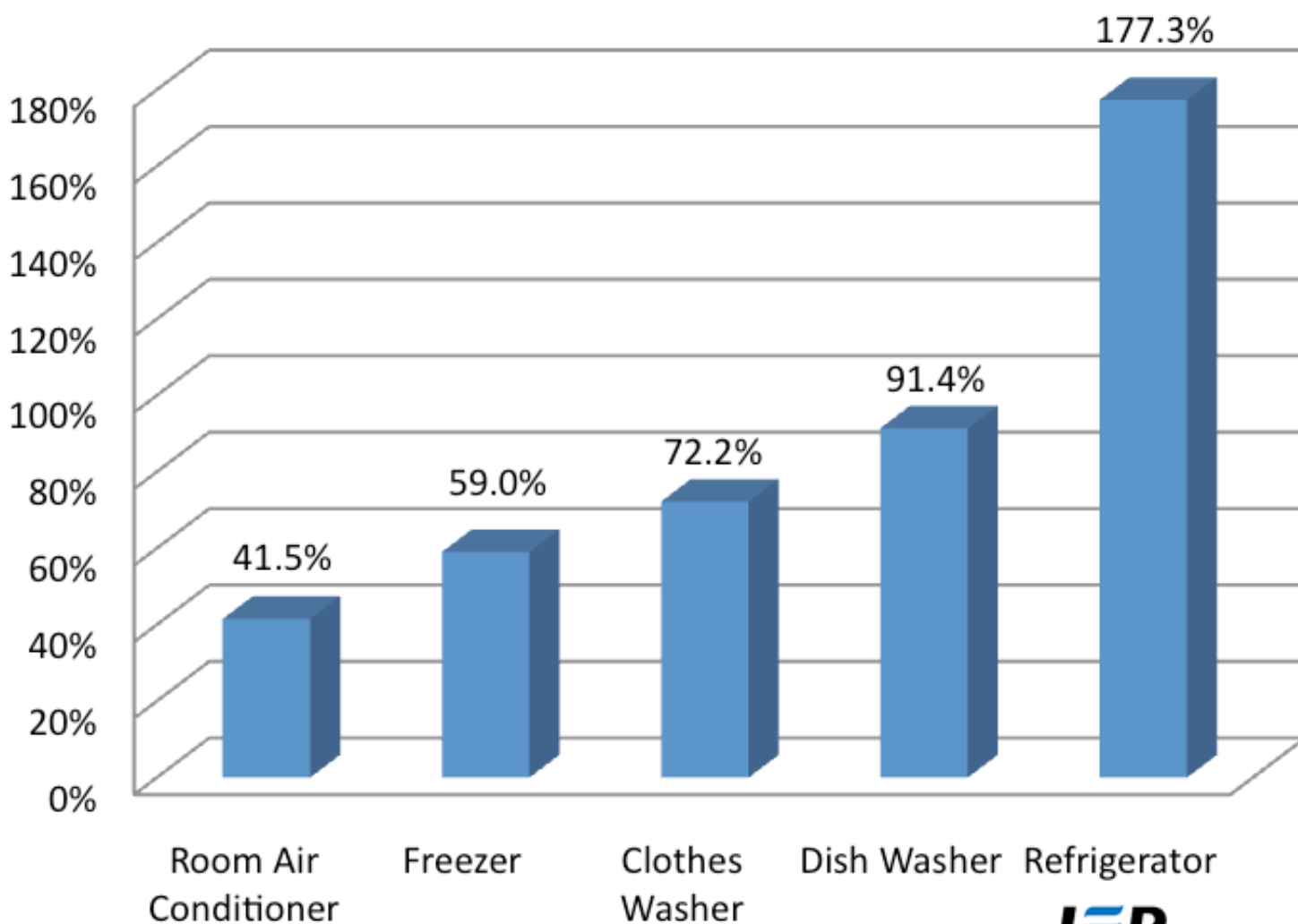
PHILIPS
sense and simplicity



Electricity use of home appliances, USA



Percent Increase in Energy Efficiency: Household Appliances 1980-2008

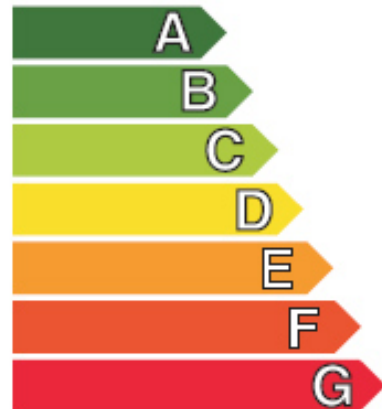


Energy

Washing
machine

Manufacturer
Model

More efficient



Less efficient

Energy consumption
kWh/cycle
(based on standard test results for 60°C
cotton cycle)
Actual energy consumption will
depend on how the appliance is used

0.95

Washing performance
A: higher G: lower

A B C D E F G

Spin drying performance
A: higher G: lower
Spin speed (rpm)

A B C D E F G

1400

Capacity (cotton) kg
Water consumption l

5.0

55

Noise
(dB(A) re 1 pW)

Washing
Spinning

5.2

7.0

Further information is continued
in product brochures

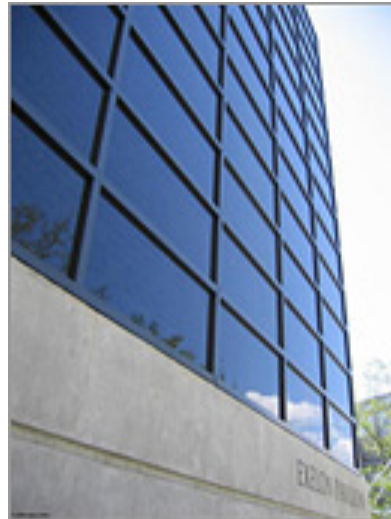


How to buy an energy efficient appliance?

Solar PV on building roofs



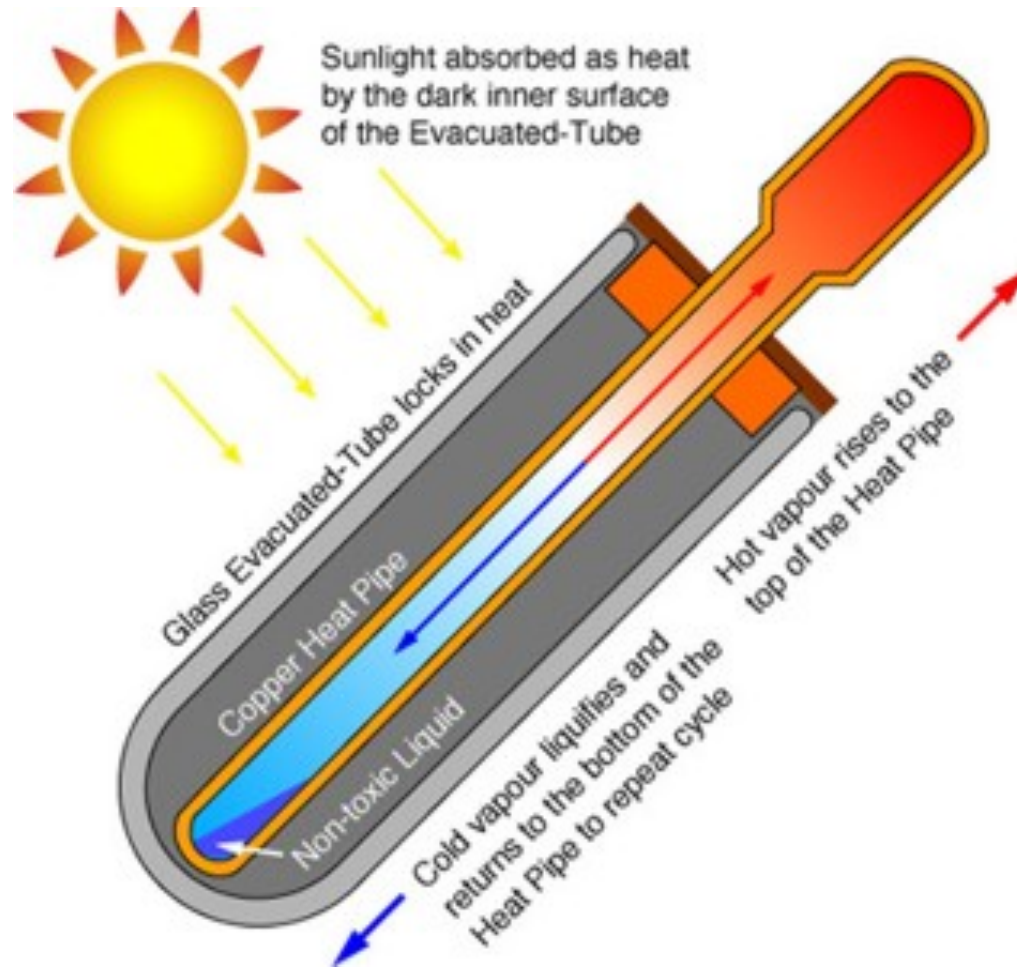
Building integrated solar PV



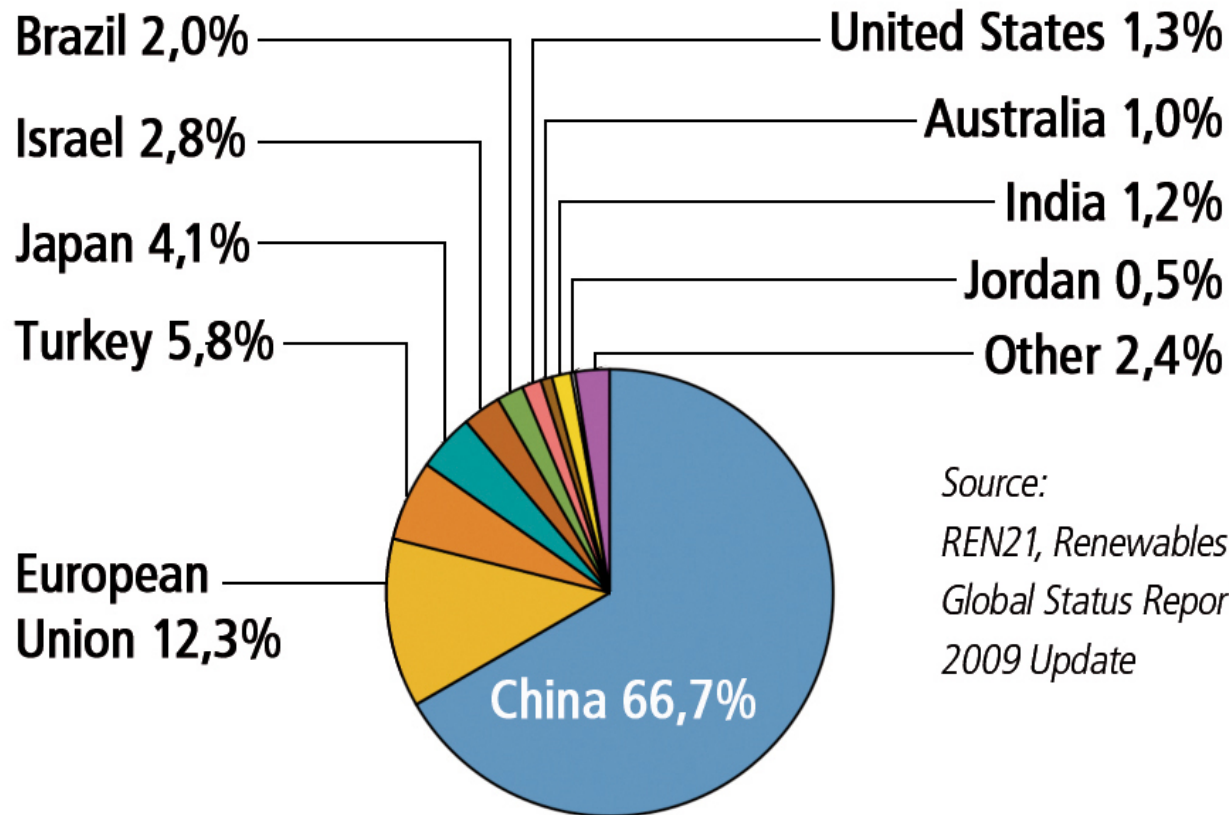
Solar water heating



Heat pipe principle



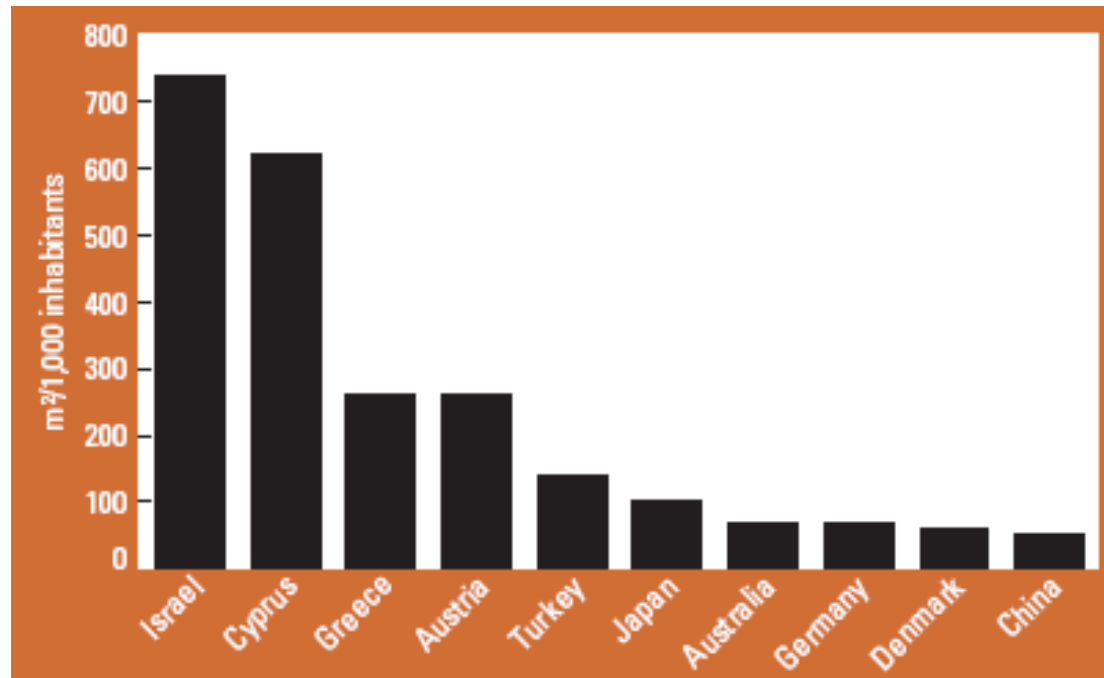
Share of Solar Hot Water/Heating Capacity Existing, Top 10 Countries, 2007



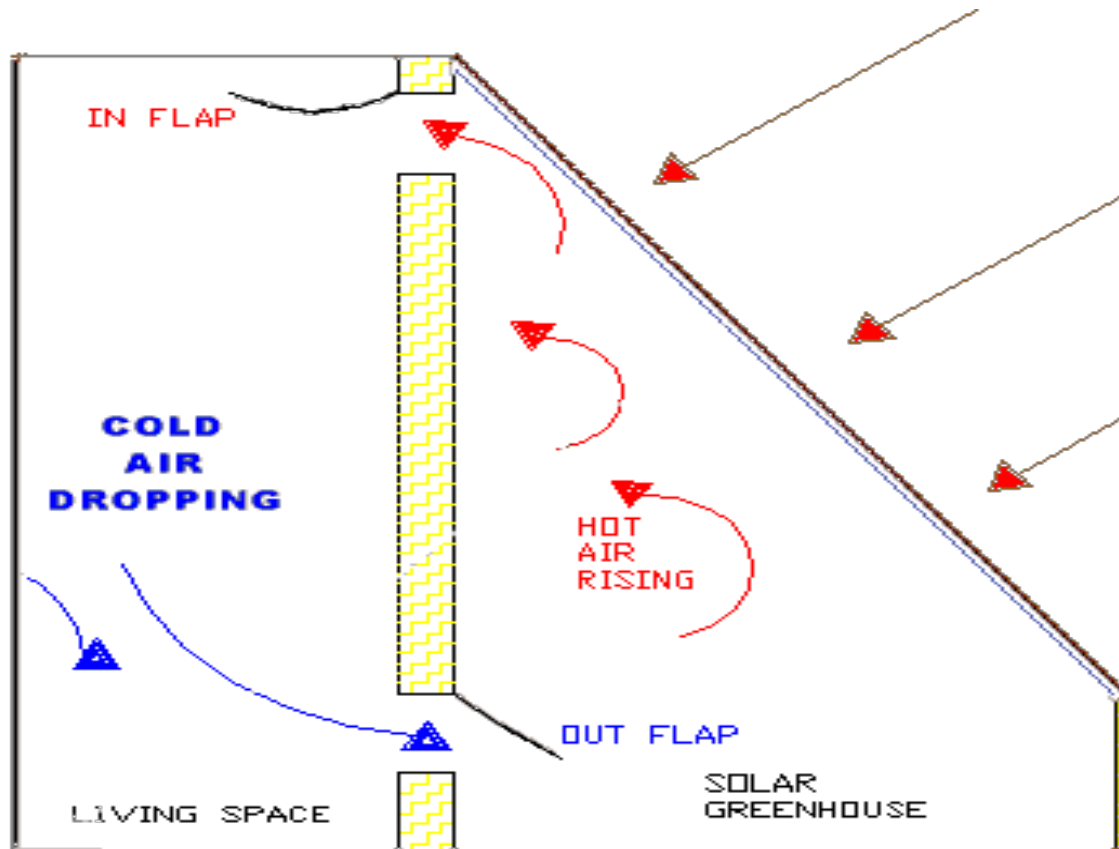
Source:
REN21, Renewables
Global Status Report:
2009 Update

Total = 126 gigawatts-thermal

Installed capacity of solar water heating (m²/100,000p)



Solar space heating

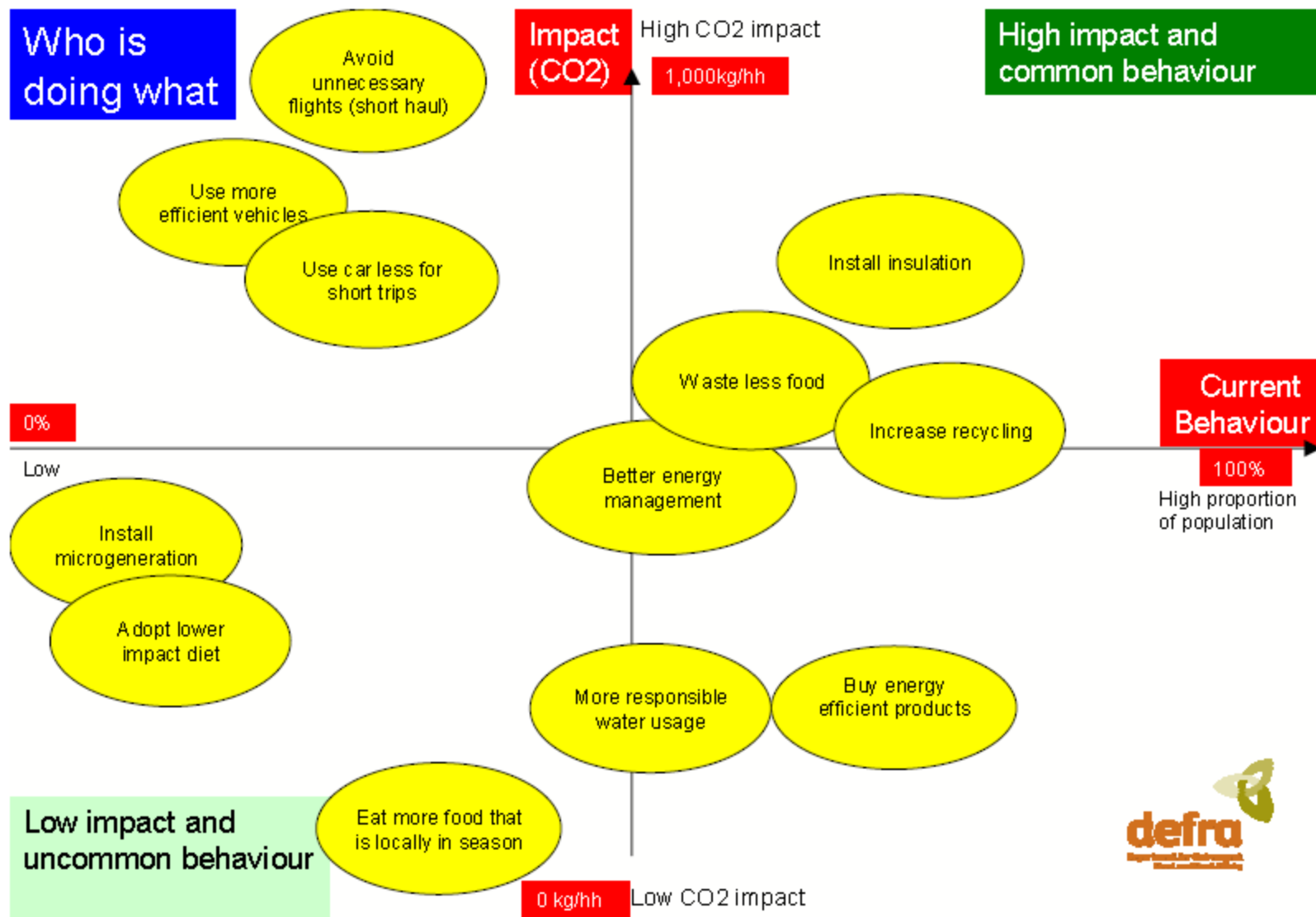


Net positive energy buildings in use

Malmö, Sweden



Dijon, France



Who is willing to do what

Ability to Act

High

High ability and willing

Adopt lower impact diet

Avoid unnecessary flights (short haul)

Use car less for short trips

Use more efficient vehicles

More responsible water usage

Better energy management

Waste less food

Increase recycling

Eat more food that is locally in season

0%

Low

Willing to Act

100%

High proportion of population

Install microgeneration

Buy energy efficient products

Install insulation

Low ability and unwilling

Low



Building sector reduction potential (direct and indirect emissions)

- About 30% of projected GHG emissions by 2030 can be avoided with net economic benefit.
- About 40% for costs upto \$100/tCO₂e
- New buildings: >75% savings compared to current (at low to zero additional cost)
- Net positive energy buildings are already in use

Barriers to applying mitigation options

- “Cost” of reliable information
- Availability of technologies
- Financing
- Limitations in building designs
- Split incentives (owner-user)