

# Global Climate Change: Technical and Ethical Challenges for Engineers

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# The Credibility of Engineers means you've got a big role to play

## U.S. Goals for Graduates

*Educating the Engineer of 2020*, National Academy of Engineering

- Technically Proficient
- Broadly Educated
- Think of Themselves as Global Citizens
- Can be Leaders in Business and Public Service
- Ethically Grounded

## Technology has changed the world



Something's just not right – our air is clean, our water is pure, we all get plenty of exercise, everything we eat is organic and free-range, and yet nobody lives past thirty

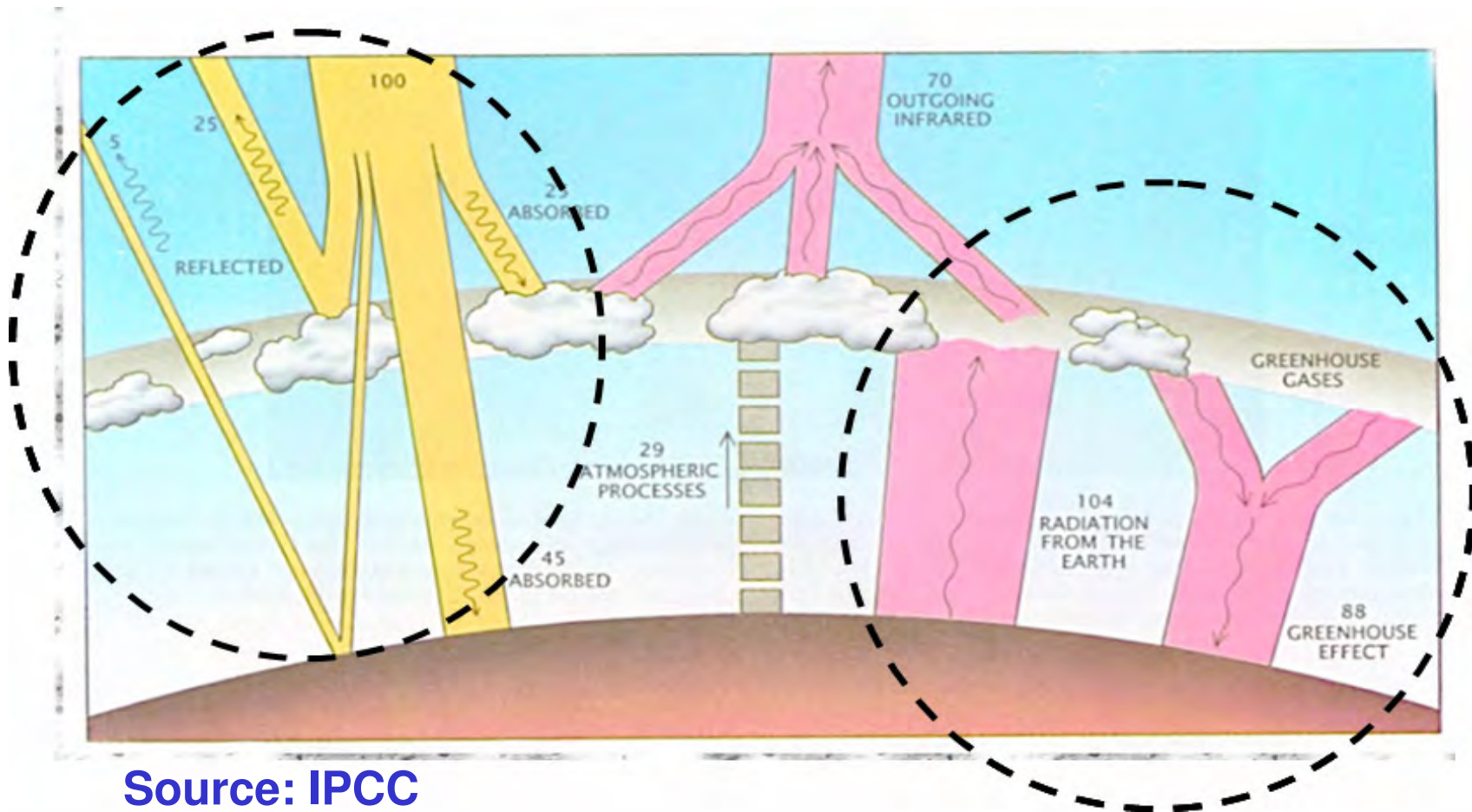
**Climate  
Change- A  
defining issue  
for our time**



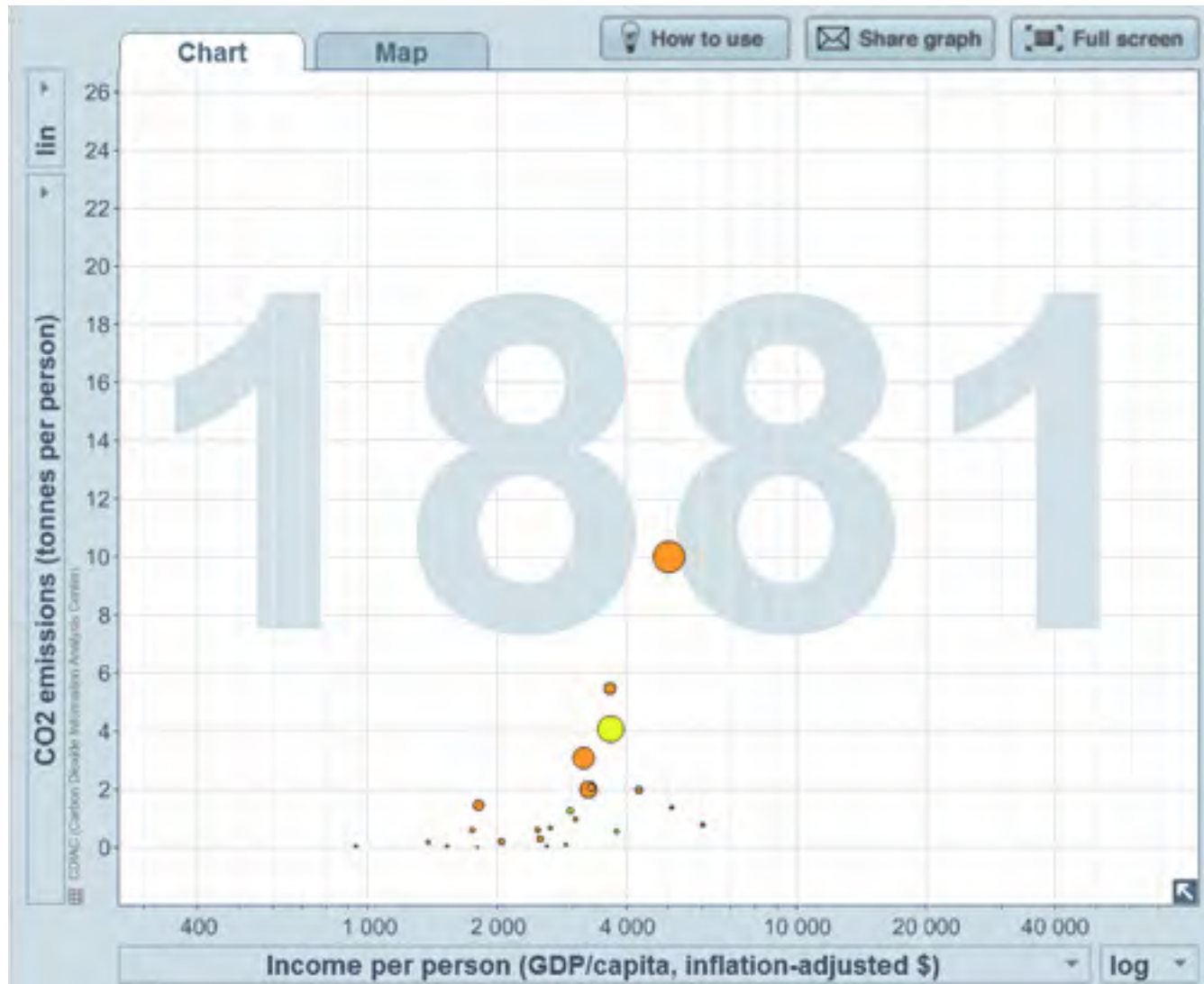
*source: cred.columbia.edu/grade*

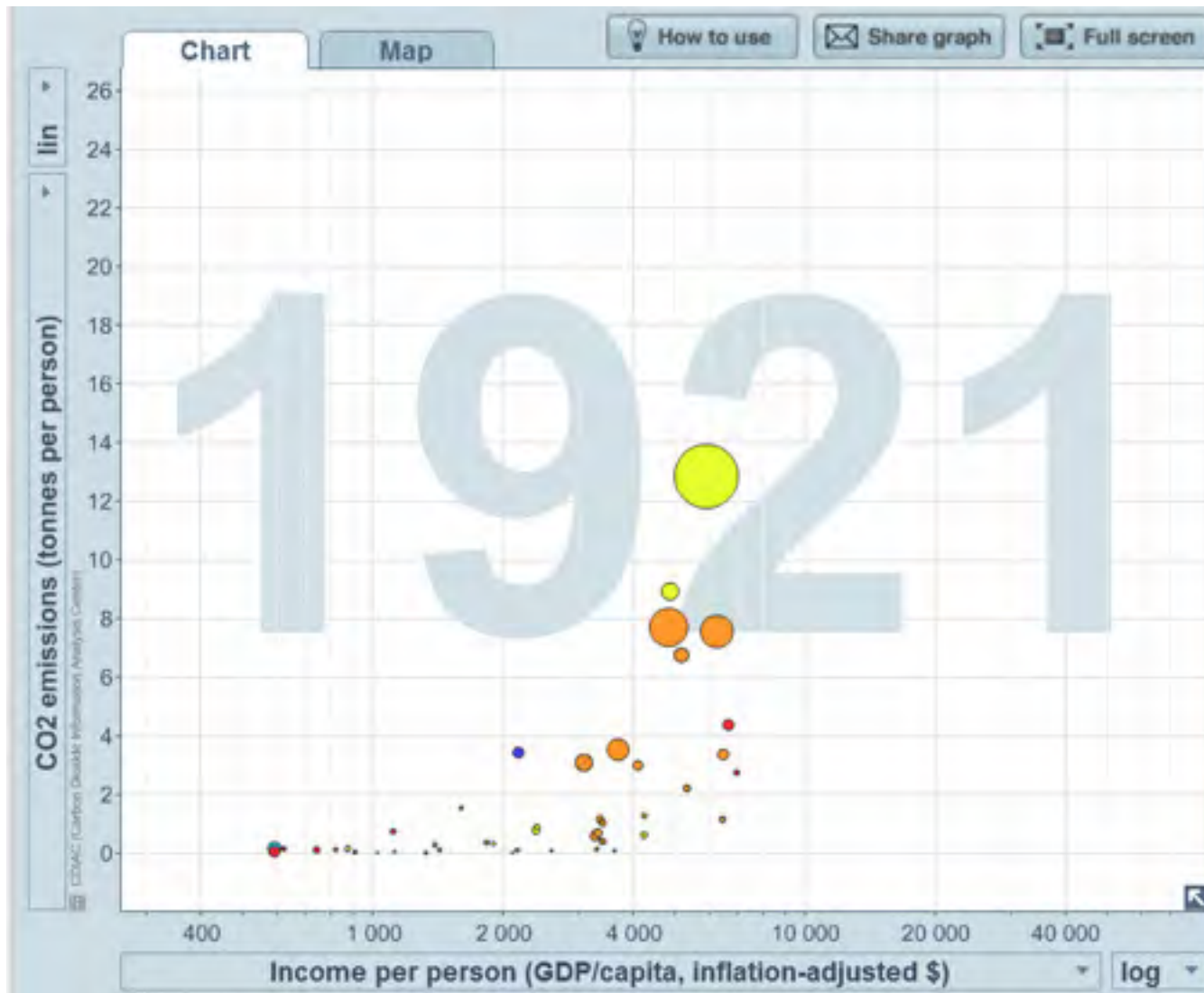
Human CO<sub>2</sub>, methane, etc are changing  
the global radiation balance

# Radiation balance

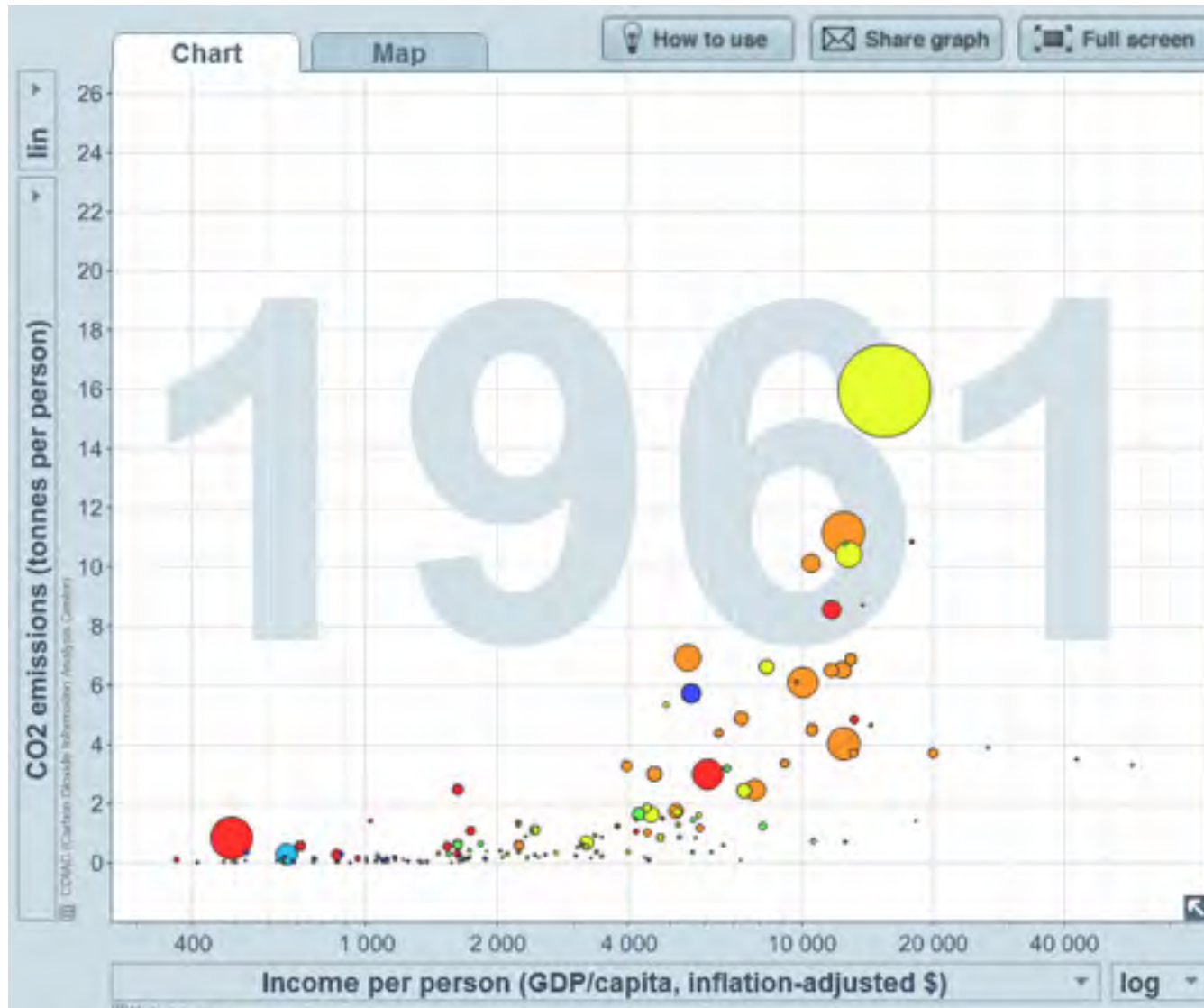


## CO2 emissions vs income













China's total now exceeds US total

[China red; US yellow]

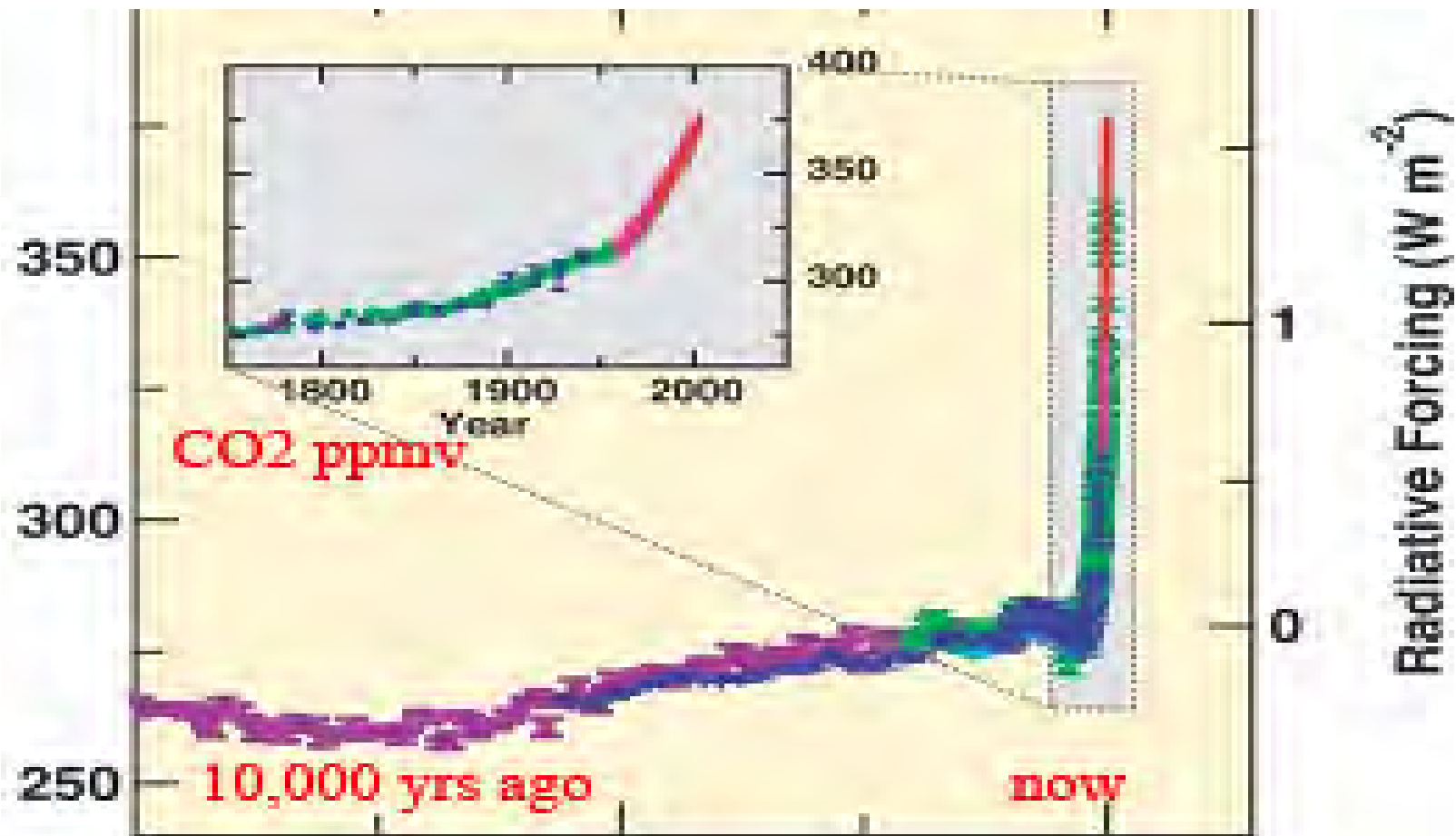


China now exceeds the US – BUT... China's per capita  
CO2 is way smaller than US

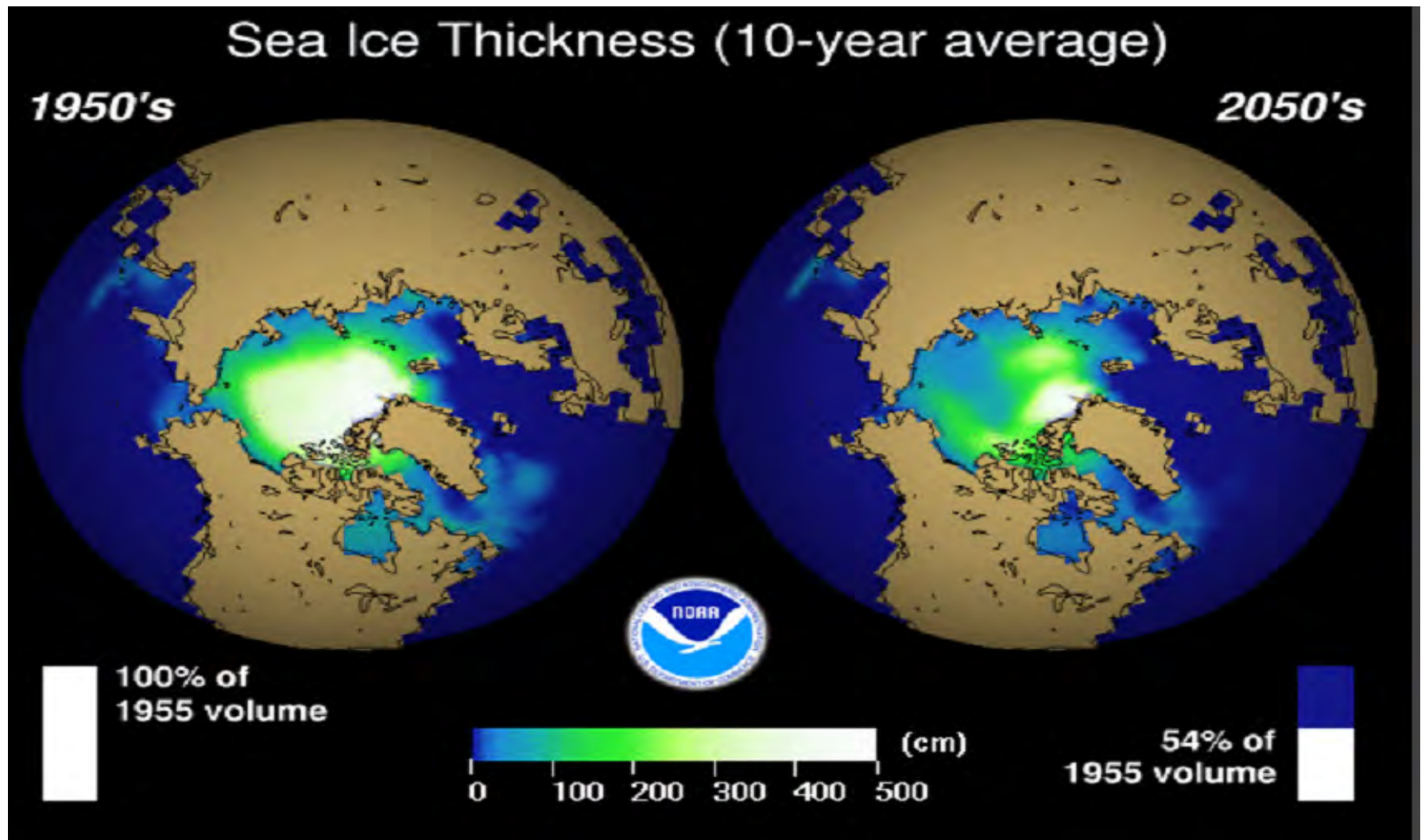
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2006 gapminder.com

Radiative forcing is going up fast



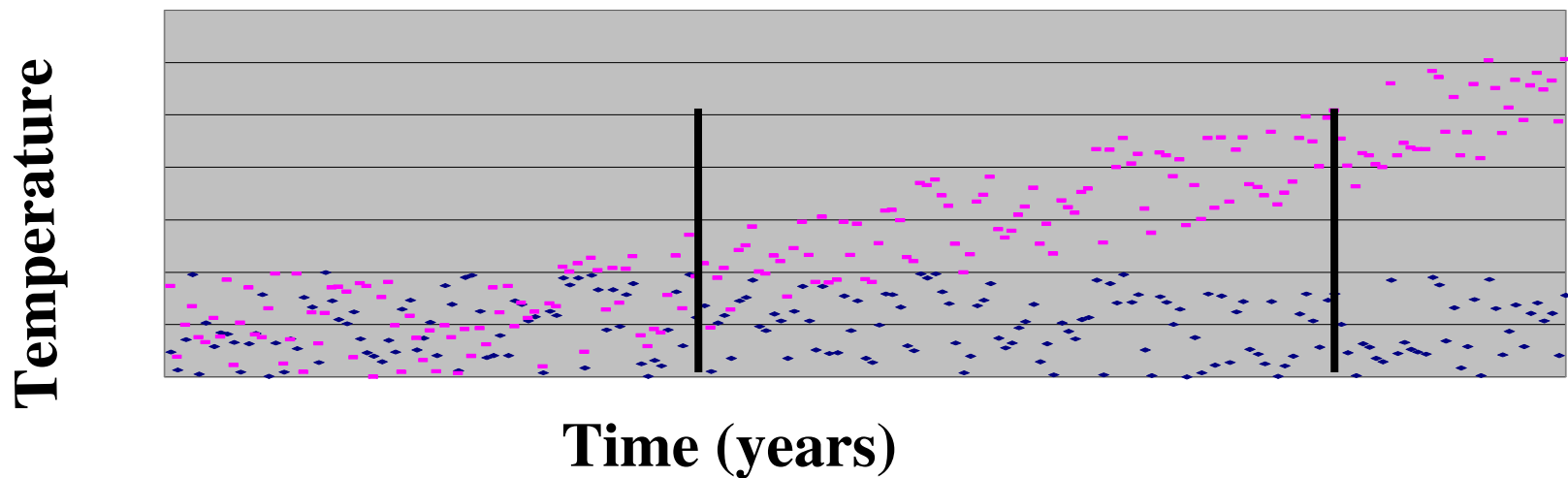
Change is happening-  
e.g. arctic ice is melting



# When does a signal become unambiguous?

The IPCC (Intergovernmental Panel on Climate Change says it's unambiguous now).

The vertical lines illustrate an early time where statistical analysis might show an effect, and a later time where eyeball analysis is compelling.



A graph like this relies on **both data and analysis**. If you don't trust both, then you won't – and shouldn't -- believe any conclusions!

[This graph is representational. I generated it using random numbers]

*The technical global climate change issue is  
daunting.*

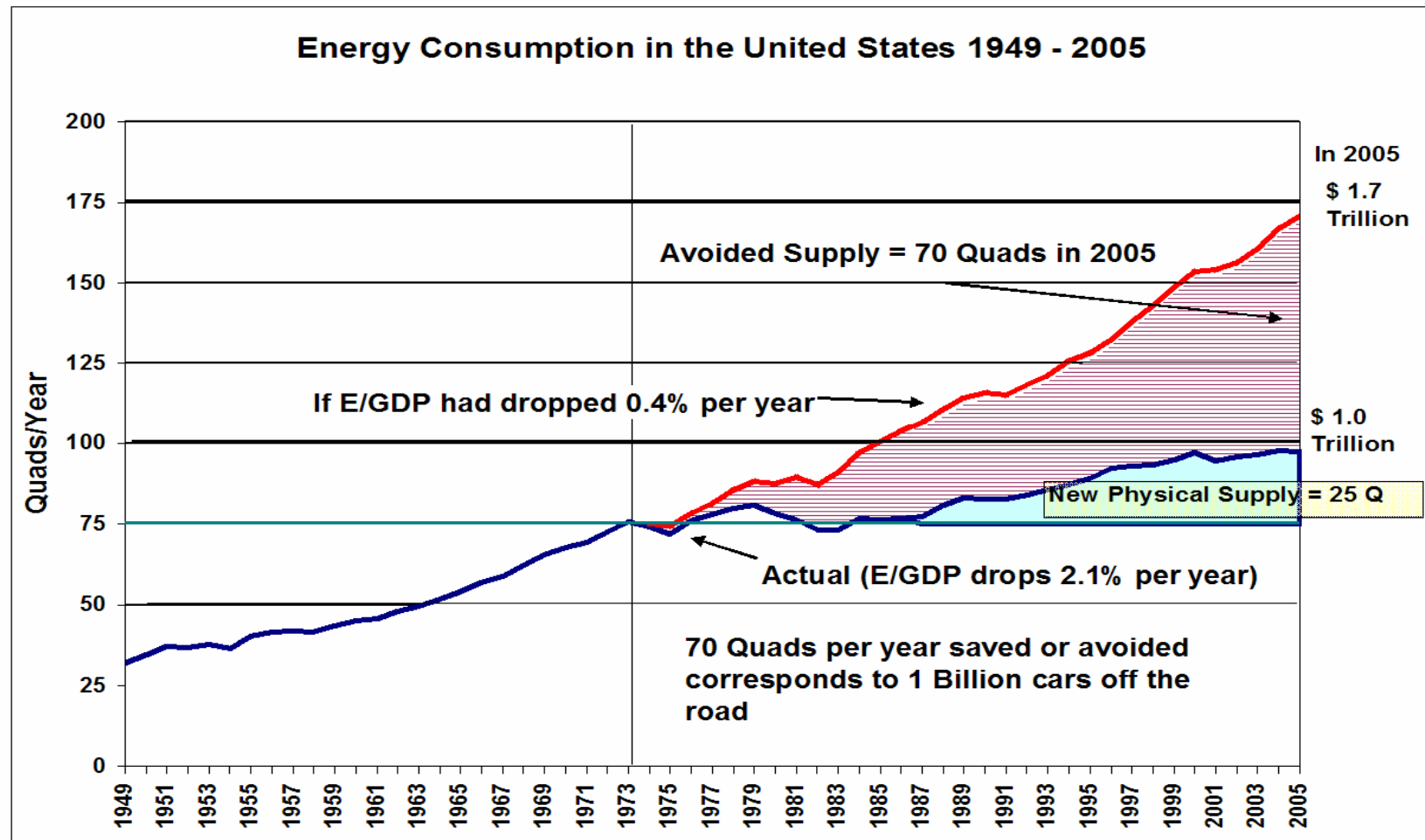
*Getting agreement to act is really tough!*

*There are hidden agendas.*

“World domination” is, indeed, the purpose  
of the climate-crisis scam”.

[Facebook.com/climategate](https://www.facebook.com/climategate) Jan 20,2010

The 1973 OAPEC embargo started the US on a more efficient energy path. Savings currently amount to ~\$1T/yr

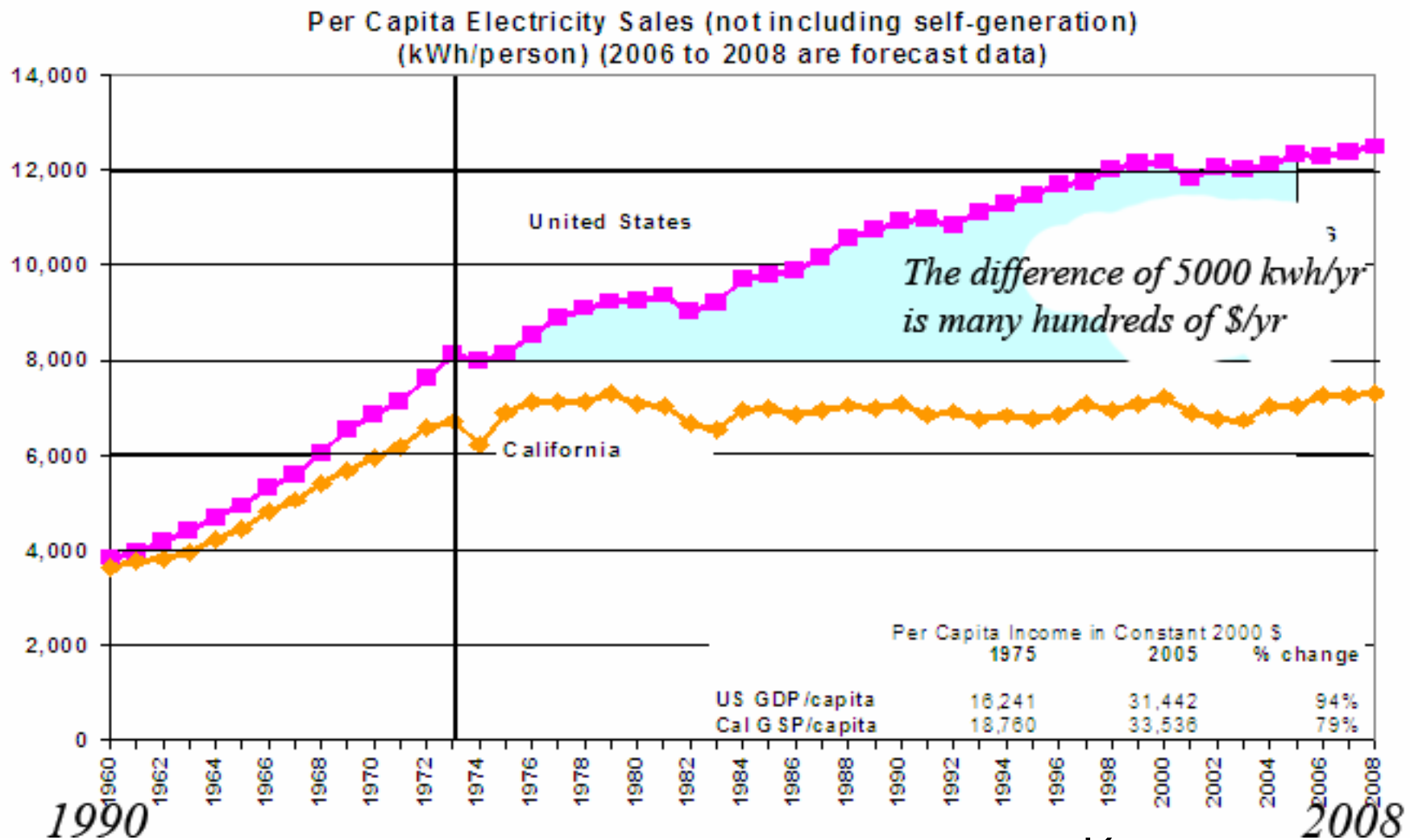


source: Art Rosenfeld

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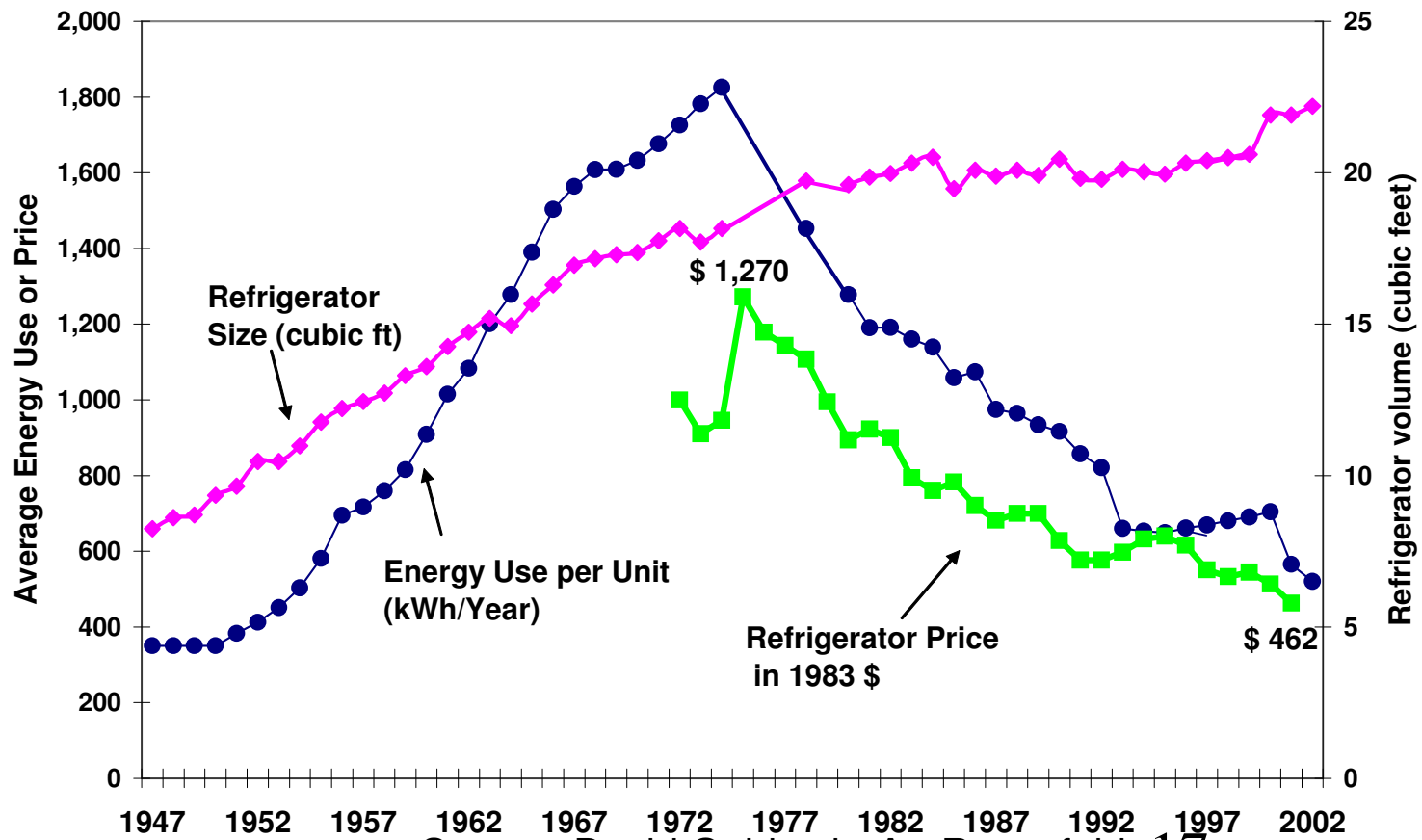


# CA versus the Nation. What happened in 1973?



# Efficiency holds huge promise

New United States Refrigerator Use v. Time  
and Retail Prices



Source: David Goldstein-Art Rosenfeld 17

## Public support for energy projects remains strong

### Broad Support for Multiple Energy Policies

	<u>Favor</u>	<u>Oppose</u>	<u>DK</u>
	%	%	%
More funding for alternative energy	78	17	5=100
Spending more on mass transit	70	25	4=100
Allowing drilling in U.S. waters	63	31	6=100
Promoting nuclear power use	52	41	7=100

Q73F2a-d. N=705. Figures may not add to 100% because of rounding.

Source: Pew Research Center 3/2/2010



## Business is getting on board

We are committed to  
a pathway that will slow,  
stop and reverse the  
growth of U.S. emissions.

In our view, the climate  
change challenge will  
create more economic  
opportunities than risks  
for the U.S. economy.

Insurance and (especially) re-insurance companies are taking climate change seriously

•“Global warming is just beginning to be recognized by many insurers as a significant risk factor for past, current and future insurance policies. Risks of loss from higher temperatures, more severe windstorms, floods, storm surges and other climate change phenomena are significant and are predicted to be more severe in the future”

•[AON risk management and reinsurance company]

•[http://www.aon.com/about-aon/intellectual-capital/attachments/risk-services/will\\_insurers\\_be\\_burned\\_by\\_the\\_climate\\_change\\_phenomenon.pdf](http://www.aon.com/about-aon/intellectual-capital/attachments/risk-services/will_insurers_be_burned_by_the_climate_change_phenomenon.pdf)

# It's time to act on Climate Change

- Decrease dependence on fossil fuels AND enhance national security
- Enhance innovation
- More American jobs, more sustainable jobs
- That's even if the scientists are wrong – and they aren't
- It's a “No regrets” strategy
- It's the right thing to do

# New Orleans -- on the Firing Line

**“We are fighting Mother Nature;... the health of our economy depends on victory.” Corps of Engineers film, quoted in McPhee**

**[S]hifts .. occur roughly once a millennium. . Eight hundred years before the birth of Christ, the channel was captured from the east. ..In the second century AD its was taken south, By the 1950s .. it was about to shift again, and the Atchafalaya was ready to receive it....” [p3]**

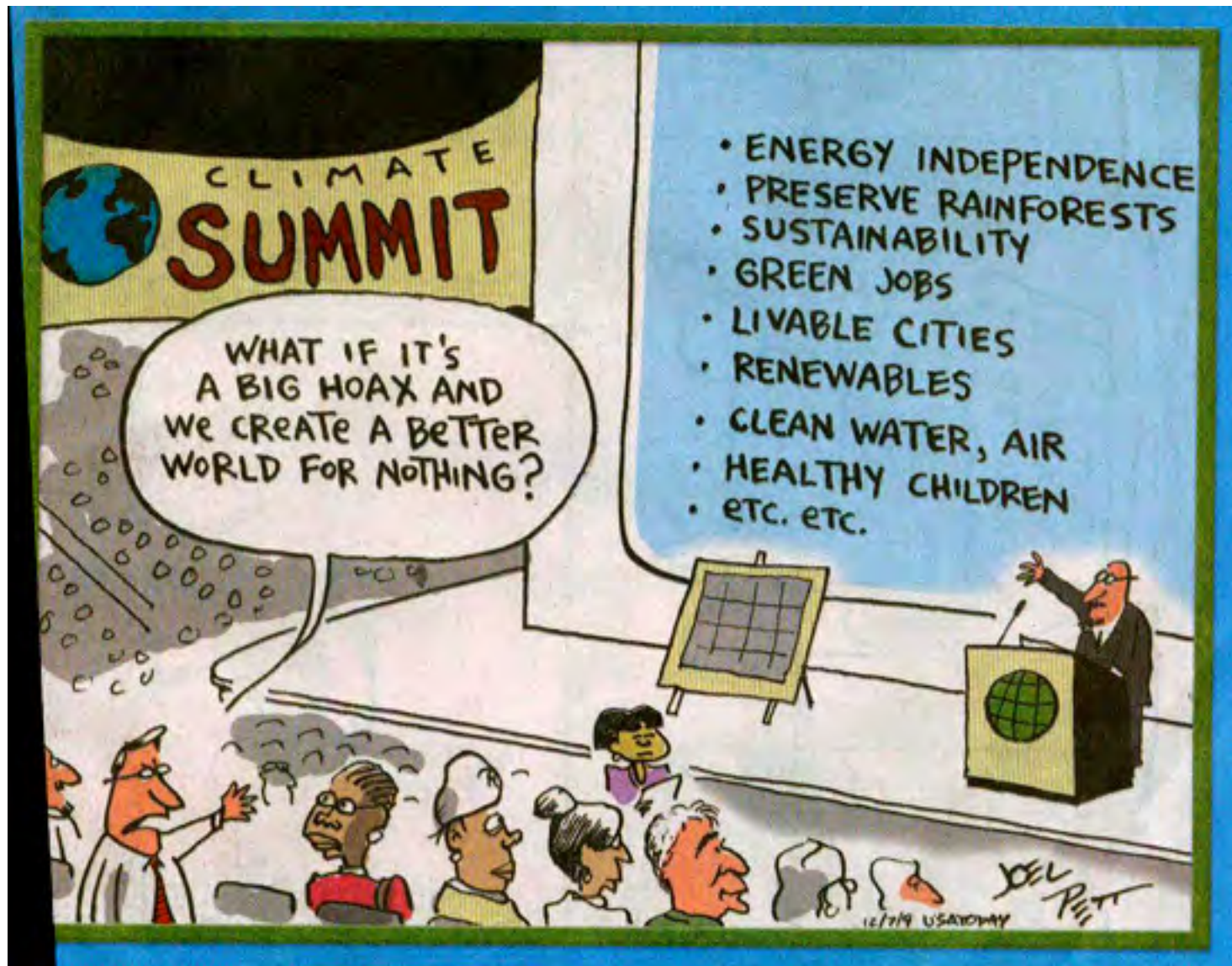
**[O]ne might as well ...bully the comets in their courses, as to bully the Mississippi into right and reasonable conduct” Mark Twain, quoted in McPhee, p39**

John McPhee, “The Control of Nature”

**Today – Add Global Climate Change!  
Add “End of Oil”**



It's “win-win”



We all want a better world

I want a good world for my  
grandkids -- and theirs!



Engineers and scientists are trusted

Use that trust wisely

Thank you!

# Backup



Public opinion: Probably not + definitely not = 18%

## Climate Change is Real ... so don't fight about it

*If you had to choose,  
do you believe **CLIMATE CHANGE** is really occurring?*

