

Why is nobody doing anything
about the worlds biggest problem?



The World's Biggest Problem is

People don't look for
Dangerous Maths

And so they choose disaster

How do you Save the World?

Understand the deceptive disaster of exponential growth

Demand Change!

A thick green line representing an exponential growth curve starts at the bottom left and curves upwards towards the top right corner of the slide. The background is a solid red color.

Dangerous Math: Exponential Growth

(The Doubling Rule)

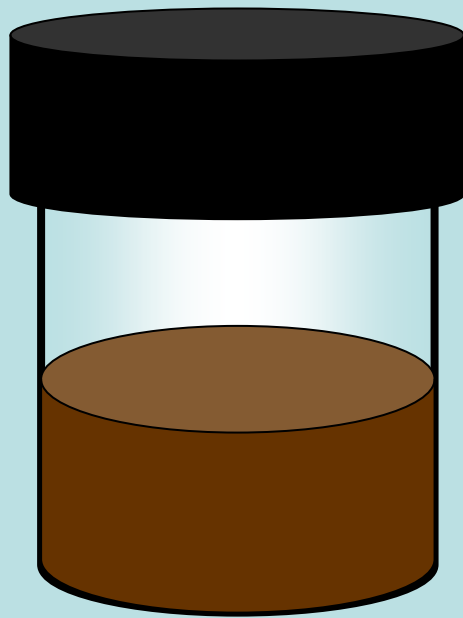
Bacteria divide once per minute — —

At 9:00 am, put 1 bacteria in a jar. The jar is full at 12:00 pm



When is the jar $\frac{1}{2}$ full?

Doubling time = 1 minute



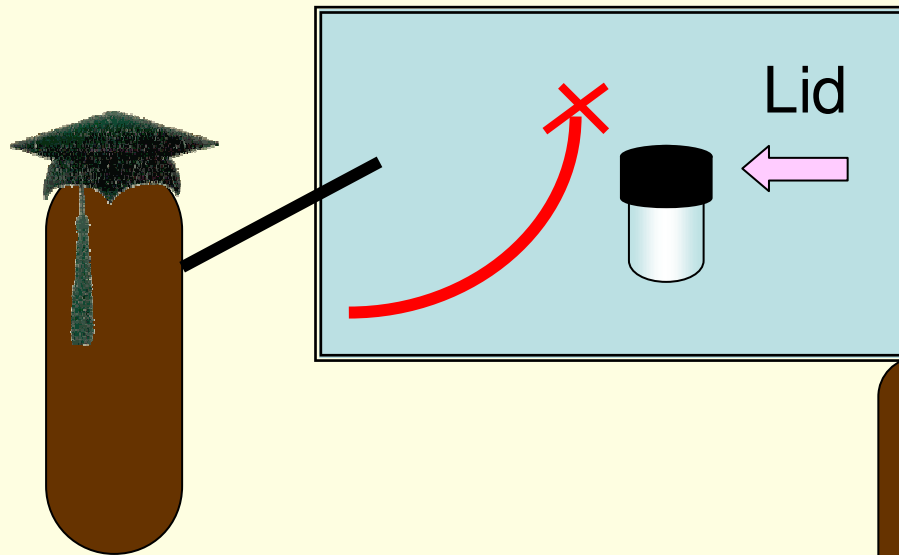
Answer:

11:59 am

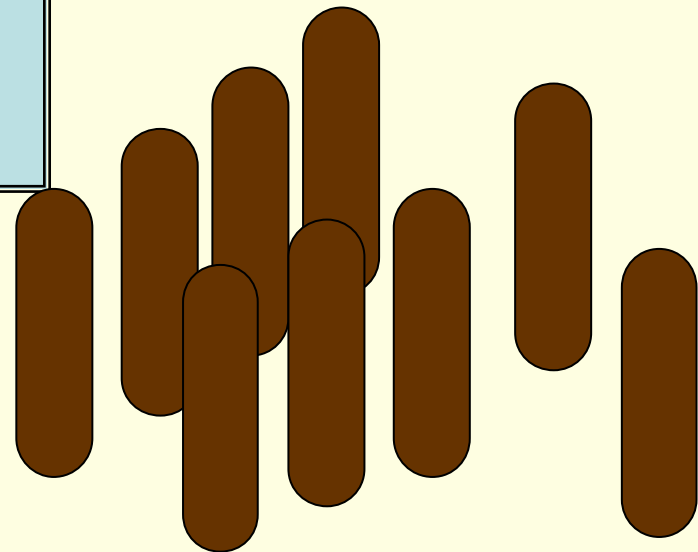
(1 minute before noon!)

Warnings of Jar Filling

Researchers warn of a lid on the jar!



11:59 am





There's a Lid on our Jar?

The government must do something!

**I don't believe in
the Lid Theory**

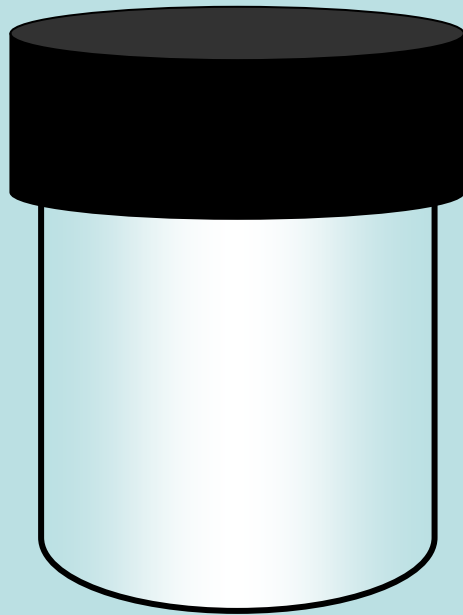
**We can't just
stop dividing! We
need to divide!**

**Where's the evidence
that Bacteria are
causing the jar filling?**

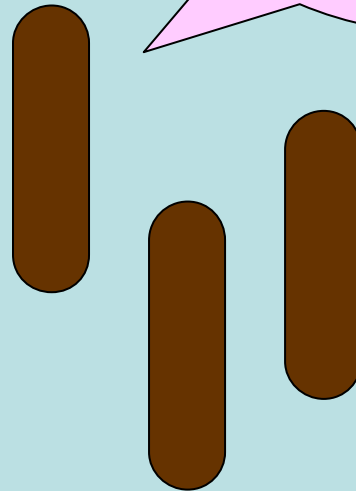
We need another Jar

11:59

New Jar Found!

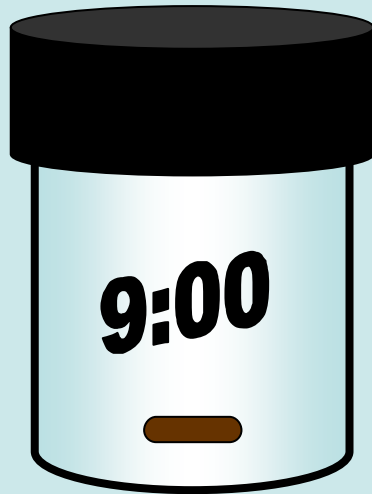


Woo Hoo!
We're Saved!



When is this jar full?

Growth Rate = doubling every minute



The second jar is
full at one minute
after noon!



Exponential GROWTH

Population growth of a pest species

Ever notice how the population of rabbits seems to “explode”?



1.5 year doubling time



The day you were born...

Your parents won a Million \$



\$1,000,000



17th Birthday



\$500,000
In the Box

\$25,000 /yr
Spending

Example: What if your parents put \$1M in a box and spent \$25,000 per year. They said that what ever was left on your 17th birthday would be yours!

What would you get?

But with exponential growth...



**\$1,000,000
In the Bank**



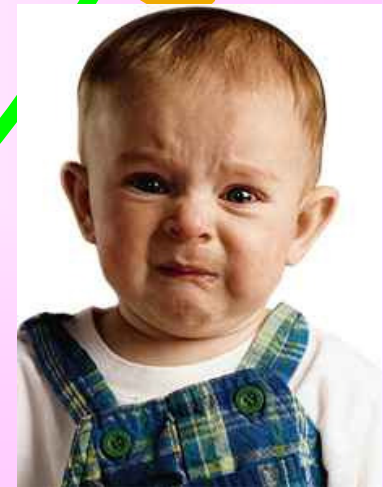
17th Birthday



**\$ - 445,000
Loan**

**\$25,000 /yr
Spending**

What if they spent 10% more
each year? *yr1=\$25,000,*
yr2=\$27,500, yr3=\$30,250
yr4=\$33,275...



It's Not Fair!

Steady Growth Rate =
Exponential Explosion

Any steady growth looks
OK at the start

But becomes a disaster very fast



It's Really Not Fair!

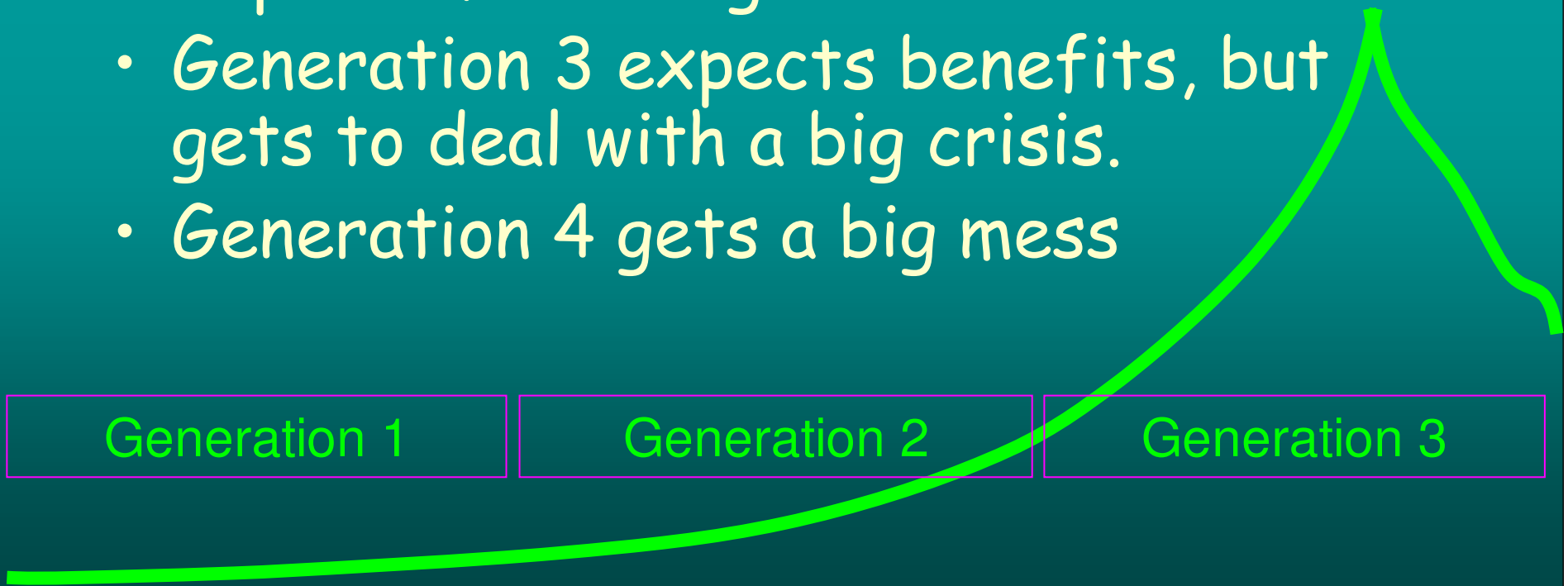
Exponential Growth is really a Boom and Bust

- Generation 1 gets benefits of growth
- Generation 2 gets benefits and expects further growth
- Generation 3 expects benefits, but gets to deal with a big crisis.
- Generation 4 gets a big mess

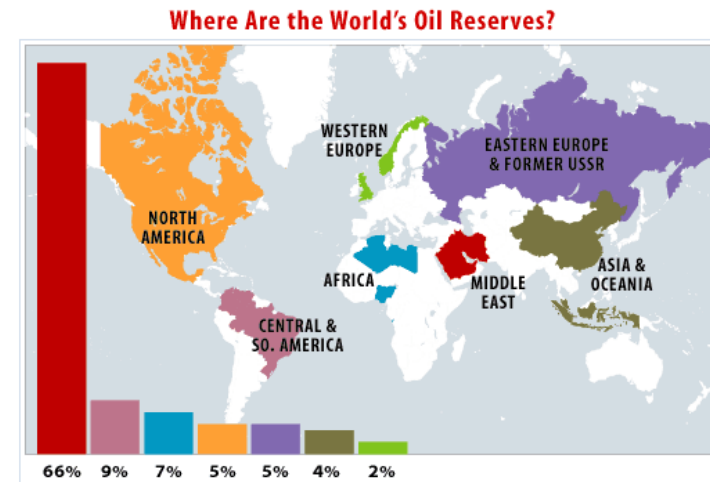
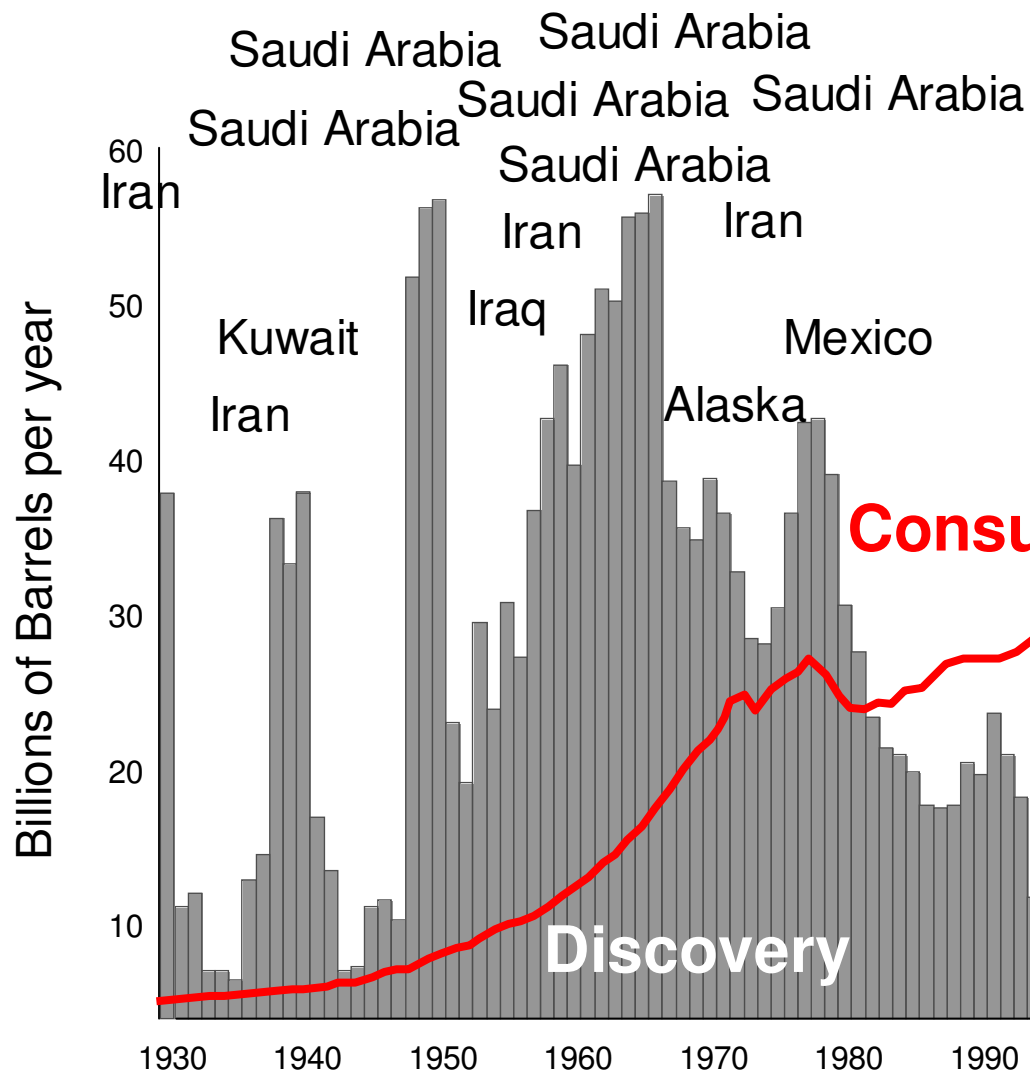
Generation 1

Generation 2

Generation 3



Oil Resources



Consumption

What if people in 1950 had decided to not grow oil consumption, when would peak oil be? (Answer: 2160)

Peak Oil

2000

Cost of Oil = \$10

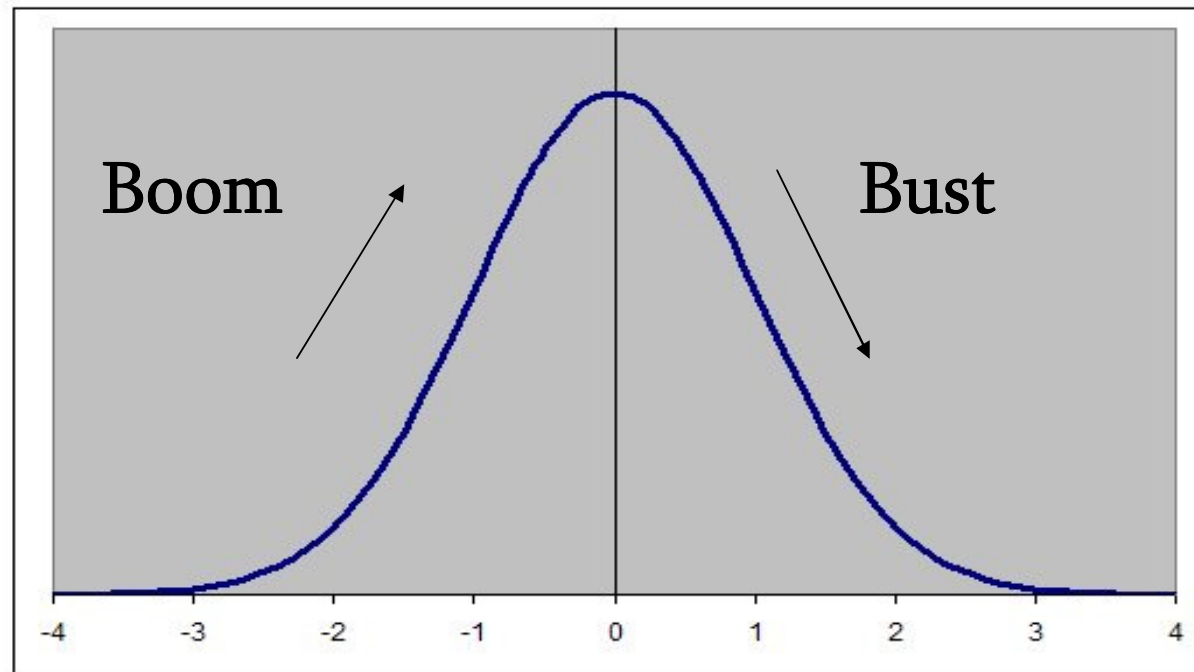
2008

Cost of Oil = \$110

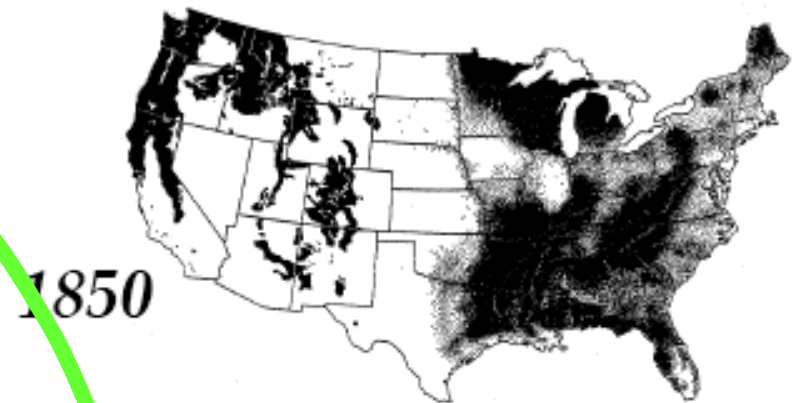
Peak

2016

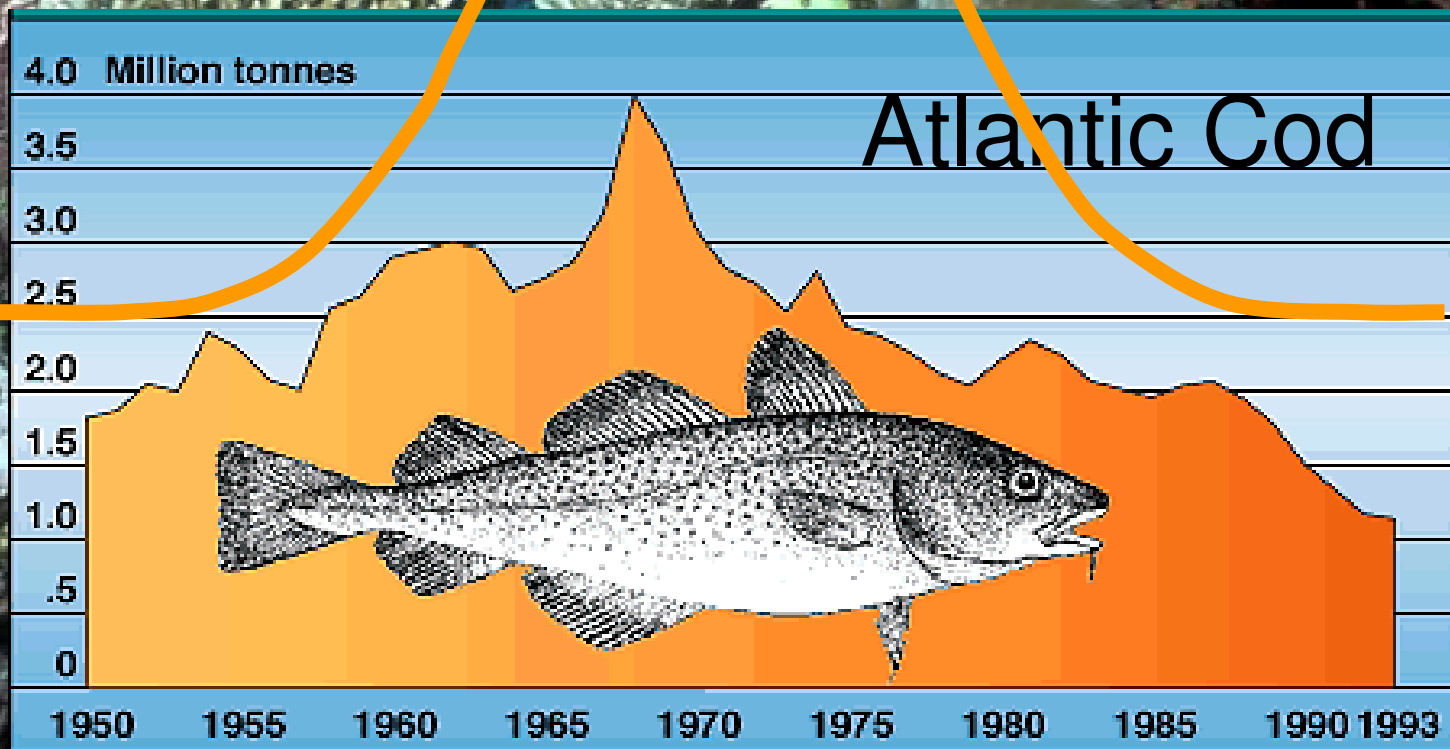
Cost of Oil = \$420?



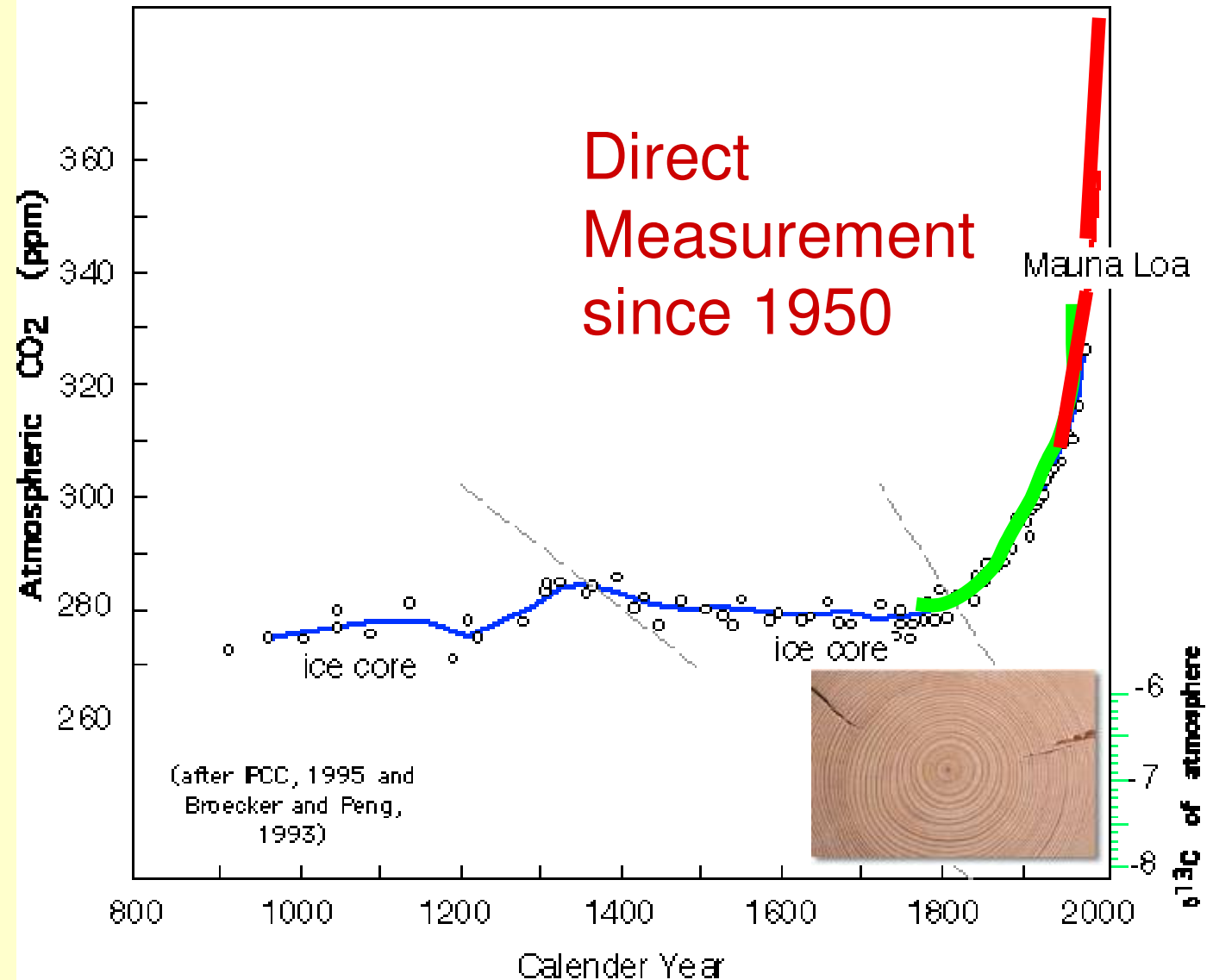
Forests



Fish



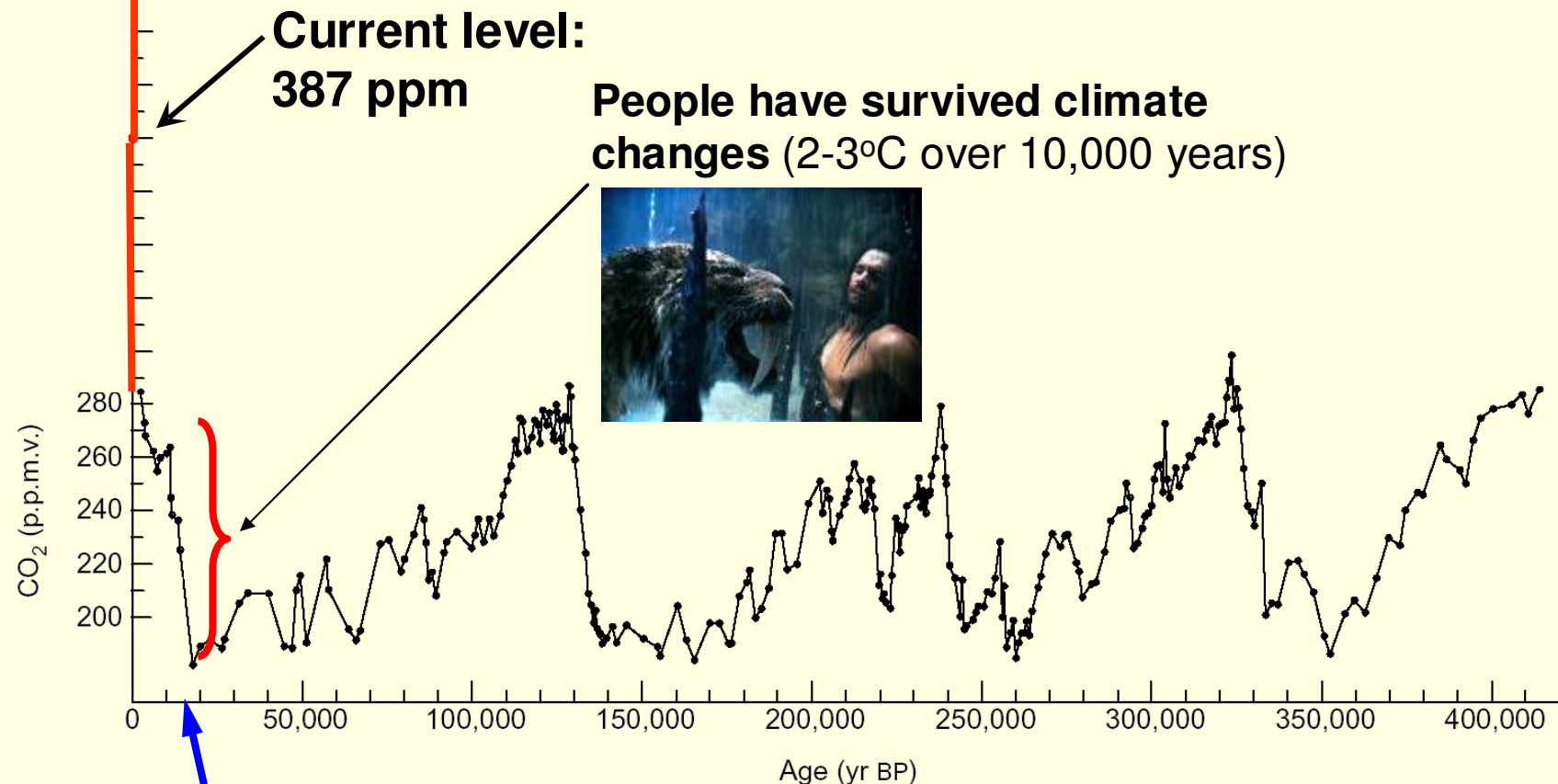
Researchers Warn of CO₂ Growth



D.M. Etheridge, L.P. Steele, R.L. Langenfelds, R.J. Francey, J.-M. Barnola and V.I. Morgan. 1998.

550 ppm - International Energy Agency Optimistic Target 2030

Researchers Warn: CO₂ Level Linked to Climate!



CO₂ History of the World

J. R. Petit *et al.*, *Nature*, Vol 399, June (1999)

550 ppm CO₂

2-3°C Temperature rise over 100 years

1/2 of the world's life forms committed to extinction

Already Gone

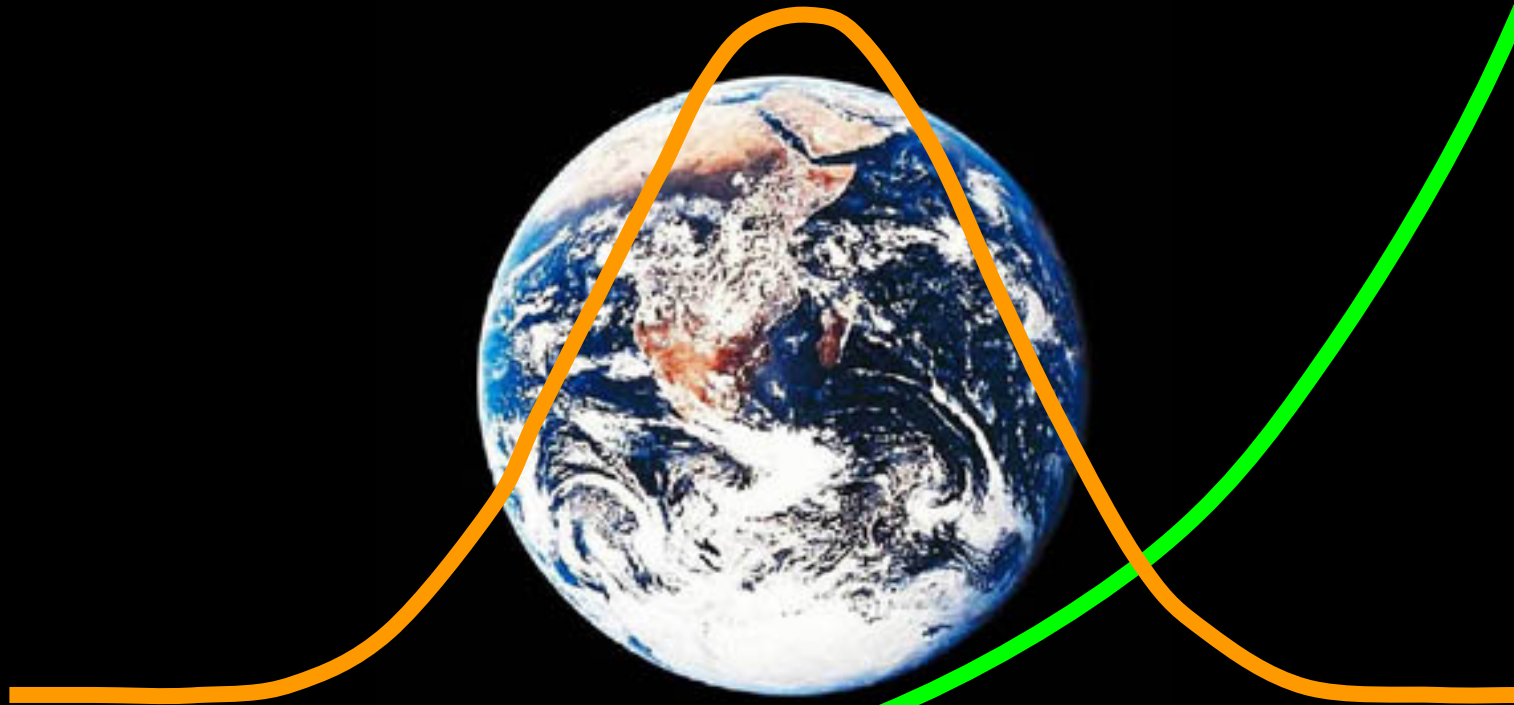


Thomas *et al.* *Nature* 2004

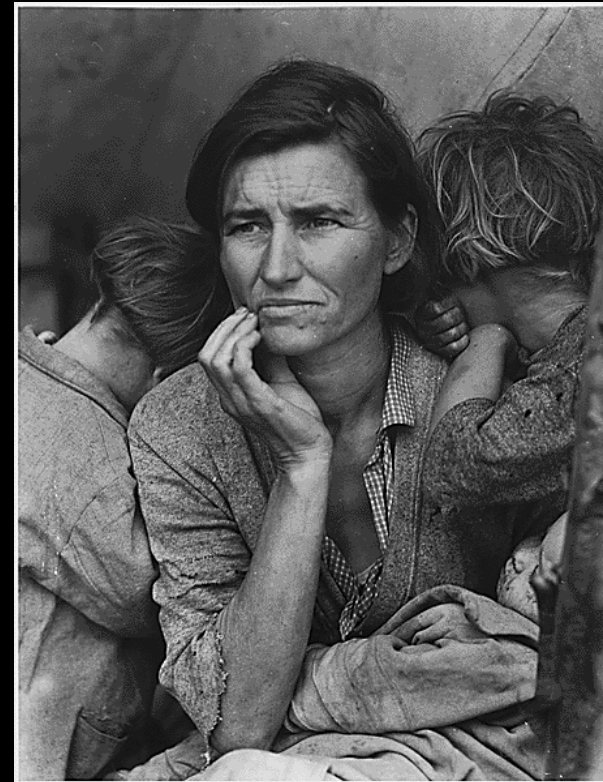
Higher CO₂ means greater catastrophe



It's too late to avoid changing our world,
but we will have to take immediate
dramatic action to avoid disaster.



The Big Problem 1930



Every generation has its really big problems to deal with.

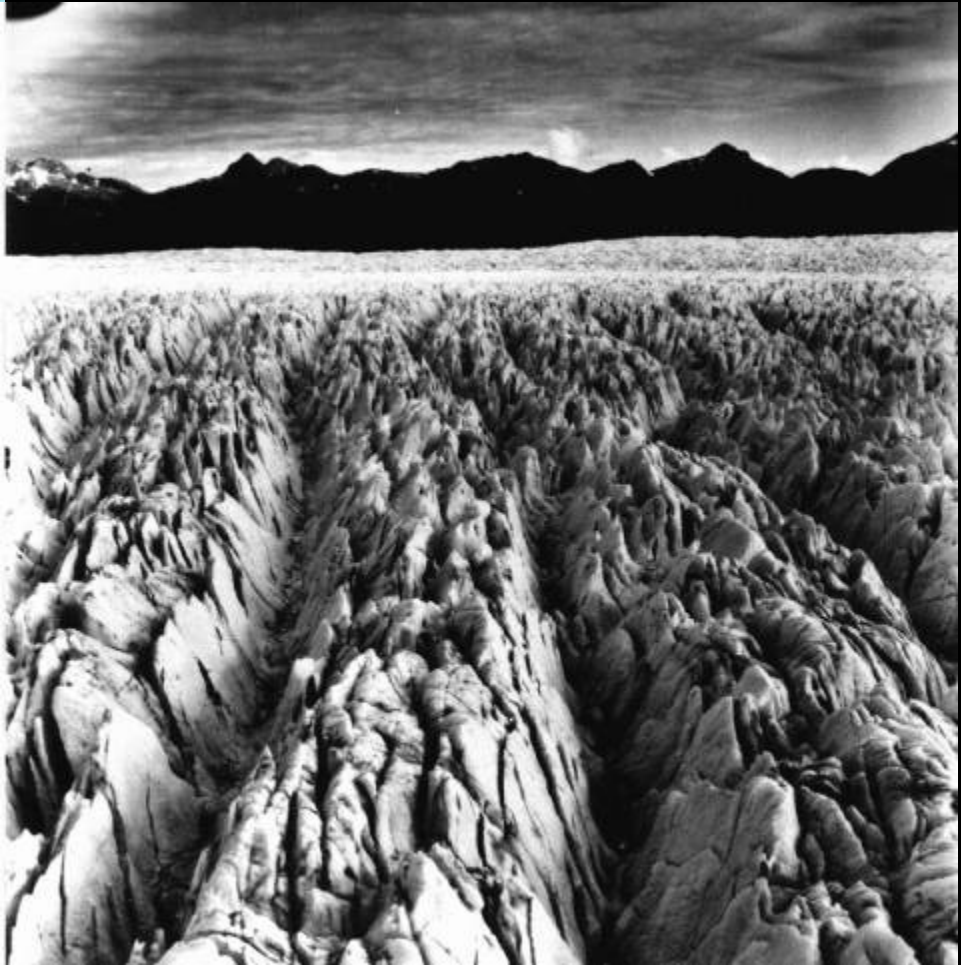
The Big Problem 1960



The Big Problem 1980



Mutually Assured
Nuclear Destruction





Every generation
**Some People
do Something**





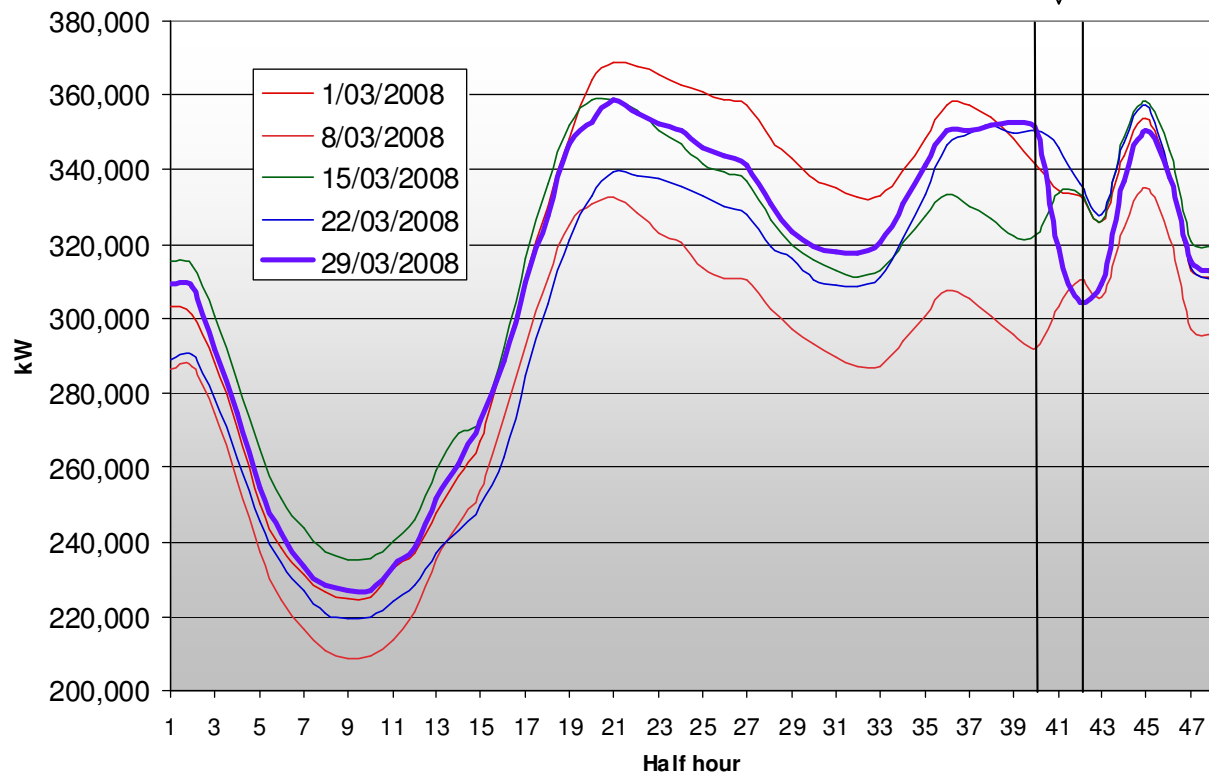
The voluntary power reduction during Earth Hour in Christchurch was equivalent to 50 Wind Turbines!

Some People Do Something

12.8%



Electricity Use in Christchurch



Question for Youth to ask Generation 1 & 2:



Do we really need more
energy, roads, stuff?

What would happen if
exponential growth stopped?

Would you be willing to
reduce your consumption by
10% to stop future disaster
for me and others who are
children now?

Question for Youth to ask Generation 1 & 2:



Didn't you teach me that we need to share and think about other people?

Don't you always say that I should pick up after myself and not leave a mess for others to deal with?

Get Together and Demand End of Exponential Growth



Leave Something for Us !

Somebody Do Something

Petition Govt to reduce oil imports 10% next year

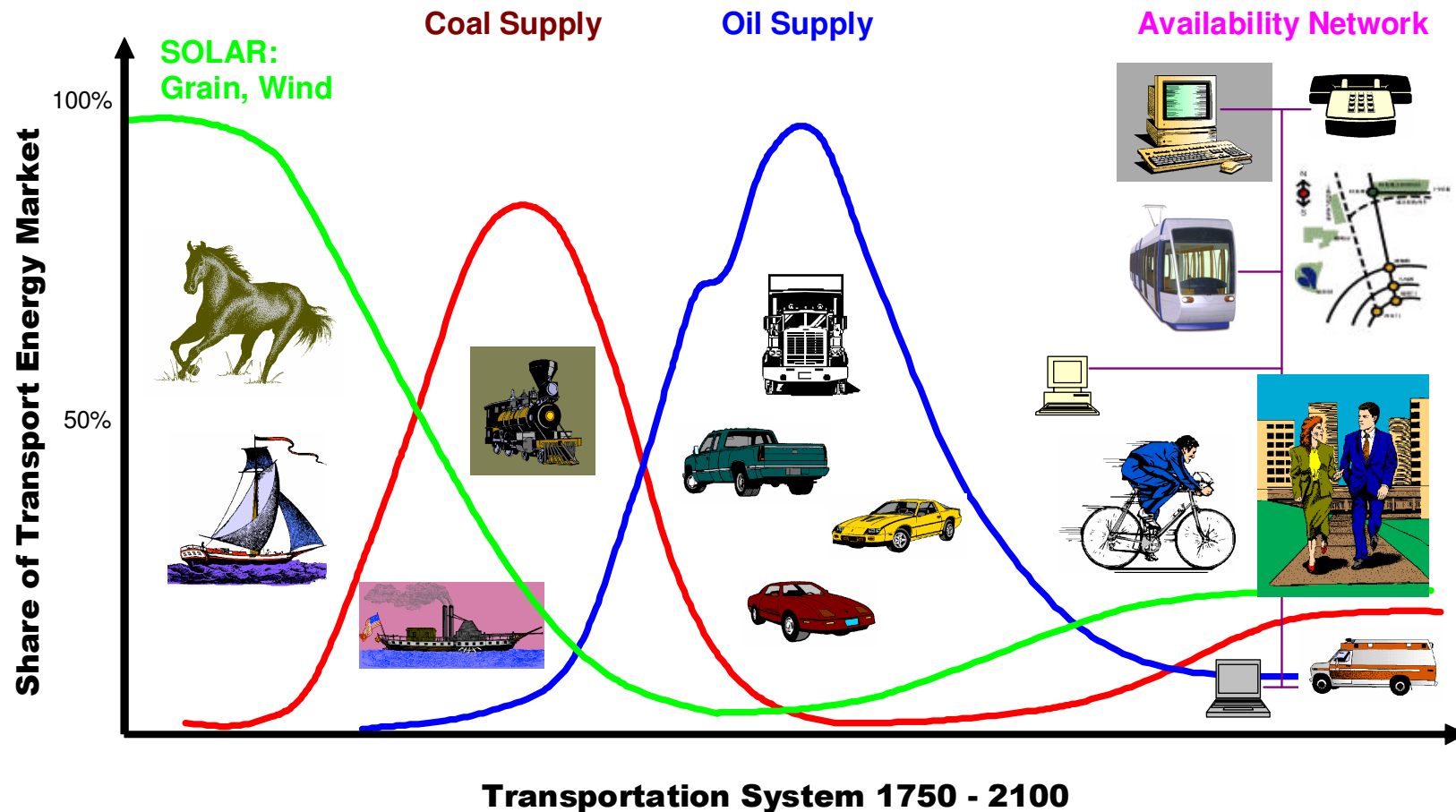
Organise 10% car reduction day at your High School to demonstrate it can be done no worries!

Petition Govt to shut down Huntly Coal Power Station (13% NZ electricity)

Organise a “no coal week” where NZ saves 13%

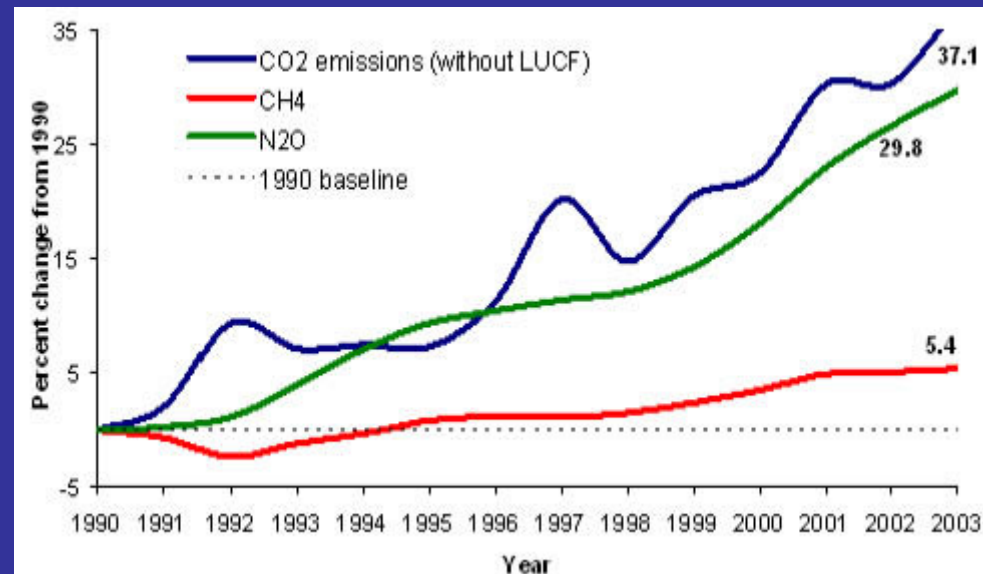
Organise a “Hands around Huntly” demonstration

Vision where you WANT to go



Work Together

- Demand a stop to exponential growth in resource use and pollution



**New Zealand
Green House Gas Emissions**

Work Together

- Ask your grandparents and parents to help restore your environment



**Create
Marine Reserves**



Regenerate Bush



Understand Sustained Value and Human Networks

The future may not be "Made in China"
and let's make sure it does not float
up on the beach.

Dr. Susan Krumdieck
Associate Professor in Mechanical Engineering

