

# NATURAL CAPITALISM SOLUTIONS



FOR A FINER FUTURE

A Presentation by L. Hunter Lovins  
© NCS 2015



Dr. Sylvia Earle:

“What we do in the next ten years is more important than what humanity does in the next 10,000 years”



Humanity stands  
on the edge of a  
crumbling cliff.

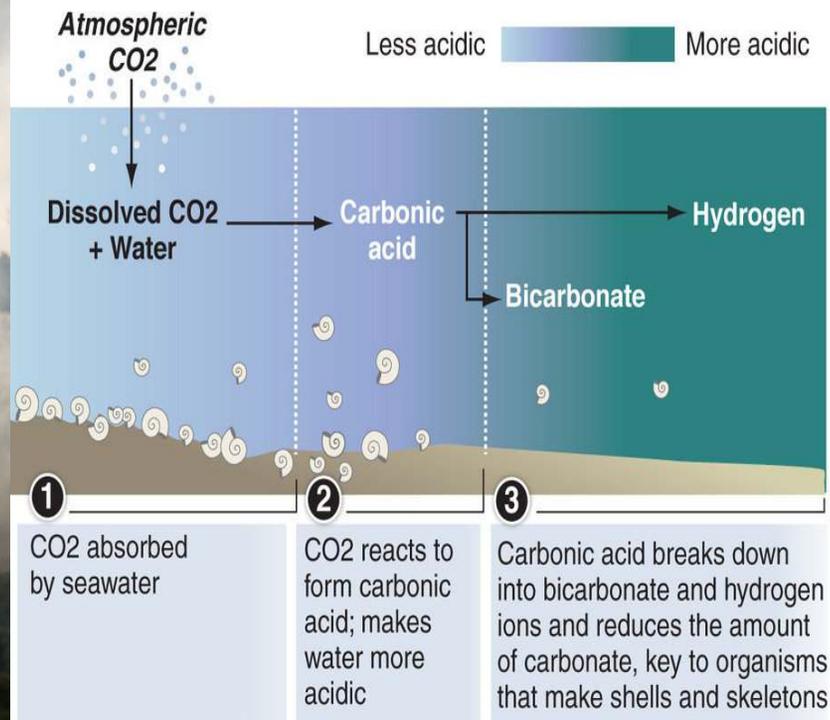
Most of the  
world's people  
live on  
precarious  
edges of one  
sort or another,  
watching it all  
unravel



# Global Biodiversity Outlook Three -

## Oceans turning acidic

Higher carbon dioxide (CO<sub>2</sub>) emissions from human activity are acidifying the oceans and could harm everything from plankton to whales.

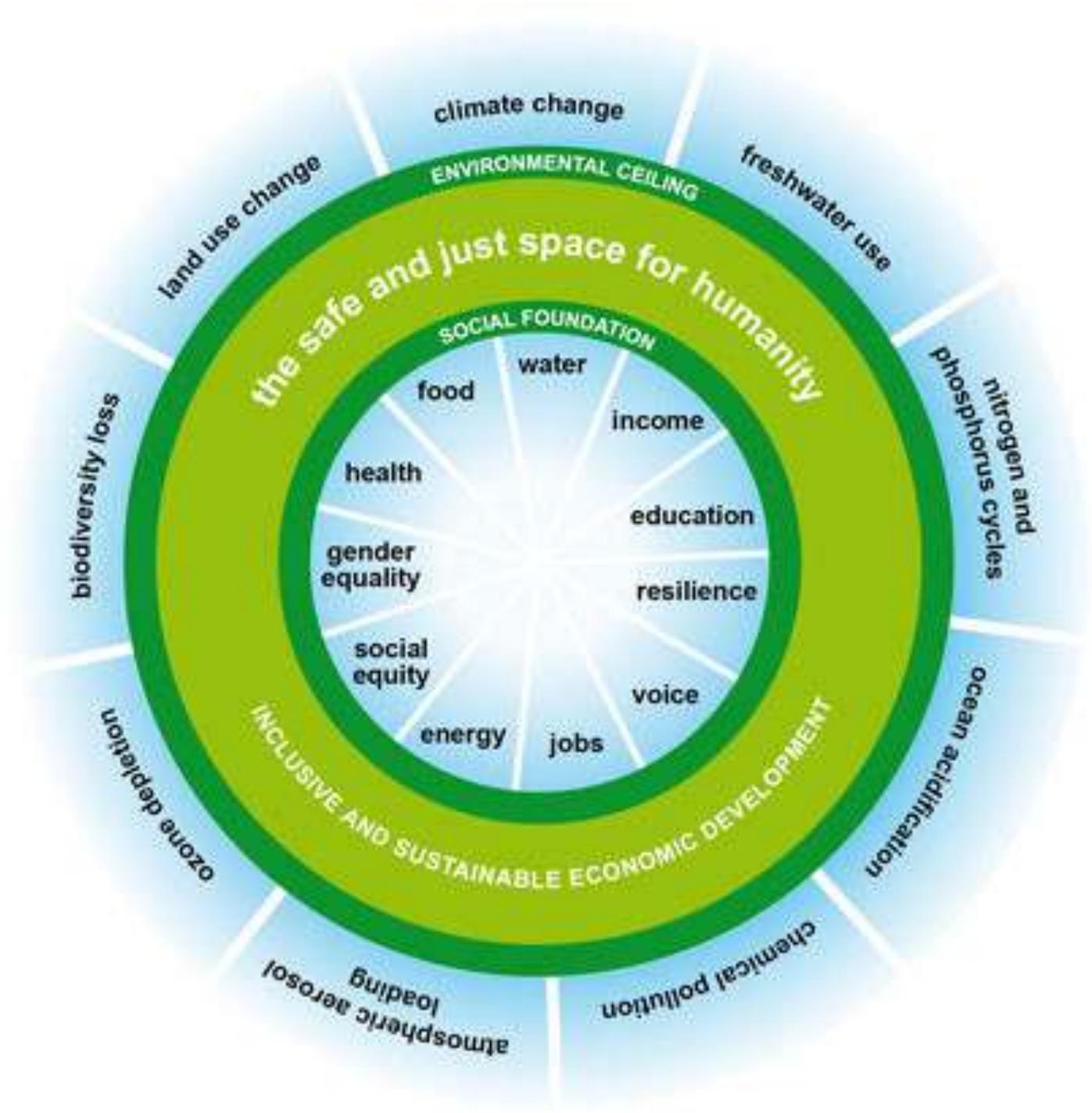


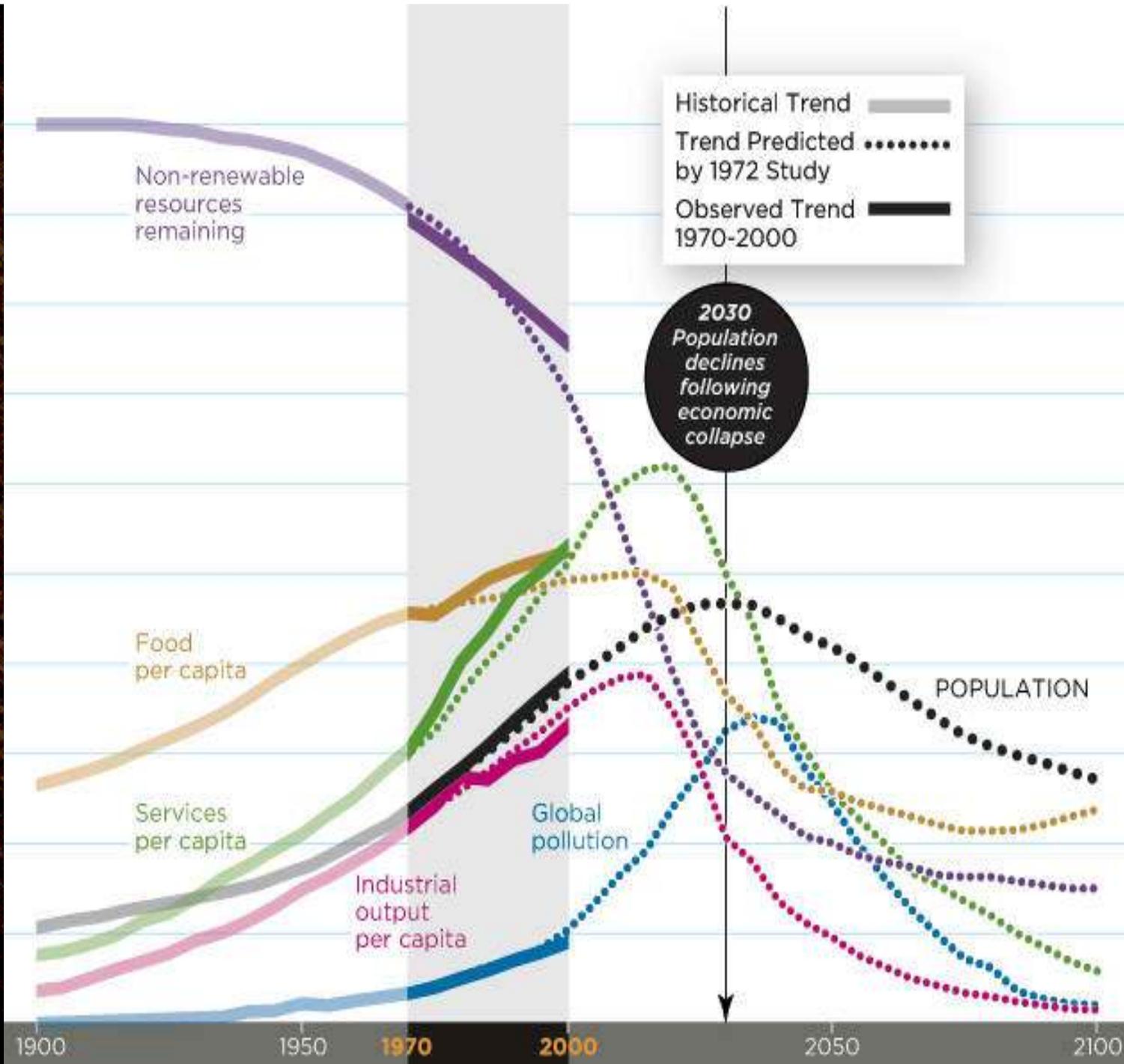
### How acidity affects marine life

- Depletes oceans of compound that clams, coral, plankton, other creatures need to build shells, skeletons
- Fish, other organisms can develop metabolic, immune, reproductive problems
- Kills off food for animals at higher end of food chain

Source: University of Maryland, Center for Biological Diversity

© 2010 MCT





Non-renewable resources remaining

Food per capita

Services per capita

Industrial output per capita

Global pollution

Historical Trend  
Trend Predicted by 1972 Study  
Observed Trend 1970-2000

2030  
Population declines following economic collapse

POPULATION

1900 1950 1970 2000 2050 2100

Research Paper Series

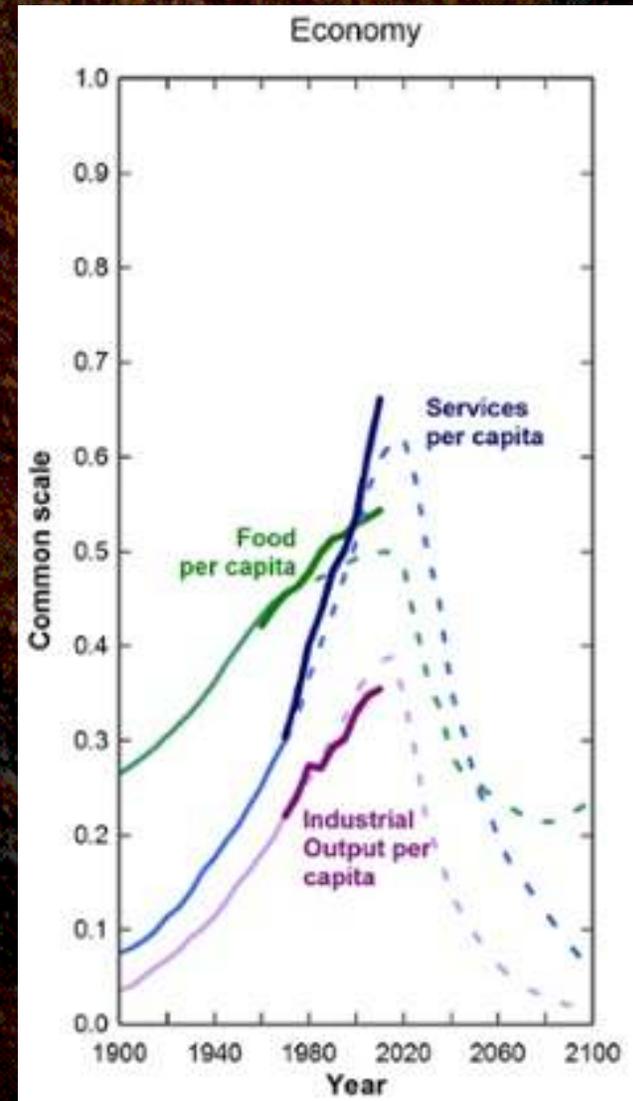
# IS GLOBAL COLLAPSE IMMINENT?

GRAHAM TURNER



MELBOURNE SUSTAINABLE  
SOCIETY INSTITUTE

## Replicated & verified Limits graphs





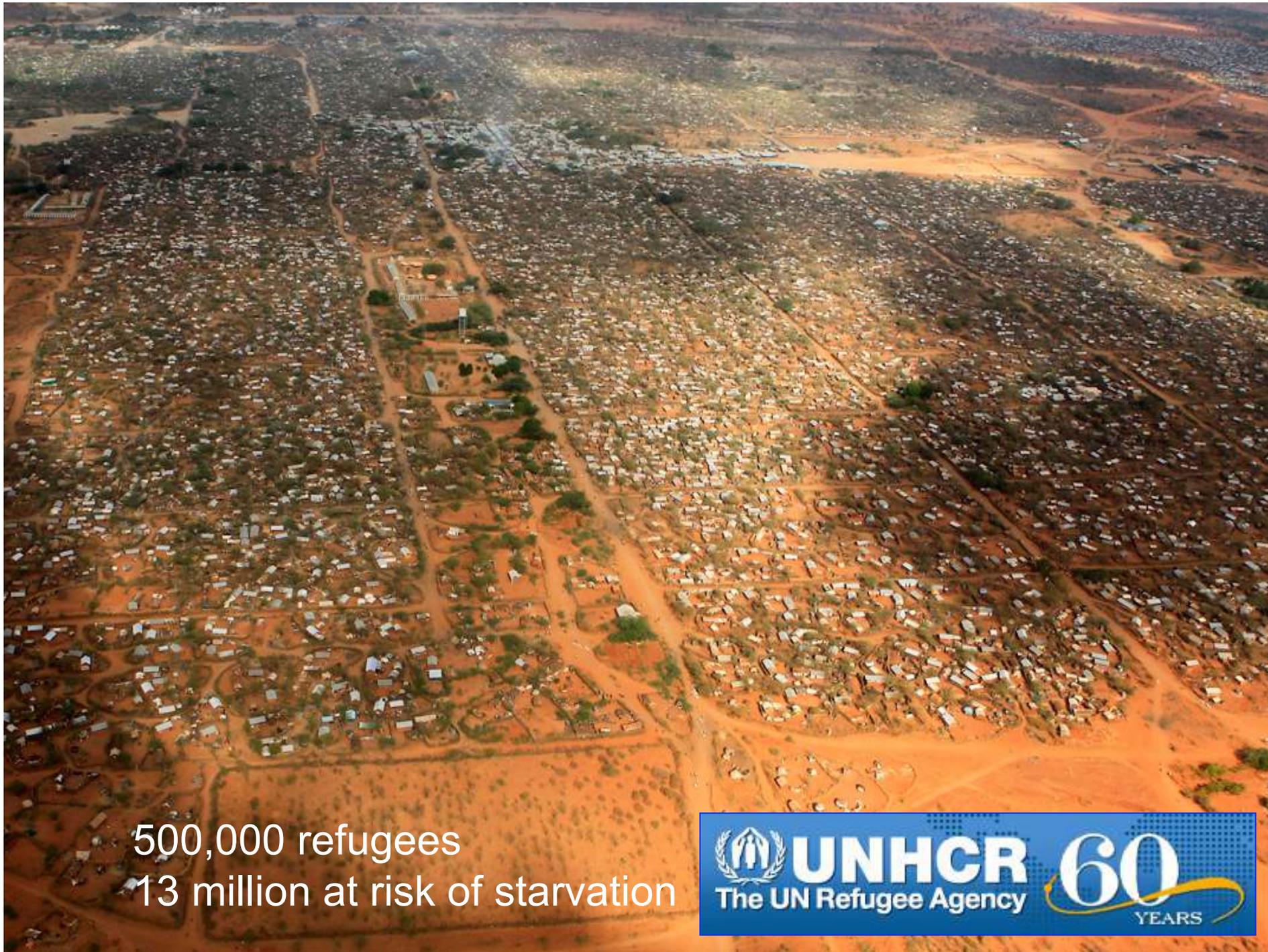
“Climate change has become the human rights challenge of our time, responsible for many of the challenges that the impoverished face, including loss of life, lack of fresh water, the spread of disease and rising food prices.”

# Climate change hurts the poorest first



# CLIMATE CHAOS





500,000 refugees  
13 million at risk of starvation

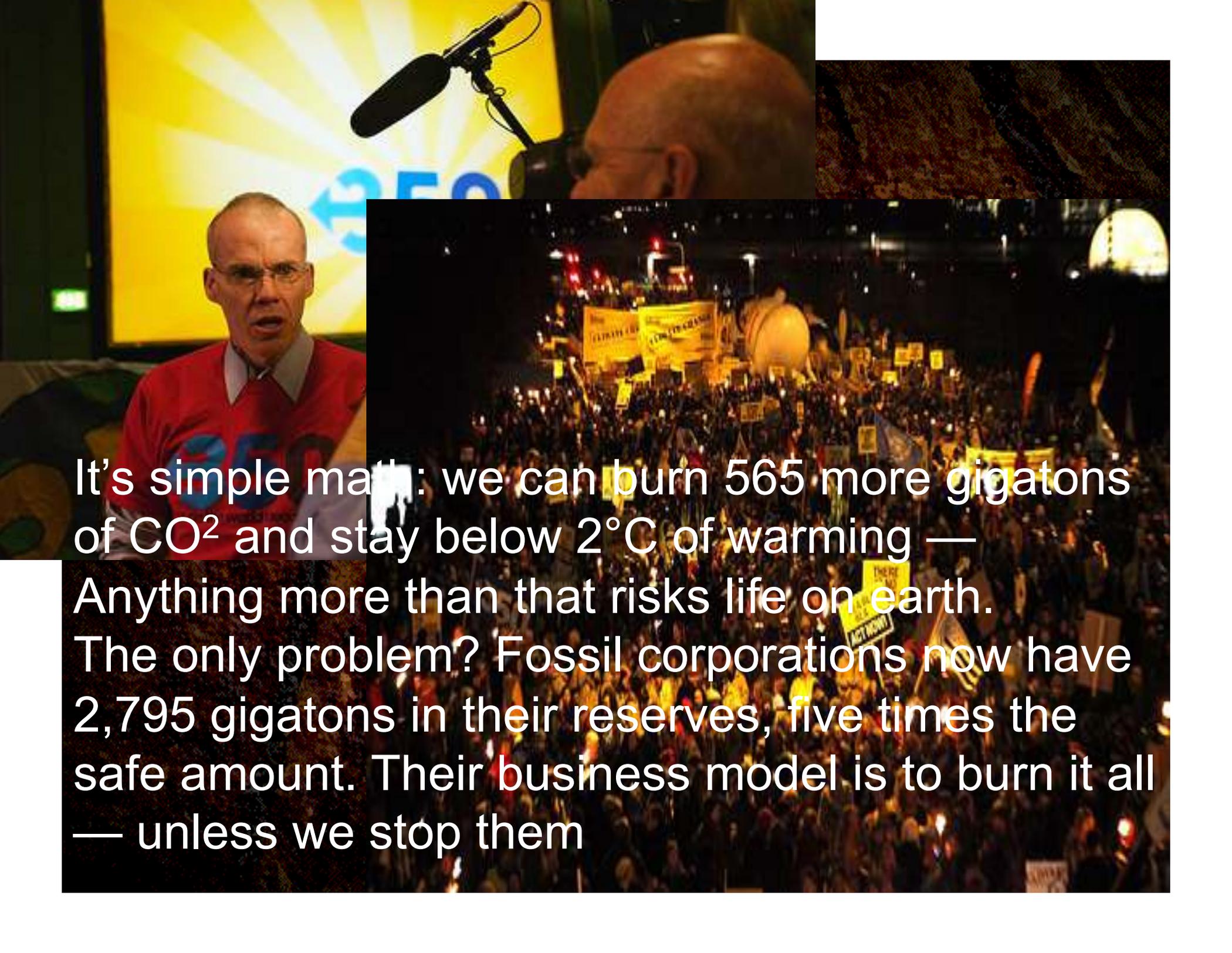


Where did the lights stay on?





2011, a new record: 14 weather related disasters with damages over \$1 billion.  
2013 6<sup>th</sup> year in a row with weather related damages over \$10 billion  
2013 – 2014 20 billion dollar storms

The image is a composite of three photographs. On the left, a man with glasses and a red sweater with '565' on it is speaking into a microphone. The background behind him is a yellow screen with '565' and a blue arrow. On the right, there is a large, dense crowd of people at night, many holding yellow signs. In the top right corner, there is a close-up of a microphone on a stand.

It's simple math: we can burn 565 more gigatons of CO<sup>2</sup> and stay below 2°C of warming — Anything more than that risks life on earth. The only problem? Fossil corporations now have 2,795 gigatons in their reserves, five times the safe amount. Their business model is to burn it all — unless we stop them

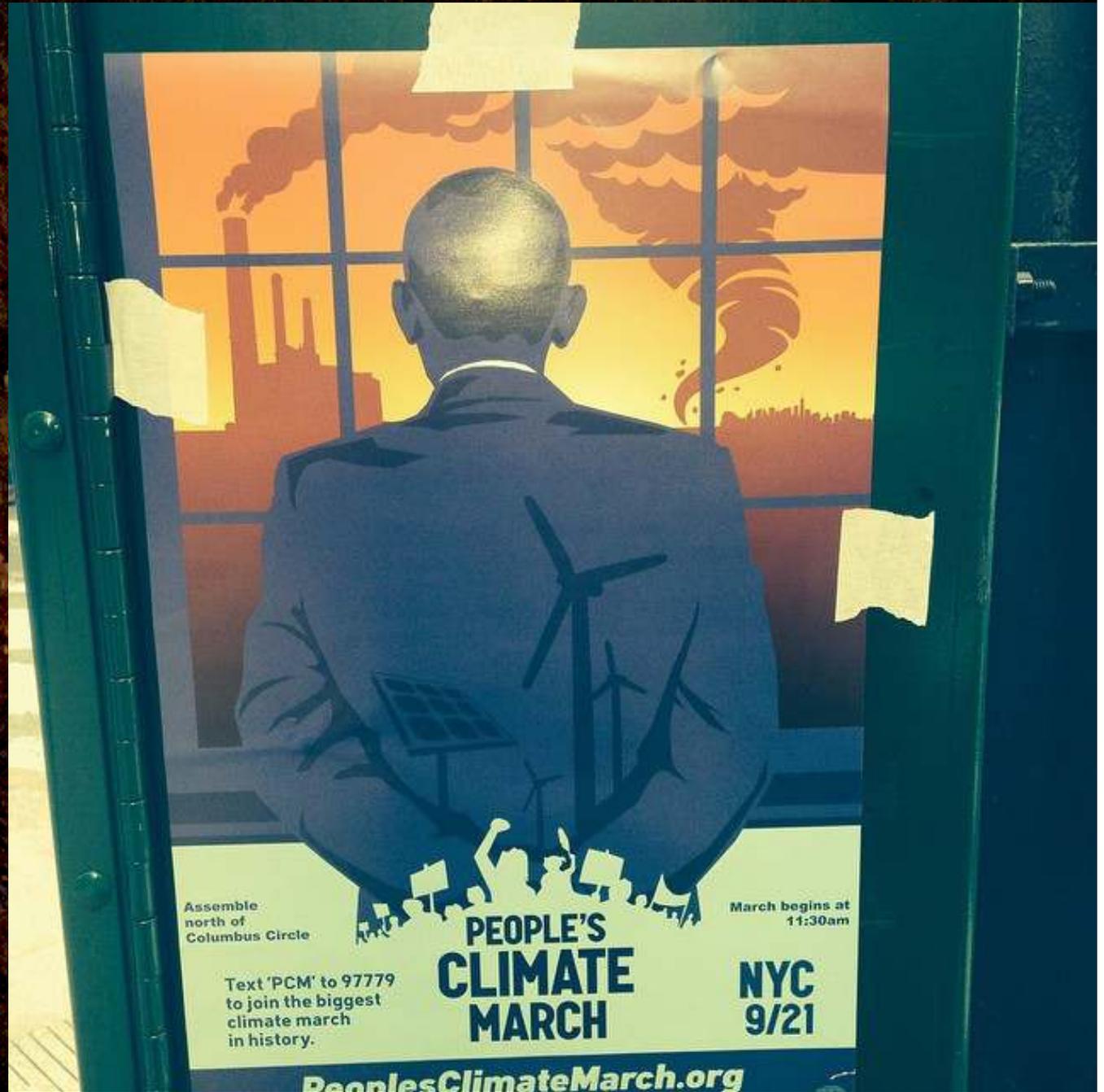
There's nothing politicians fear more  
than people in the streets



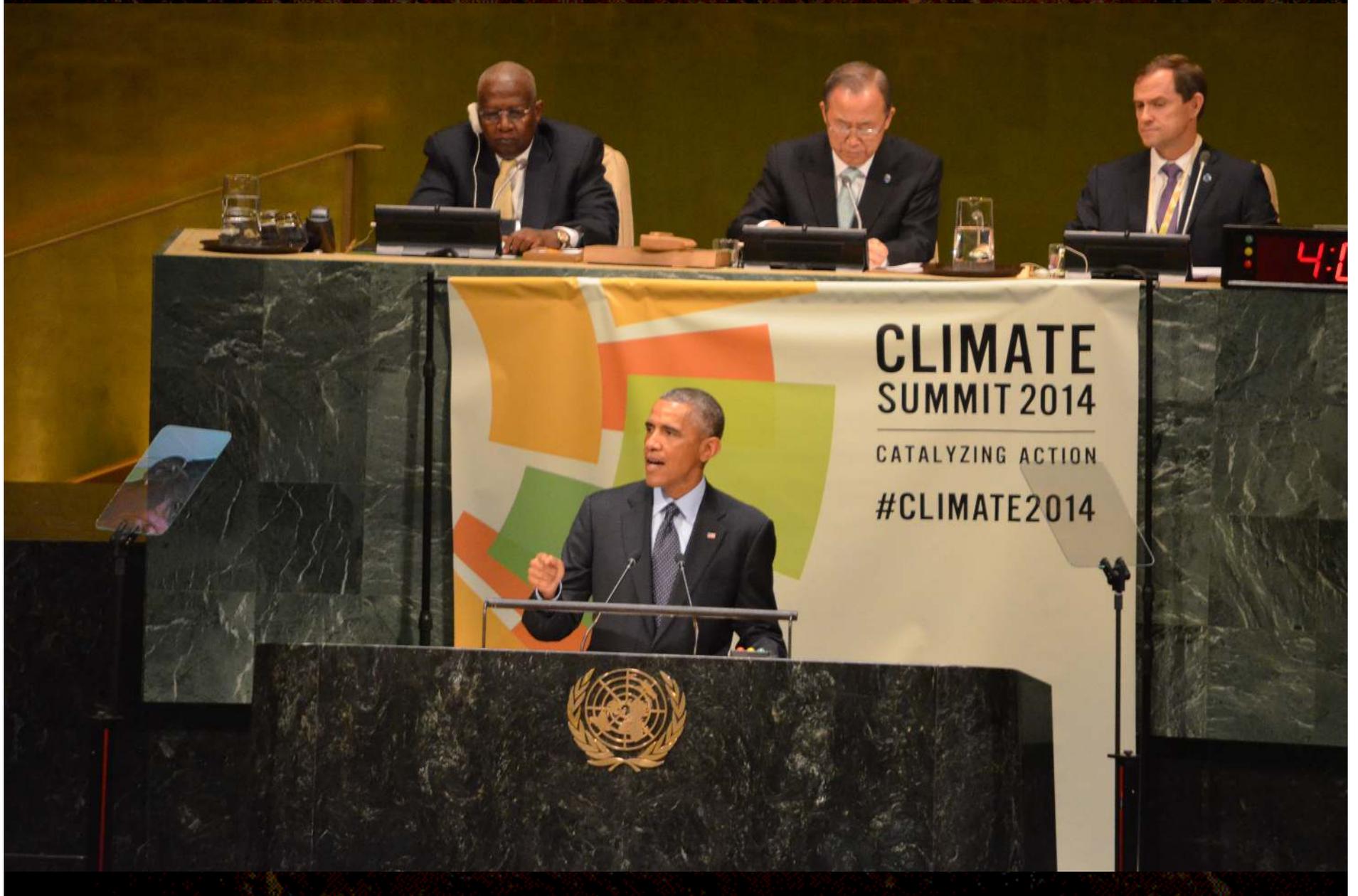
400,000 people in the streets



What moves  
a politician?



400,000 people in the streets:



At the UN Obama said:

Our climate is changing faster than our  
efforts to address it

No nation gets a free pass on climate  
change

We are the first generation to feel the effects  
of climate change and the last who can  
do anything about it

# The Deal

Nov 12 US and China signed historic deal:

US cut coal emissions 26 – 28% below 2005 levels by 2025

China peak emissions by 2030 – increase share of renewable to 20%



Reality requires the US to do much more



China will open the world's largest carbon trading market in 2016

Already predicted to peak by 2030

Coal use decreased in 2013 – imports this August down 11% from this time last year

But to meet its commitments China will have to install 800 – 1,000GW renewables – as much as the US has in utility capacity now.

16 of world's most polluted cities are in China.

2004: cleaning up air pollution 3% of GDP.

Economic impact of air pollution **\$112 billion**

USD in 2005, \$22 billion in 1975: MIT

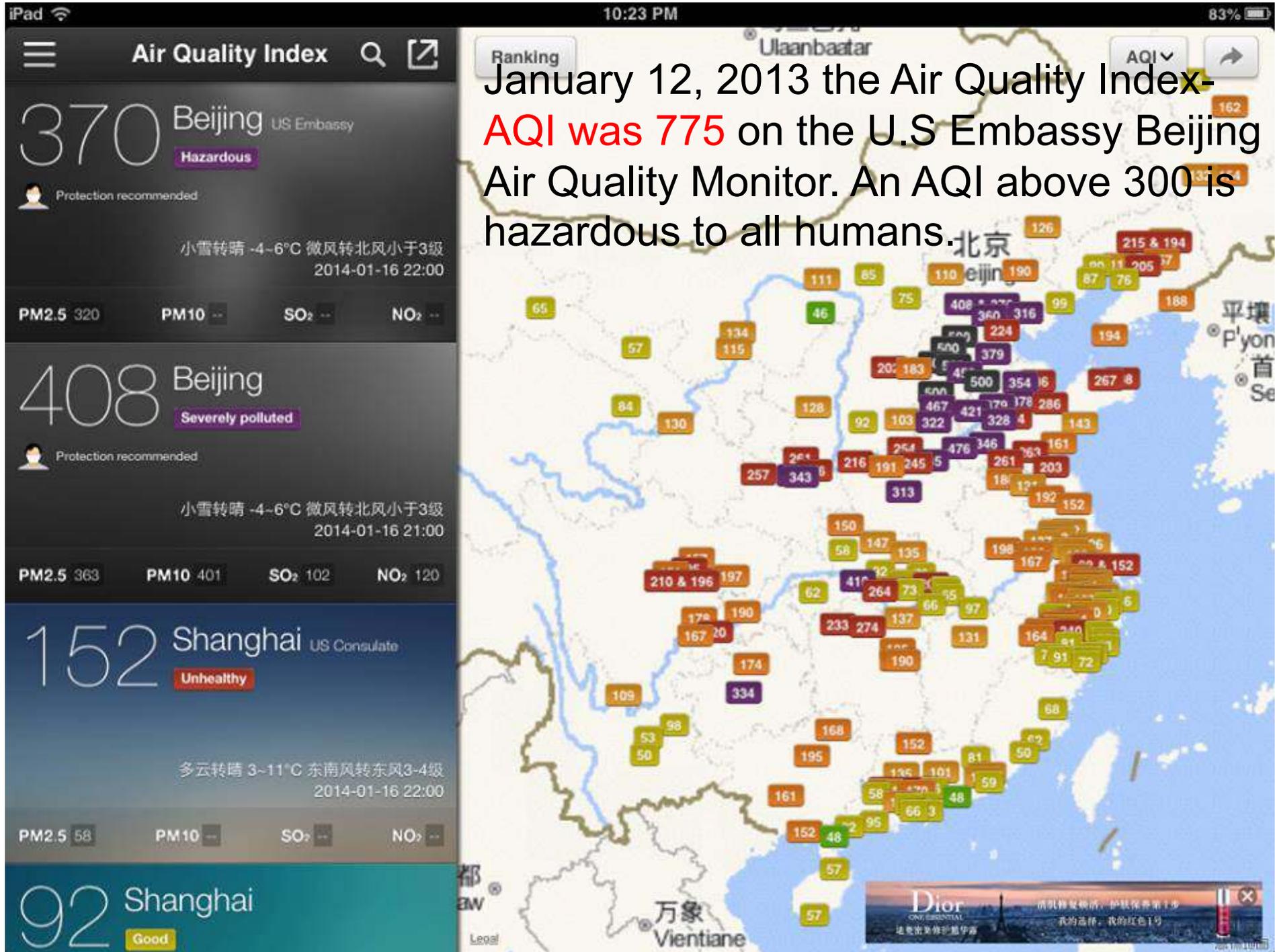
Now UNDP estimates that damage to the ecosystem costs China 9% of its GDP.

2008, environmental degradation accounted for

**10.51% GDP** of China: World Bank. Other

estimates put the cost of its environmental

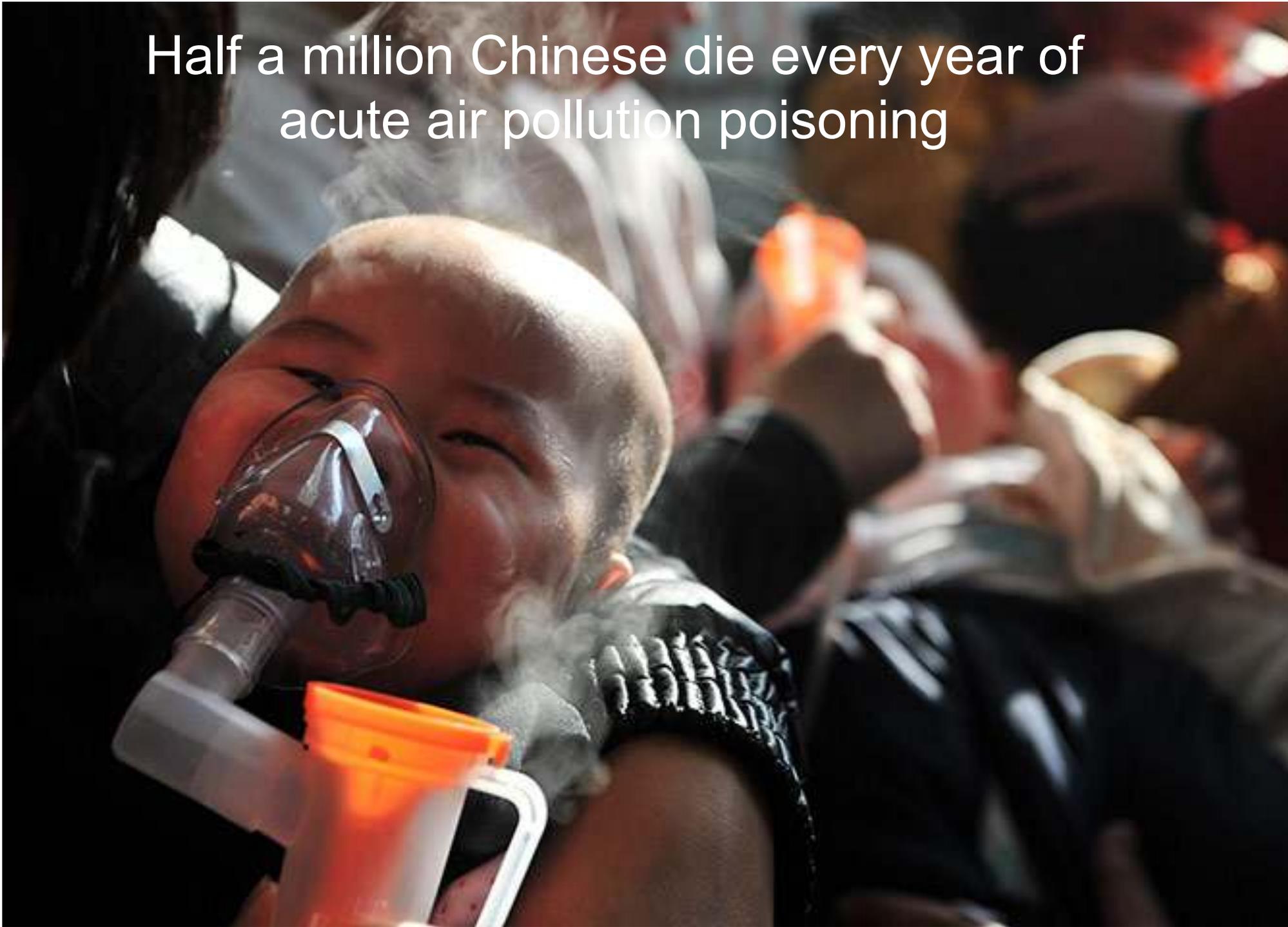
damage at almost **13% of GDP**



January 12, 2013 the Air Quality Index-  
**AQI was 775** on the U.S Embassy Beijing  
 Air Quality Monitor. An AQI above 300 is  
 hazardous to all humans.



Half a million Chinese die every year of acute air pollution poisoning





# The science is uncertain

*Positive proof of global warming.*



**18th  
Century**

**1900**

**1950**

**1970**

**1980**

**1990**

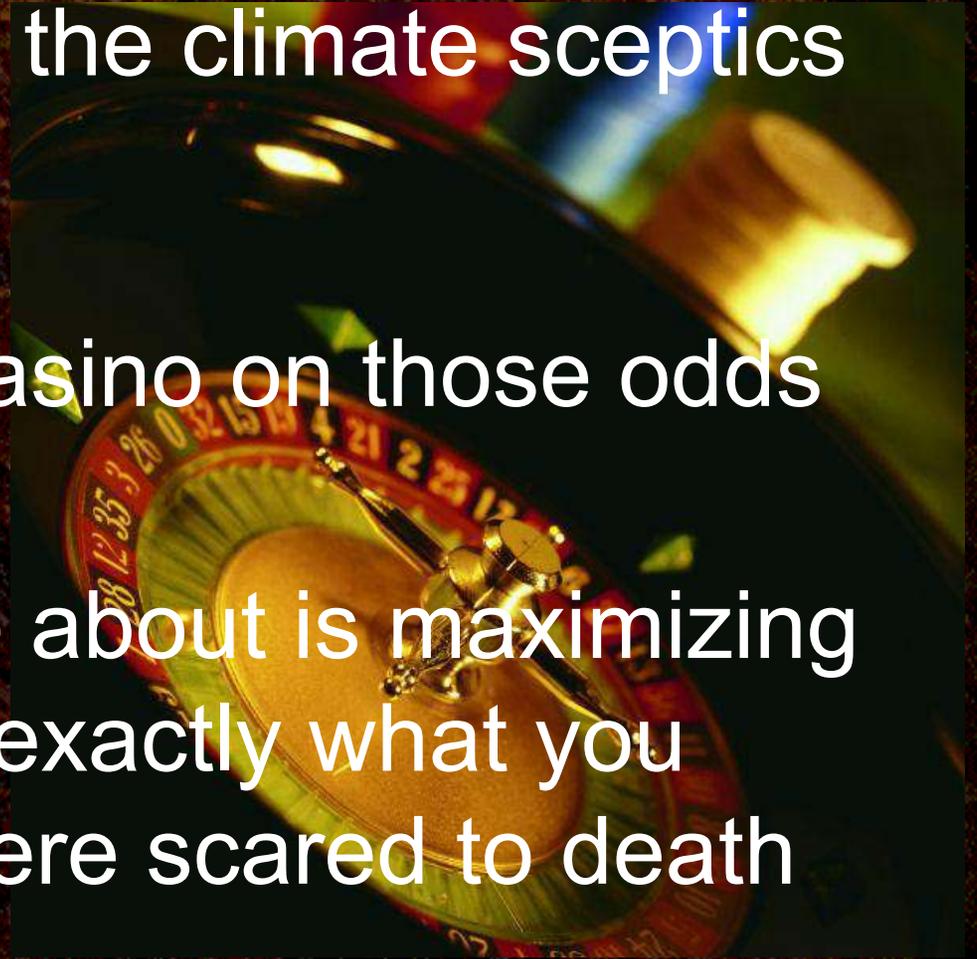
**2006**

The science does not matter

Let's assume that the climate sceptics are right.

Don't go to the casino on those odds

If all that you care about is maximizing profit, you will do exactly what you would do if you were scared to death about climate



BY THE COAUTHOR OF THE BESTSELLING *NATURAL CAPITALISM*

"A must-read for entrepreneurs, industry investors, experts, and corporations."

—Jigar Shah, founder, SunEdison, and CEO, Carbon War Room

# THE WAY OUT



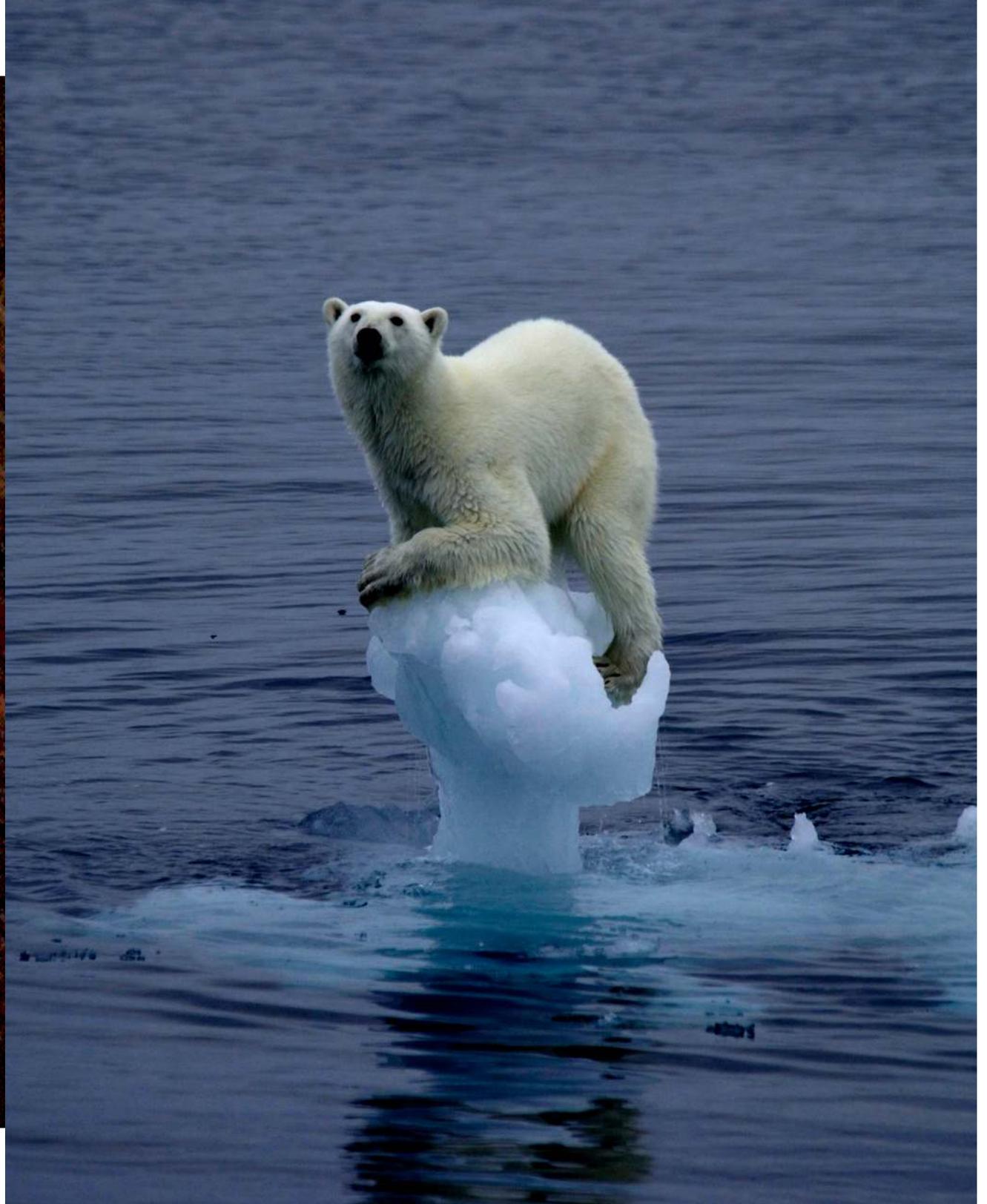
KICK-STARTING  
CAPITALISM TO SAVE  
OUR ECONOMIC ASS

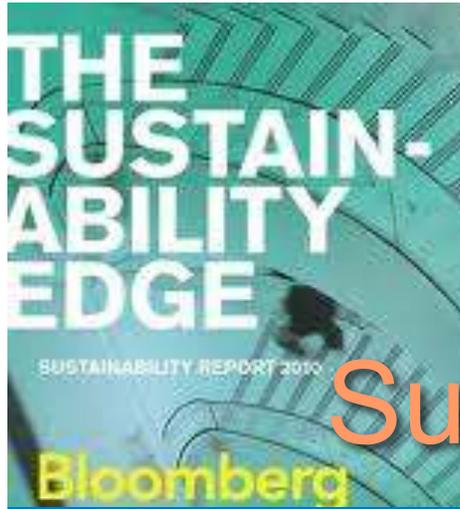
L. HUNTER LOVINS  
AND BOYD COHEN

The business case  
for climate  
protection

Sustainability  
is not about  
the plight  
of these  
guys . . .

It's about  
business





Sustainability is happening



# Harvard Business Review

“Sustainability isn’t the burden on bottom lines that many executives believe it to be. It can lower your costs and increase your revenues. That’s why sustainability should be a touchstone for all innovation.

In the future, only companies that make sustainability a goal will achieve competitive advantage. That means rethinking business models as well as products, technologies and processes.”

Why Sustainability is Now the Key Driver of Innovation

# Sustainability pays

Companies in the Dow Jones sustainability Index outperform the general market

Goldman Sachs report July 2007: Companies that are leaders in environmental, social and governance (ESG) policies **outperform competitors in stock performance—by an average of 25%**.

72% of the companies on the DJSI outperformed industry peers

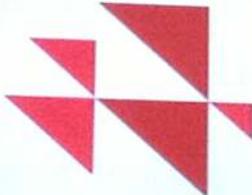


# SUSTAINABILITY PAYS

Studies That Prove the Business Case for Sustainability





 **CDP**  
DRIVING SUSTAINABLE ECONOMIES

SEPTEMBER  
**23**  
MONDAY

 **CDP**  
DRIVING SUSTAINABLE ECONOMIES

NYSE  
Euronext

2008 – 2012 leaders in reporting/  
managing carbon emissions  
information achieved **5.2%** higher  
return on equity, **18.1%** greater  
stability in cashflow generation,  
and **1.6%** higher growth –  
**twice the average total return vs**  
the Global 500 from 2005 - 2011

2013 CDP shows  
how U.S.  
businesses can  
reduce emissions by  
3%/ year.

Doing this will drive  
savings of up to  
\$190 billion per year  
by 2020 and curbing  
climate change.



**The**  
**Solution**

Driving Profits Through  
Carbon Reduction

# First we shape the built environment, then it shapes us

Most of us spend 90% of our lives inside of buildings



70% of electricity consumption

30 - 60% of green house gas emissions

Carbon War Room | Creating Climate Wealth



Join the Conversation



Contact Us

# NEW REPORT: ENERGY EFFICIENCY: HOW TO CREATE CLIMATE WEALTH THROUGH EFFICIENT BUILDINGS

"TODAY WE ARE ON THE BRINK OF A SIGNIFICANT ACCELERATION IN ADOPTION OF ENERGY EFFICIENCY SOLUTIONS DUE TO MAJOR TECHNOLOGICAL AND FINANCIAL INNOVATIONS."

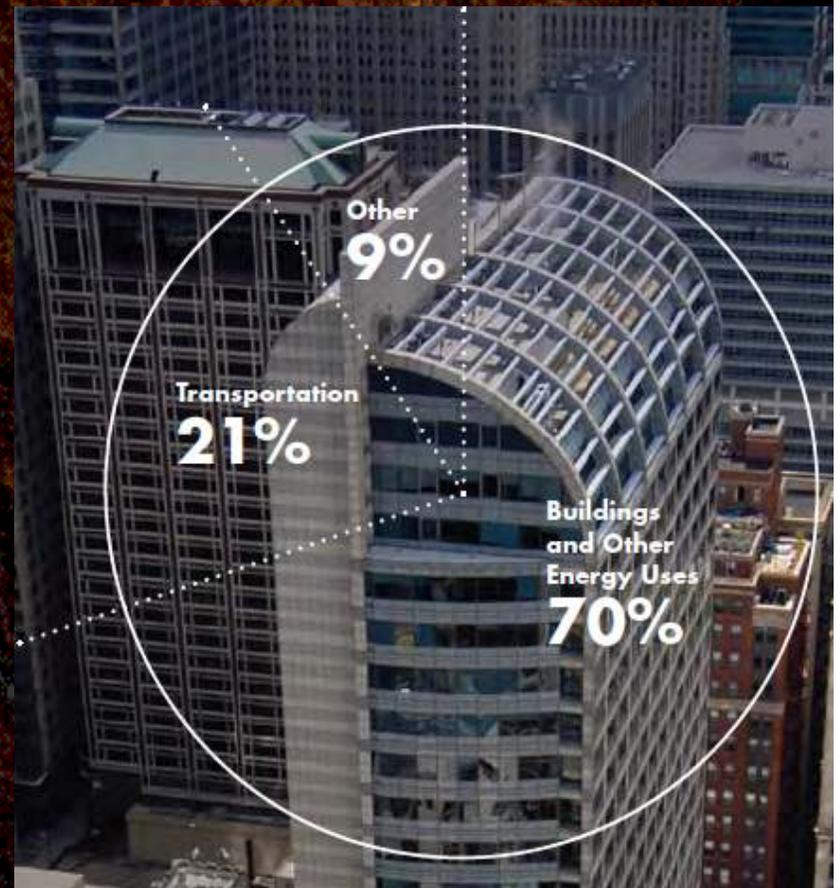
José María Figueres, President, Carbon War Room

# Chicago

Goal to reduce GHG emissions to 25% below 1990 levels by 2020; 80% below 1990 levels by 2050

Buildings are the primary target, accounting for 70 percent of emissions.

Chicago is home to 300 wind and solar supply-chain companies and 18,000 related jobs, 13 wind-power corporate headquarters



6,300 computers and monitors in sleep or standby mode when not in use (24/7).

Authoritatively told five versions of "company policy" that IT updated software during off times and the machines needed to be left on.

IT felt turning machines on and off reduced lifespan. Machine life was not affected by turning them off.

VERY conservative estimate of saved electricity leave machines on one evening a week for updates and turn them off at the end of the work day... \$700,000.

# Ohio State University

Turning off computers at night, saved the University over \$250,000 a year.

This money is used for academic programs across the campus



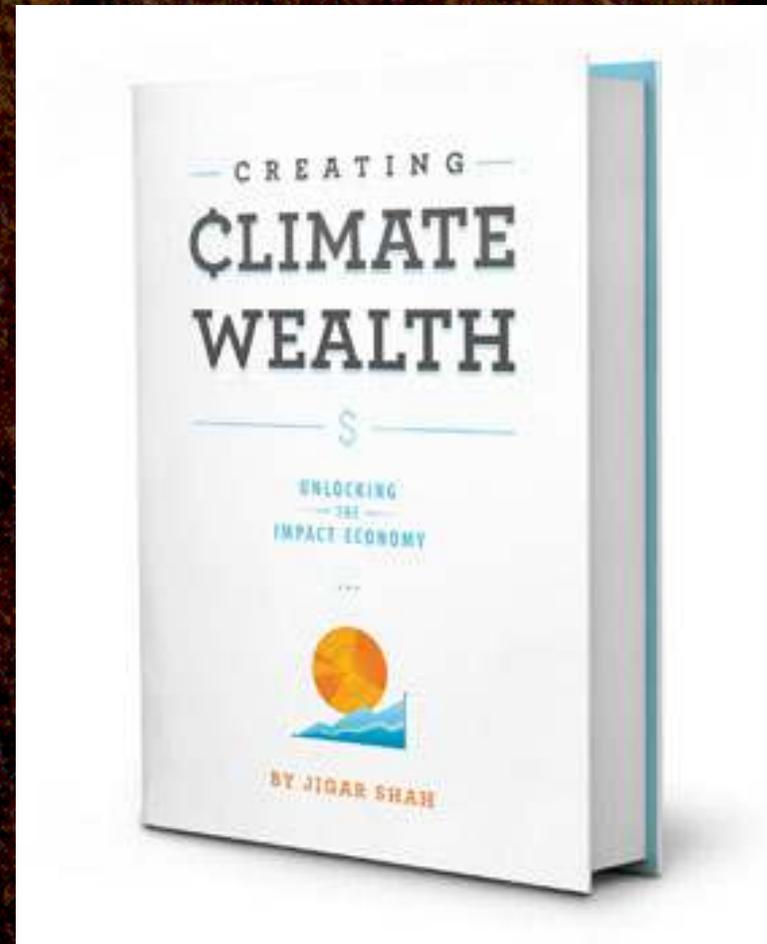


We're at 32 GT/yr now, need to get to  
14GT/yr by 2050

By 2020 we have to save 17 gigatons  
of carbon annually to stay below 2  
degrees C. and it would be better to  
stay below 1.5 above historic levels

# Jigar's Climate Wealth Law

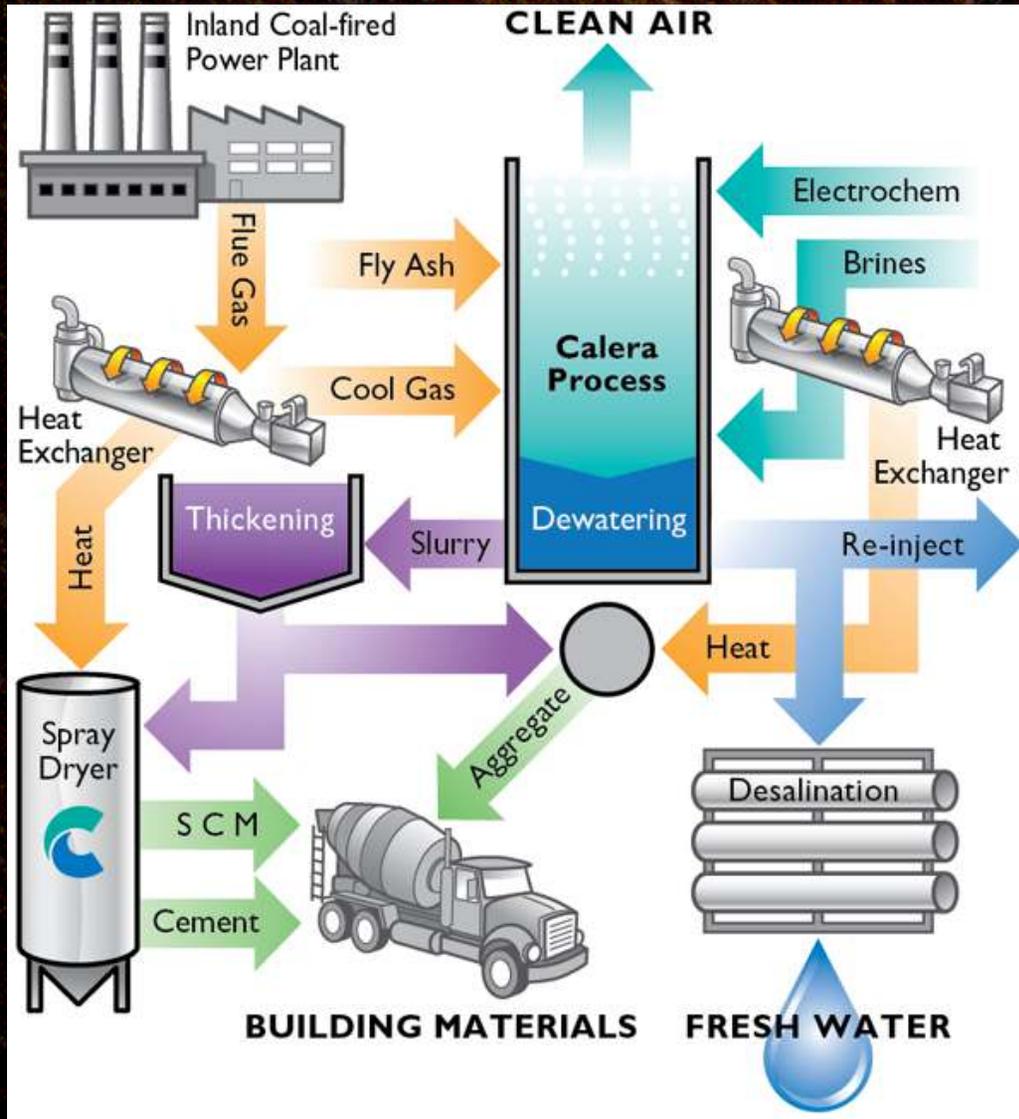
~50% of the greenhouse gas emissions will **always** be profitable to eliminate, due to continuous technology innovation – held up only by lack of effective business model and financial innovation.



In nature carbon is not  
the world's greatest  
poison



# Calera



Calera is piloting making cement in the same way that coral reefs make limestone: CO<sub>2</sub> and seawater.

Carbon negative process.

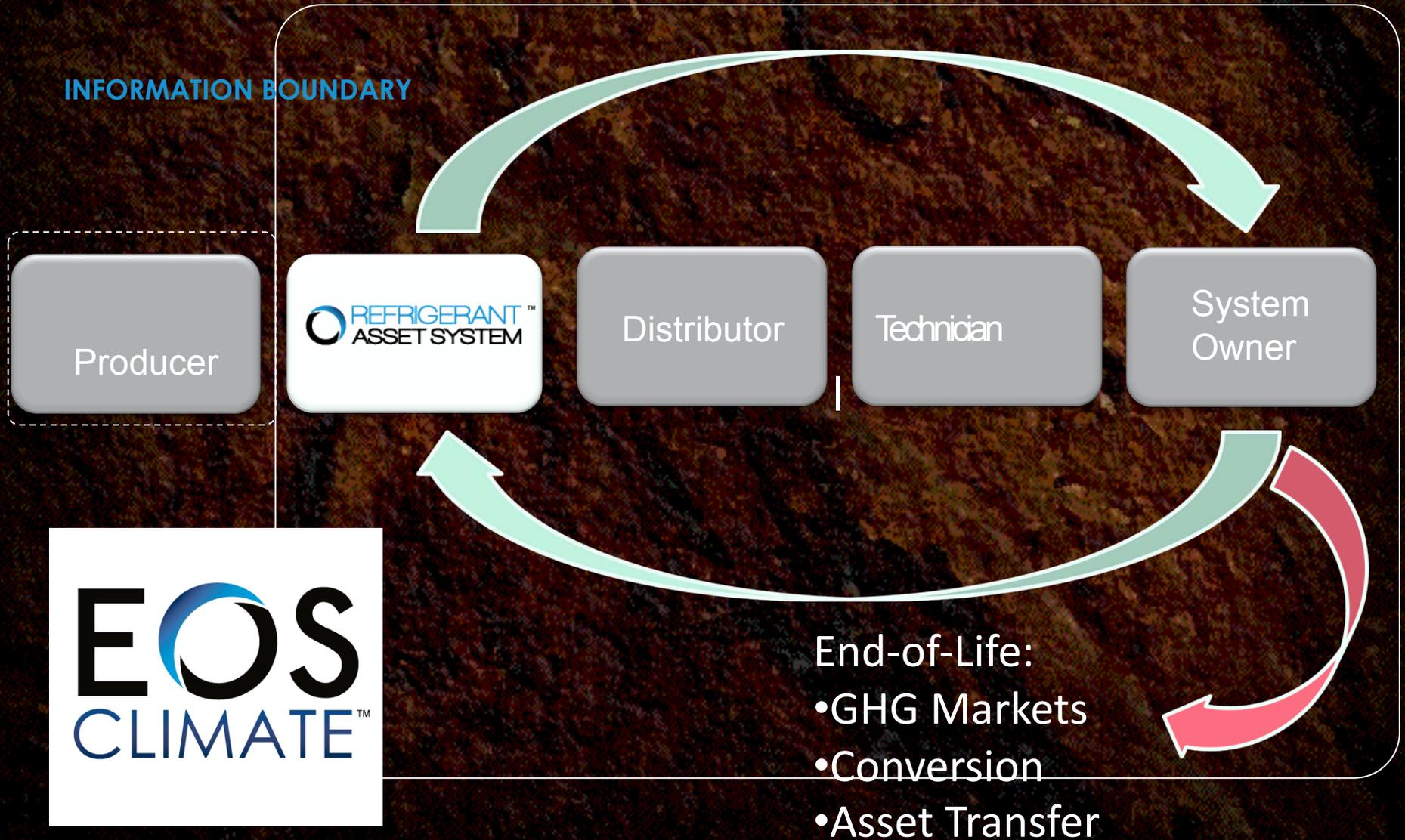
Vinod Khosla is a lead investor

# My kids



Recipients of CA's GEELA award – highest environmental award

# Refrigerant Lifecycle : Closed Loop



# China Renewable Investments

- China's State Administration of Energy (SAE), is creating a new energy blueprint
- Total investments for renewable energy by 2020
  - \$911 billion for efficiency and renewables
  - 10.6 million new jobs
  - Generate several trillion dollars in new GDP



# China - 1 MW grid interconnected



# Rizhao, China



City of 3 million  
– 99% use  
solar hot water

5,000  
manufacturers  
of simple solar  
water heaters

Now looking at  
export

# Baoding, China

Mayor Yu Quin:

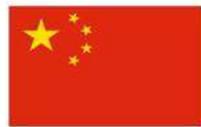
“Polluting first and cleaning up later is very expensive. So we chose renewable energy to replace traditional industry.”

200 renewable energy companies replace cars and textiles



# HIGH-SPEED RAIL

BY REGION



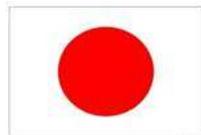
**CHINA**

12,036 mi



**EUROPE**

6,453 mi



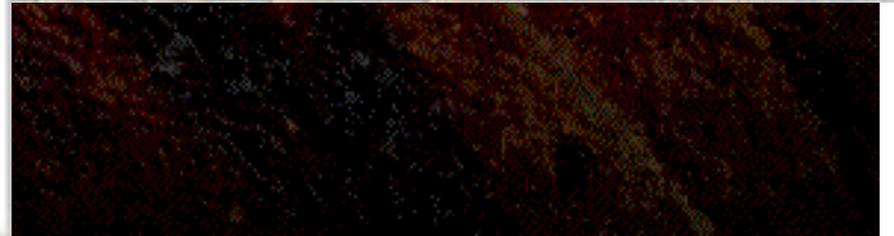
**JAPAN**

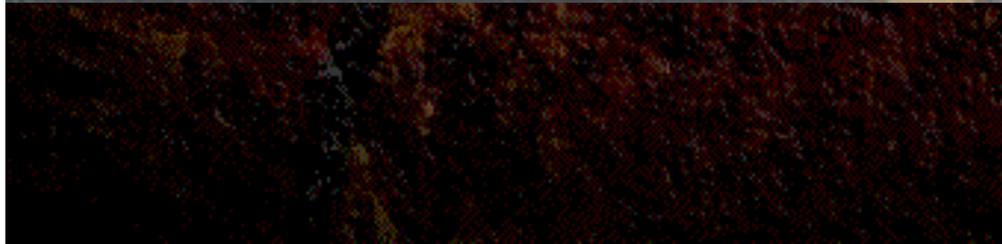
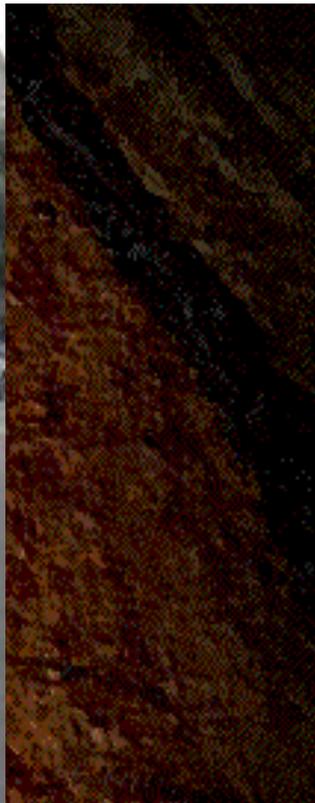
1,655 mi



**U.S.**

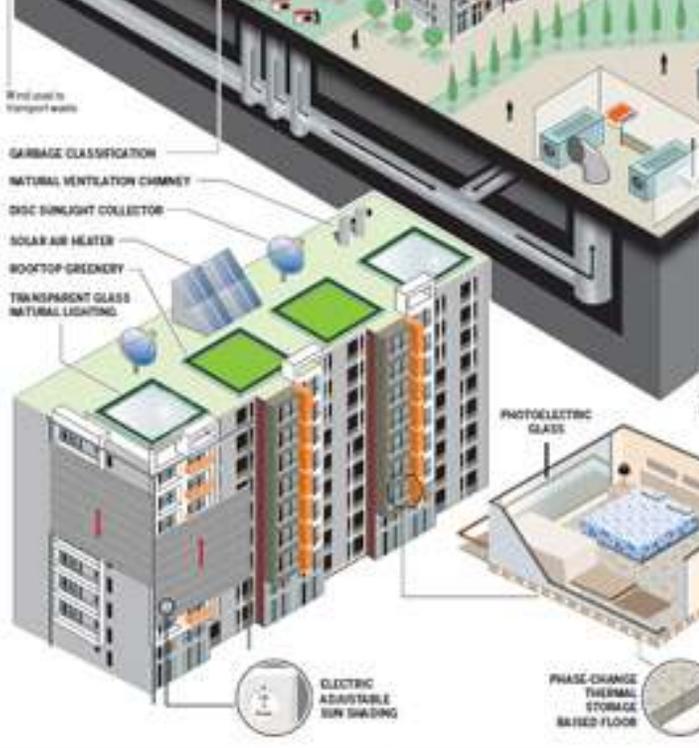
0 mi





## ECO-CITY GREEN LIVING

- GREEN BUILDING
- GREEN TRANSPORT
- CLEAN ENERGY
- CLEAN WATER
- WASTE & ENVIRONMENT MANAGEMENT
- LIFESTYLE OF HEALTH & SUSTAINABILITY



Our civilization is to be either lost or redeemed in China, the awakening giant.”

RICHARD REGISTER  
ENVIRONMENTAL SCHOLAR  
AND ECO-CITY ADVOCATE

# Distributed future is here



Wind is firm  
power



# Renewables Win

Solar added 1.7 GW in 2011, up 2x from 2010  
3.3 GW in 2012 – 76% growth, prices fell 27%,  
70% in last 3 years

39 GW in 2013, doubling every two years

Nuclear added 0 and coal decreased.



Japan added 9.5 GW of solar in 2013 – has a feed-in tariff

China is investing 2.4 billion in renewables, installed 14 GW solar 2013, 2014 projected

Plans to have 100 GW of wind, 21 GW of solar and 13 GW of biomass power installed by 2015

70+% of new power generation capacity added between 2012 and 2030 will be from renewable technologies.

# Butte College – 75% renewable

Could be first college in the U.S. to generate more electricity than it uses.

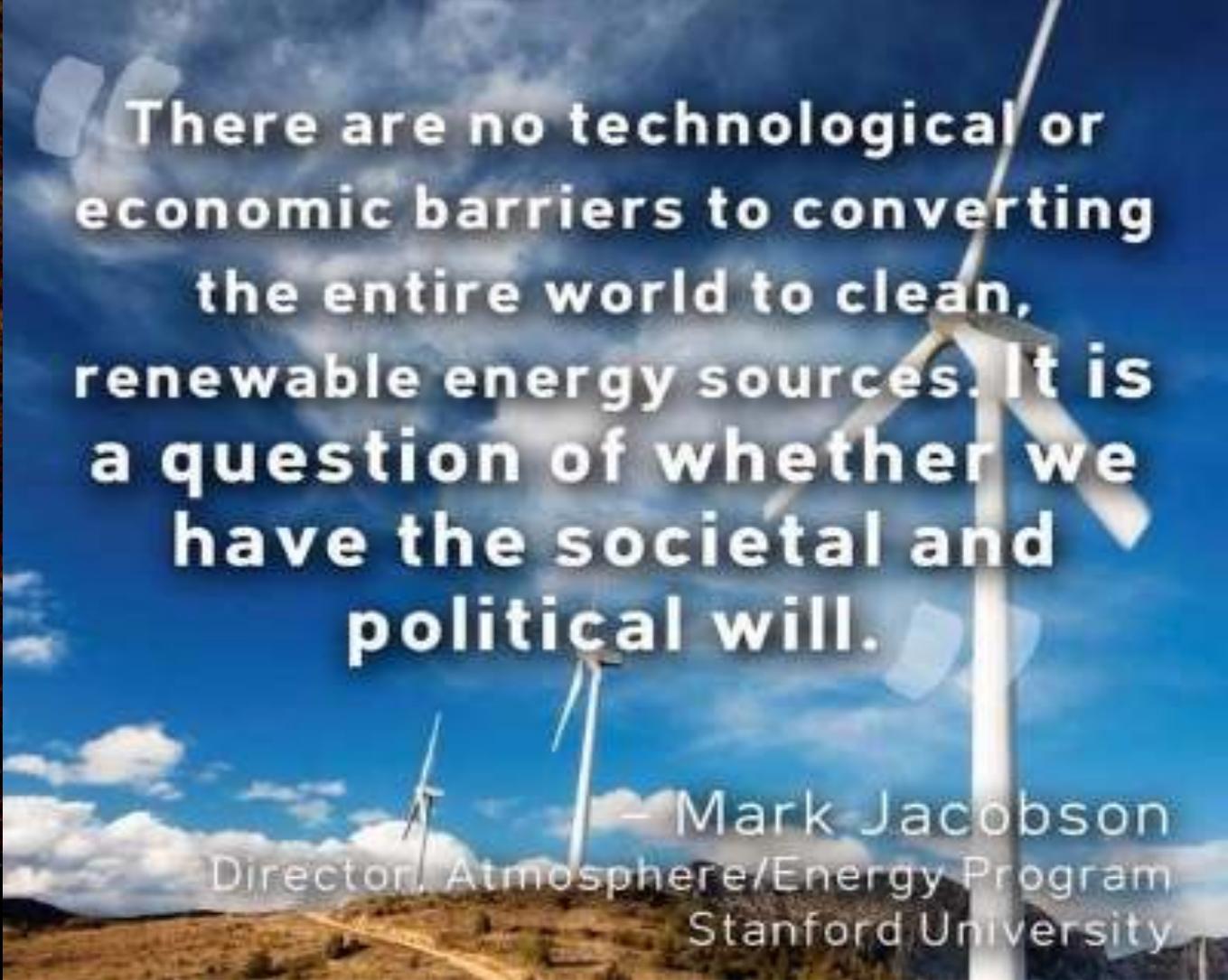
It would gain \$50-\$75 million for academic programs if PG&E would let it.



World now nearing 100 GW solar



We have all the technologies we need to solve **all** the challenges facing humanity



There are no technological or economic barriers to converting the entire world to clean, renewable energy sources. It is a question of whether we have the societal and political will.

— Mark Jacobson  
Director, Atmosphere/Energy Program  
Stanford University

# Regenerative Energy Economy in U.S.

Employs almost 3 million - more than fossil fuel

Outperformed general economy in recession

Offers better opportunities, higher pay for low and middle skilled workers median wages 13% higher

2012 solar jobs increased 13.2%, 17.2% in 2013

Green jobs increased five times faster than jobs in any other industry

A greener economy already employs almost 3 million - more than fossil fuel

It could create between 15 million to 60 million jobs worldwide over the next two decades

At least half of the global workforce will be affected in some way by 2030

2012 ILO UNEP

GREEN economy

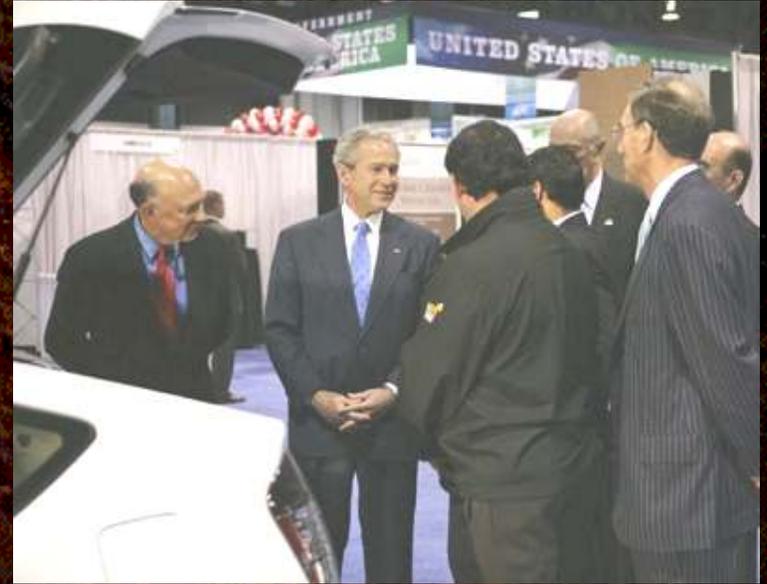


# Not a left or a right issue



R. James Woolsey's solar powered plug-in-hybrid has a bumper sticker reading:

“Osama bin Ladin hates my car.”



# Great Green Fleet

Navy Secretary Ray Mabus: "We simply have to figure out a way to get American-made, home-grown fuel that is stably priced, that is competitive with oil,"



MH-60 chopper flying on 50-50 algae/ grease biofuel and petroleum fuel



Deploy a biofuel-burning carrier group by 2016 and require the Department of the Navy to get half of its energy from alternative sources by 2020.



USS Ford frigate used 25,000 gallons to sail 12,000 miles from  
Everett Wash to San Diego – no difference in performance  
Solyazyme and Dynamic Fuels



F-18 Green Hornet flying on Sustainable Fuels' oil seed fuel/ jet fuel mix – 60 – 75 million barrels of jet fuel/ year

THERE IS NO  
SILVER BULLET

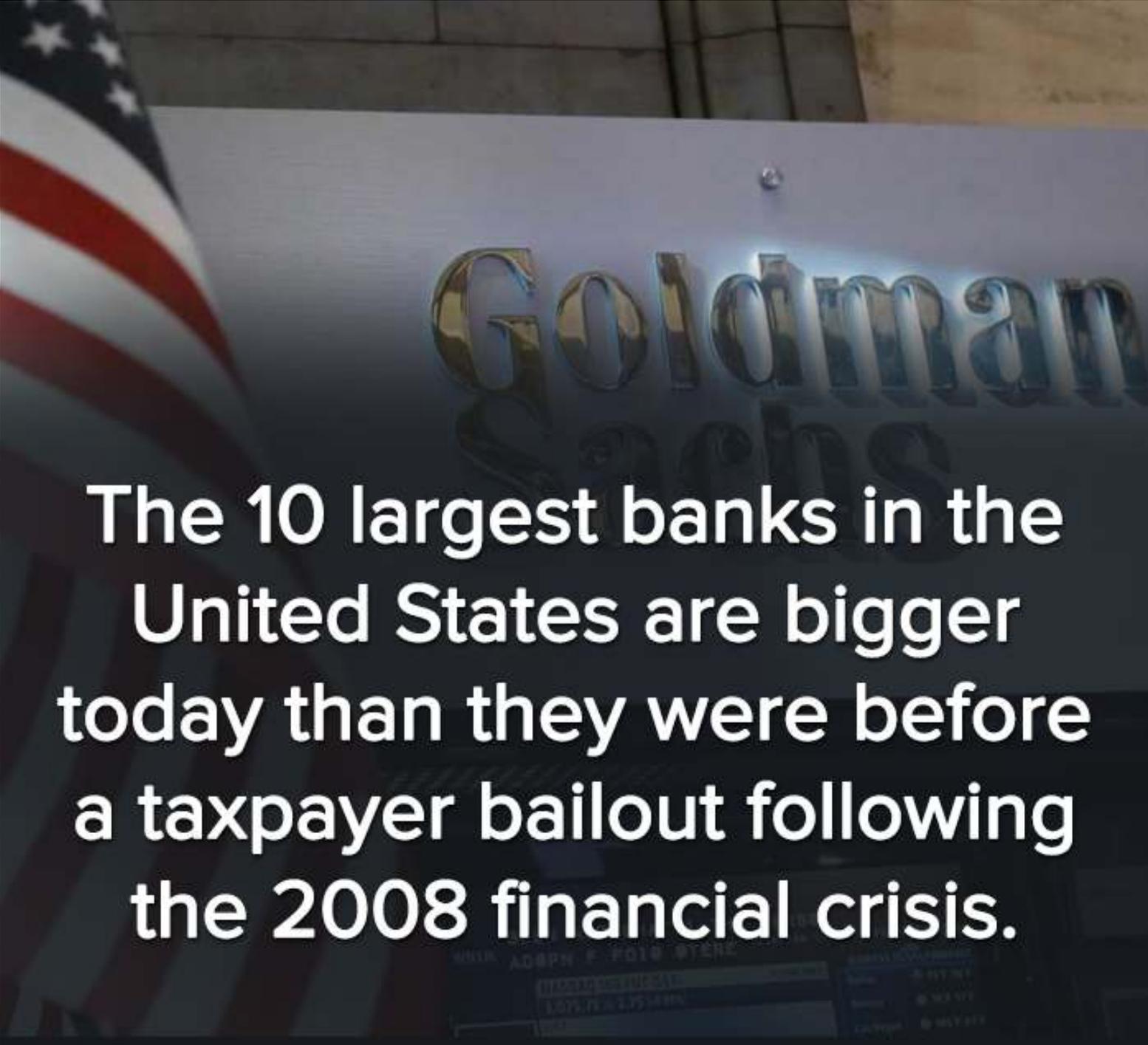
BUT WE SURE  
HAVE SILVER  
BUCKSHOT



Poverty is not an accident.  
Like slavery and apartheid,  
it is man-made and  
can be removed by  
the actions of  
human beings.

- Nelson Mandela

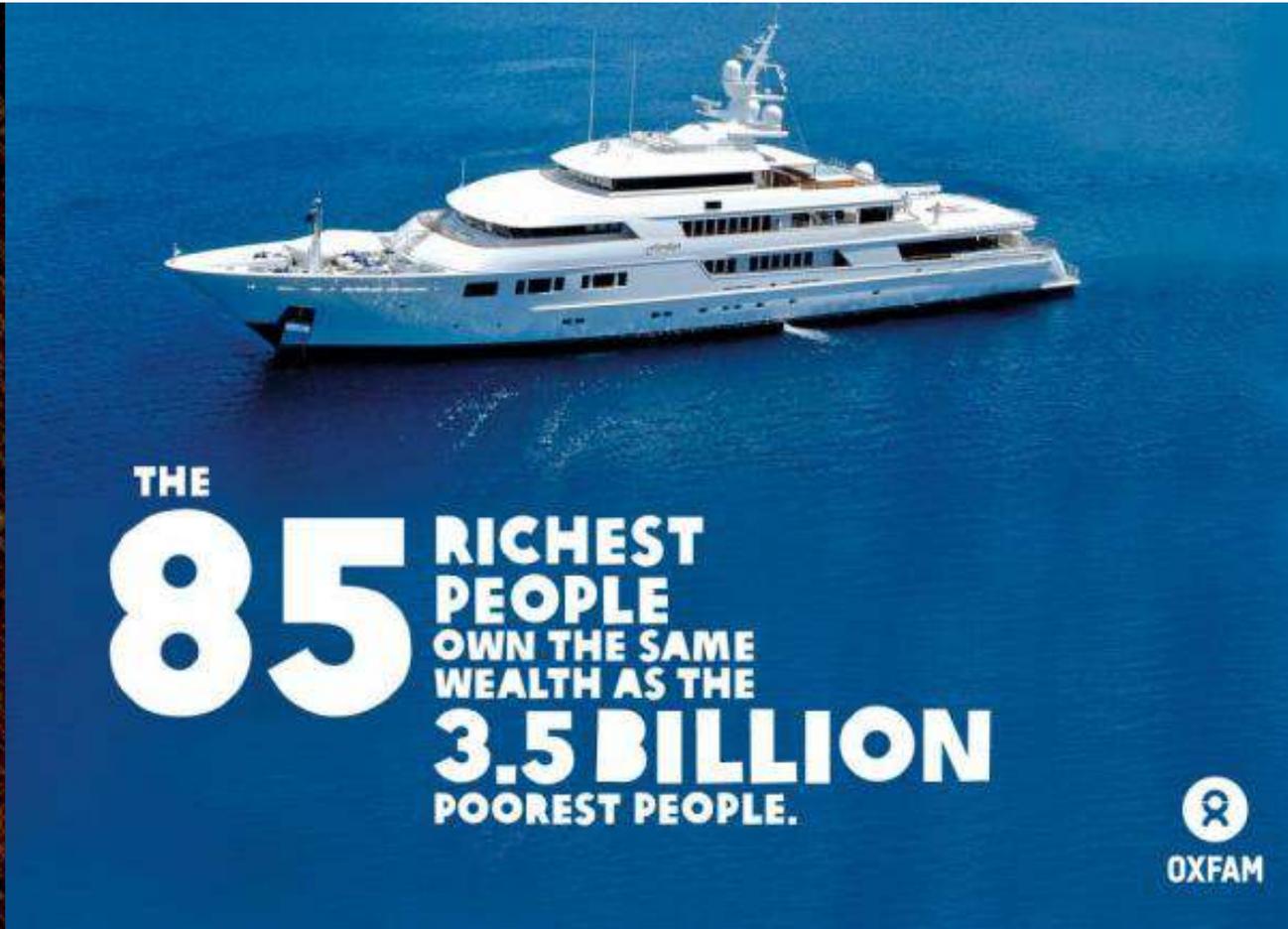


A photograph of a Goldman Sachs sign with an American flag in the background. The sign is illuminated and features the word "Goldman" in large, metallic letters. Below it, the word "Sachs" is visible in a smaller font. The background shows a portion of the American flag and a building facade.

**The 10 largest banks in the United States are bigger today than they were before a taxpayer bailout following the 2008 financial crisis.**

share ↗

[sanders.senate.gov](https://sanders.senate.gov)



THE  
**85** RICHEST  
PEOPLE  
OWN THE SAME  
WEALTH AS THE  
**3.5 BILLION**  
POOREST PEOPLE.



Almost half of the world's wealth  
now owned by just one percent of  
the population

# Unsustainability Drove the Financial Collapse

Unsustainable business practices contributed to the economic collapse, which will not be resolvable until these more fundamental issues are addressed

“People seem blind to the fact that the causes of the economic collapse are exactly the same as those behind today's ecological crisis – and behind accelerating climate change in particular.”

- Jonathan Porritt, Forum for the Future  
quoting Sir John Beddington

# PARIS WILL FAIL

Negotiating text essentially set

It will be the Lima agreement of nationally determined commitments –

NO INTERNATIONAL DEAL

BARACK OBAMA

2020



“ I’M SORRY.

WE COULD HAVE STOPPED  
CATASTROPHIC CLIMATE  
CHANGE... WE DIDN'T. ”



tcktctck

UNIVERSITY OF THE WORLD IS READY

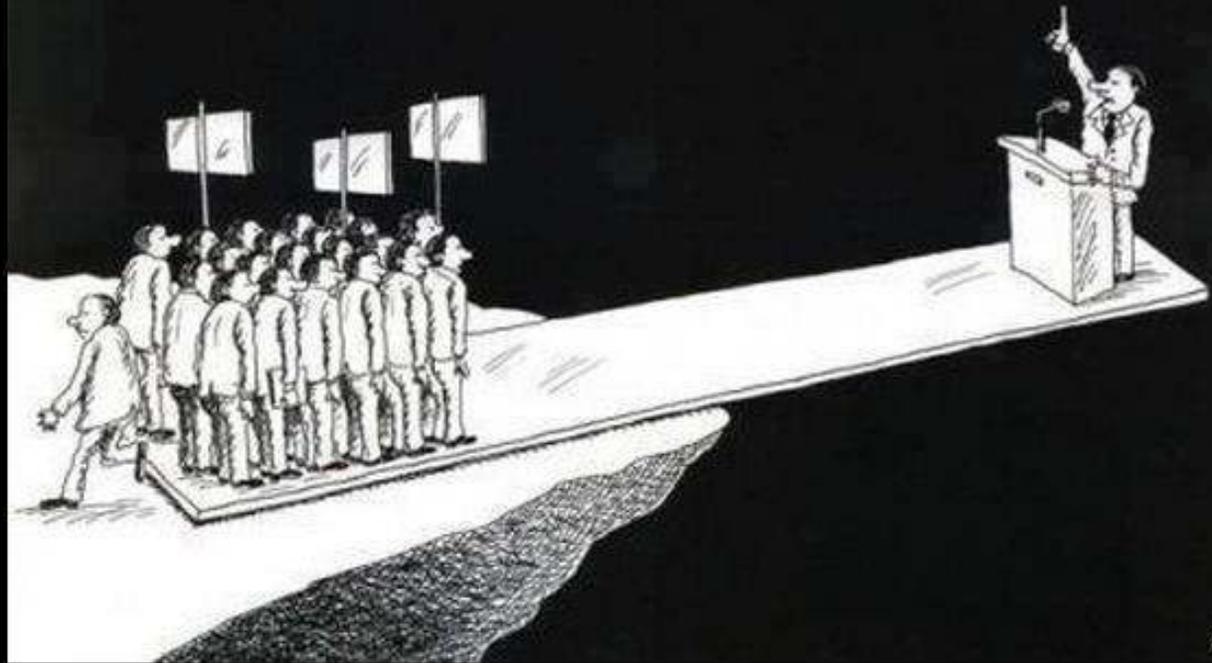
GREENPEACE

COPENHAGEN 2009

ACT NOW - CHANGE THE FUTURE

Institutions  
that lose  
legitimacy  
collapse  
very quickly

**THE PEOPLE DON'T KNOW  
THEIR TRUE POWER.**



Russell Brand vs  
Jeremy Paxman

BBC Newsnight

Most watched  
You Tube video  
for all of 2013





# Young Professionals

**96%** of workers aged 18-35 want to work for a responsible and green-minded company.

-Johnson Controls Global Workplace Innovation



Who's  
responsible?



# Sustainable Endowments Institute



Mark Orlowski

GRITS 1.0

Challenge: collectively invest \$1 billion in green revolving funds to invest in energy efficiency

# Swarthmore Divestment

Focusing on the top 200 oil, gas and coal companies, the Divest-Invest movement over 180 institutions and 600 leaders pledging to divest more than \$50 billion in assets from fossil fuel companies.

90 companies are responsible for 65% of carbon dioxide in the air today

If you do not invest you are now on notice: Don't screw it up -

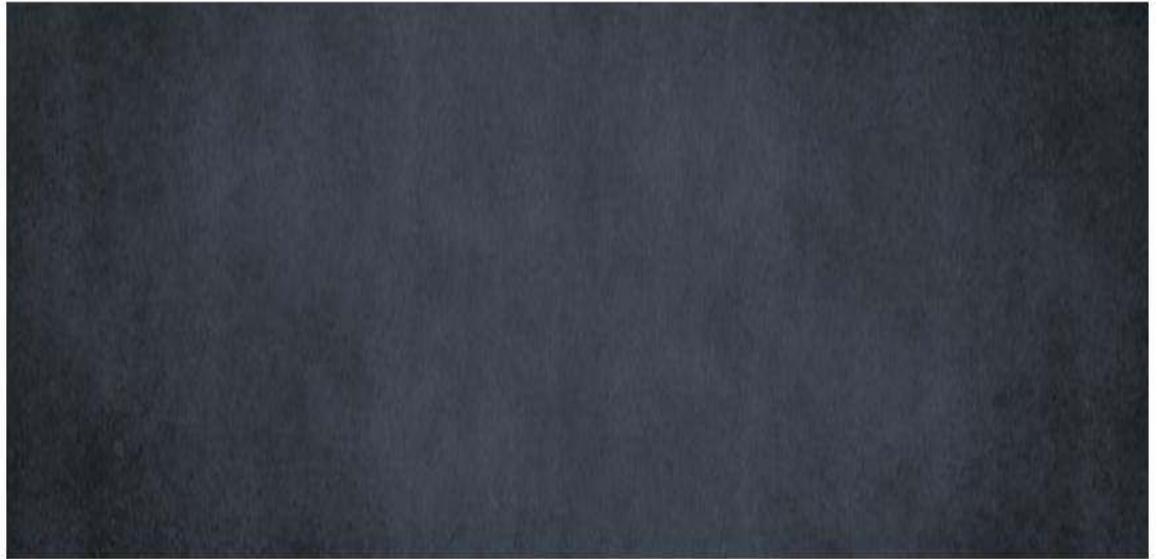
# Invest / divest

Investors with \$3 trillion are pressuring fossil companies to prepare for decline in demand and square their business model with carbon bubble

70 major investors led by CERES, Carbon Tracker ask 45 fossil firms to rethink investment in increasing supply to avoid stranded asset.

“Carry out risk assessment of the consequences of a global move to cut GHG by 80% by 2050”

HSBC: in world where GHG constrained, fossil co's lose 40 – 60% of market cap



# Principium

invest in purpose



# CLEAN, RESPONSIBLE 401K PLANS



**GREEN  
RETIREMENT**



**PRINCIPIUM**  
INVESTMENTS

---

Offers 401(k), 403(b) and corporate non-profit retirement plans with a specialty in advising on fossil-free and ESG-minded investments

# DIVEST AND INVEST (MARKET PERFORMING, DIVERSIFIED)

Principium Investments, LLC offers portfolios of publicly traded securities screened for both high ESG and financial performance.



Clean Economy  
(Fossil-Fuel  
Free)



Responsible  
Economy  
(ESG+)



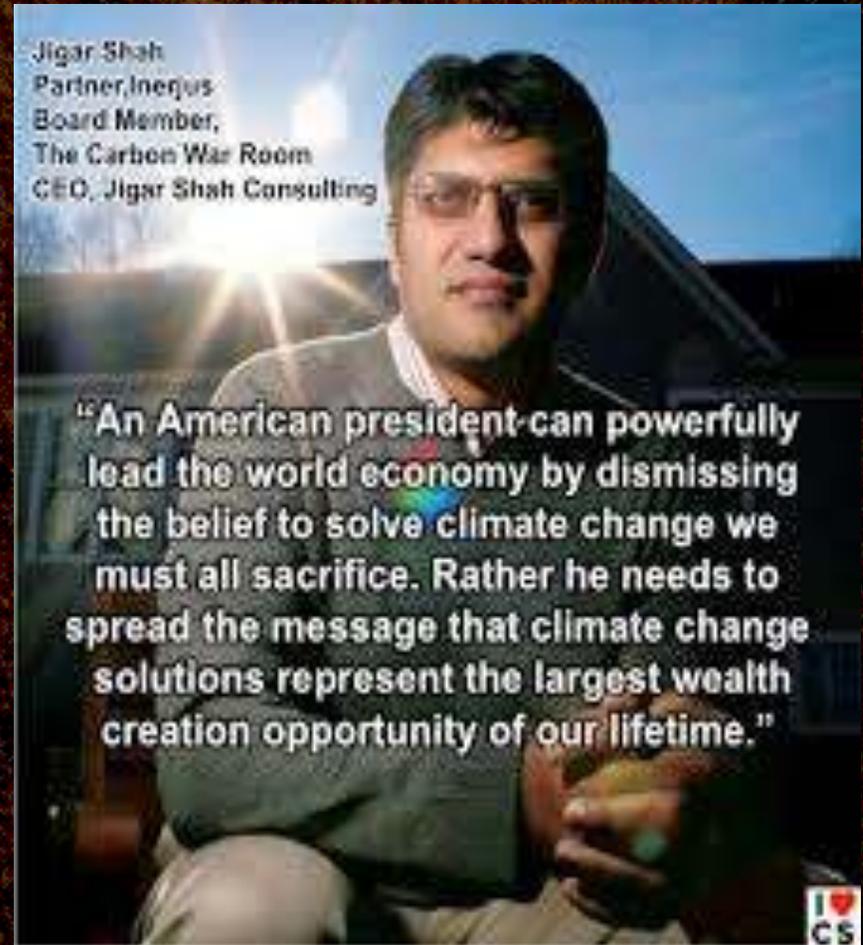
Transition  
Economy

100 x 100 = 10

## Creating Climate Wealth

Worldwide challenge to solve climate change. We need the equivalent of 100,000 companies to sell \$100 million worth of climate change solutions by 2020. Create a \$10 trillion economy.

Generate Capital





## **Bard** Graduate Programs in Sustainability



# Bard Center for Environmental Policy

✓ MS in Environmental  
Policy

✓ MS in Climate  
Science and Policy

Bard MBA in  
Sustainability



The second mouse gets the cheese



# Beyond Rearranging Deckchairs





We are called to be architects of the future, not its victims.

Buckminster Fuller

## William Murray

Until one is committed, there is hesitancy, the chance to draw back. Concerning all acts of initiative (and creation), there is one elementary truth, the ignorance of which kills countless ideas and splendid plans: that the moment one definitely commits oneself, then Providence moves too. All sorts of things occur to help one that would never otherwise have occurred. A whole stream of events issues from the decision, raising in one's favor all manner of unforeseen incidents and meetings and material assistance, which no man could have dreamed would have come his way. Whatever you can do, or dream you can do, begin it. Boldness has genius, power, and magic in it. Begin it now."





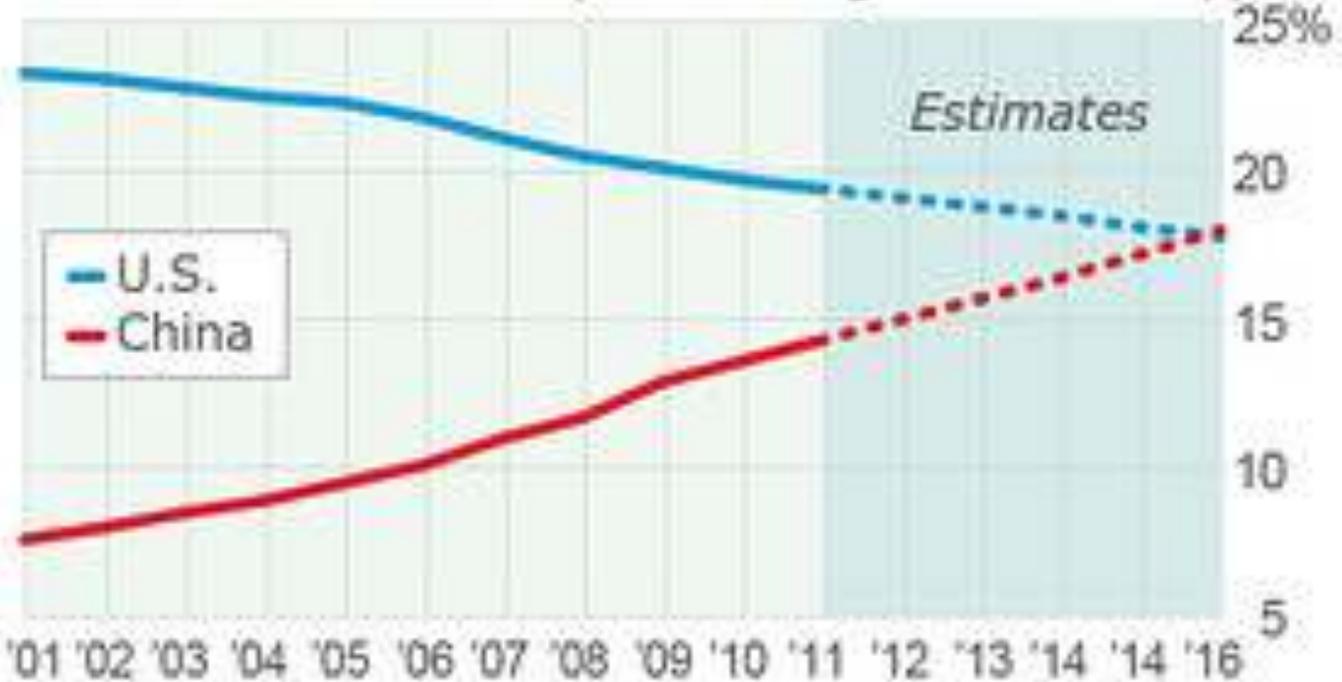
Natural Capitalism Solutions  
ELDORADO SPRINGS, COLORADO

FreeStockPhotos.com

[www.natcapsolutions.org](http://www.natcapsolutions.org)

# The End of the Age of America

Share of World GDP (Purchasing Power Parity)



Data: International Monetary Fund, April 2011

## ASIA ECONOMY

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# Shanghai first major Chinese region to ditch GDP growth target

Gabriel Wildau

Monday, 26 Jan 2015 | 6:25 PM ET

FINANCIAL TIMES

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Danny Hu | Flickr | Getty Images

70 smaller cities and counties abandoned GDP targets last year, mostly areas of high poverty rates and those with special agricultural or ecological value.

# China's Circular Economy

Promotion of the 3Rs

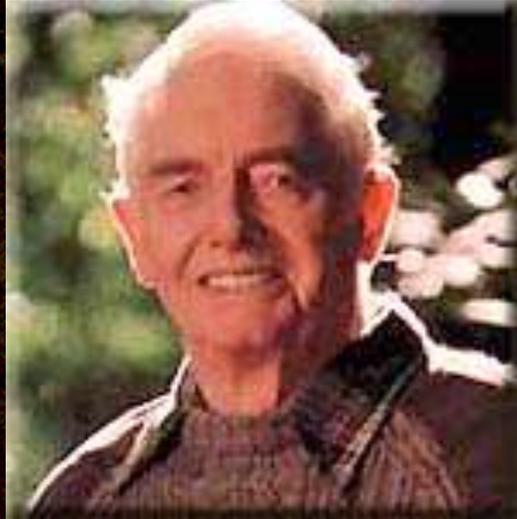
Recycling and reusing  
resources among  
industries

Circulating resources  
between industrial  
and urban systems.

Waste reduction  
strategies



This approach estimated to add \$1 trillion to EU economy/ year



## David Brower:

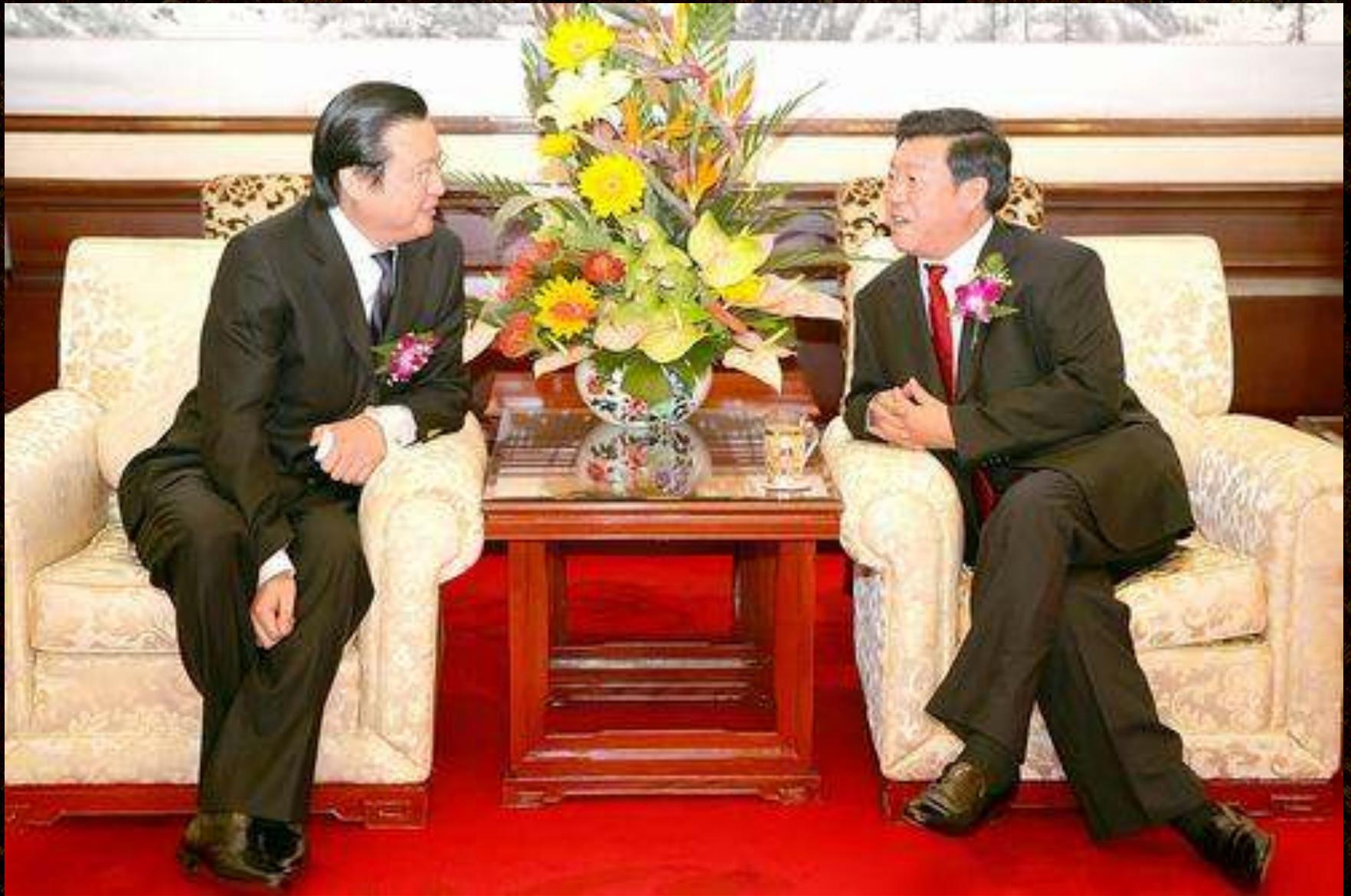
What do we want the earth to be like fifty years from now? Let's do a little dreaming.

Aim high! Navigators have aimed at the stars for centuries. They haven't hit one yet, but because they aimed high they found their way



Who is the new Ray  
Anderson?

Who is the corporate  
leader with the  
courage of a Ray  
Anderson?

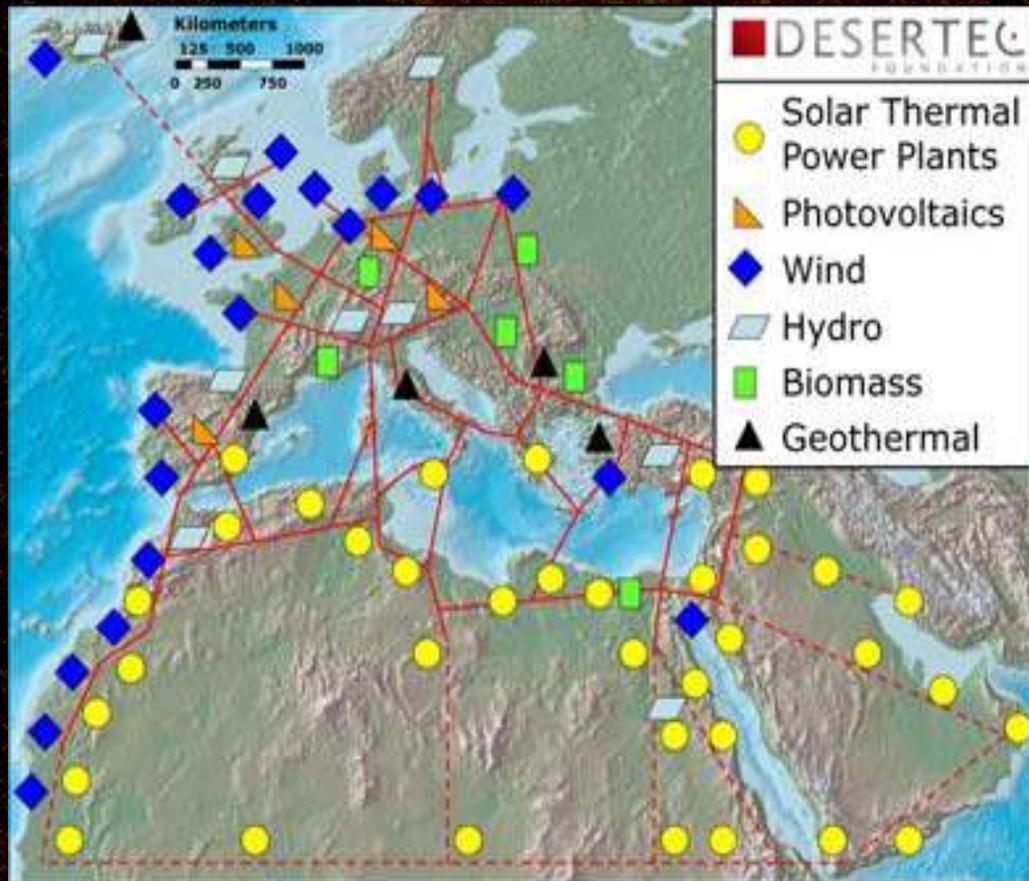


# DeTao Institute of Green Investment



Founded 23 Feb 2014, Shanghai, China

# European/Middle East needs



Power equal to the total present usage of the EUMENA region power could be generated covering less than 0.3% of the Sahara Desert with CSP plants. DESERTEC Foundation proposes a supergrid from Iceland to Arabian peninsula, from Baltic to west coast of Africa, in which offshore

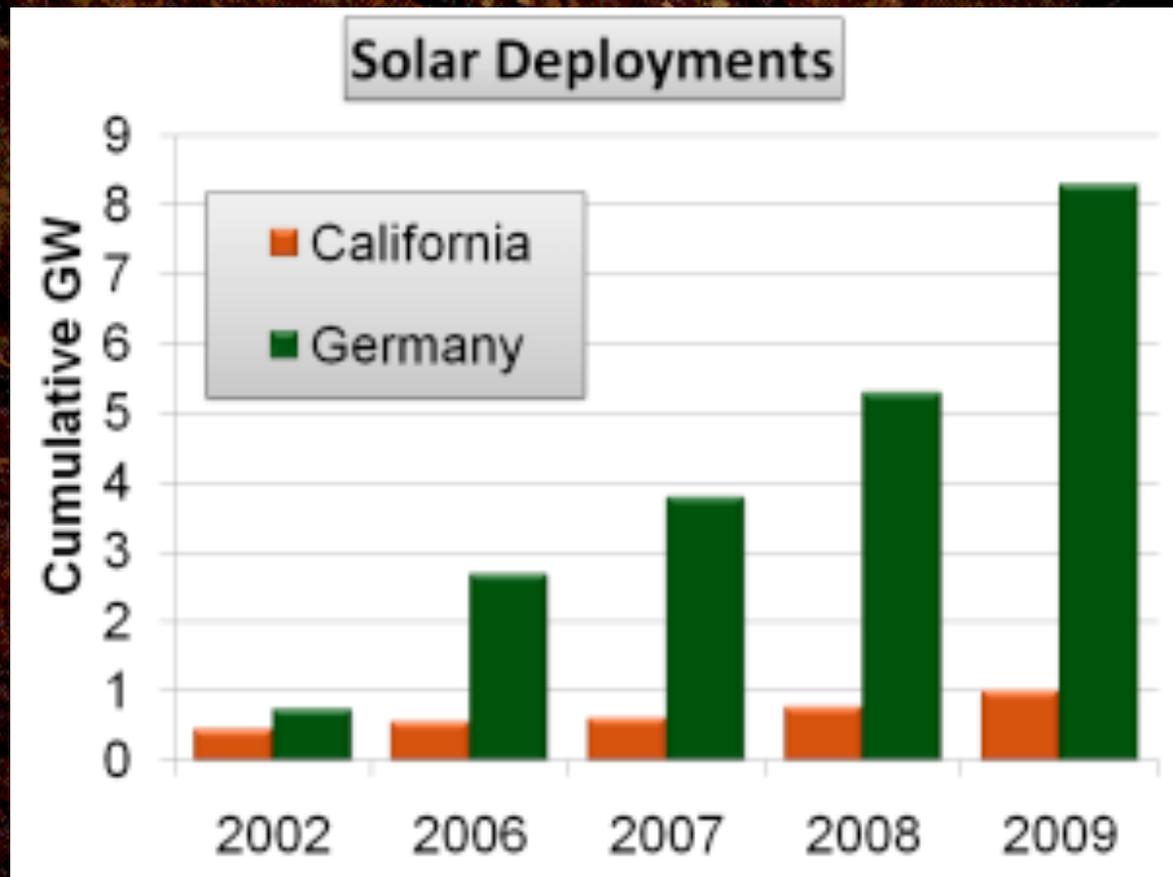
wind and wave farms, photovoltaic sites, tidal stream generators, biomass, geothermal and hydroelectric stations would unite with desert CSP arrays to meet the region's actual daily and hourly demands over an HVDC network

# Solar deployment – policy matters

California receives 70% more sunlight for producing solar energy than Germany.

But 2012 Germany installs 28 times more solar electric capacity every year

Will be 100% renewable by 2050



# The Economics of Feed-in Tariffs

Deutsche Bank Study: FiTs gave Germany the lead in renewable energy production.

FiTs created 500,000 new jobs

FiTs cut the unit cost of solar panels 30 percent in 2009 enough that they could pay for themselves within five to seven years, and reach grid parity (costing the same as grid electricity) by 2013.

FiTs drove German economic regeneration, enabling Germany to pay its own citizens to produce, install and maintain their own renewable energy systems, instead of buying imported fossil fuels. The program cost of **€2 - 3** per month (**\$50** to customers' electricity bills each year) to electricity bills in Germany (**a total of €8.6 billion.**)

Deutsche Bank: The savings created by FiTs exceeded total cost of payments made by households.

Had customers bought electricity from conventional generation and paid the costs of fossil fuel generation Germans would have paid over **€9.4 billion.**

## Dardesheim, Germany - 100% renewable



Wildpoldsried produces 321% more energy than it uses; makes \$5.7 million each year



# The future may be much more brittle

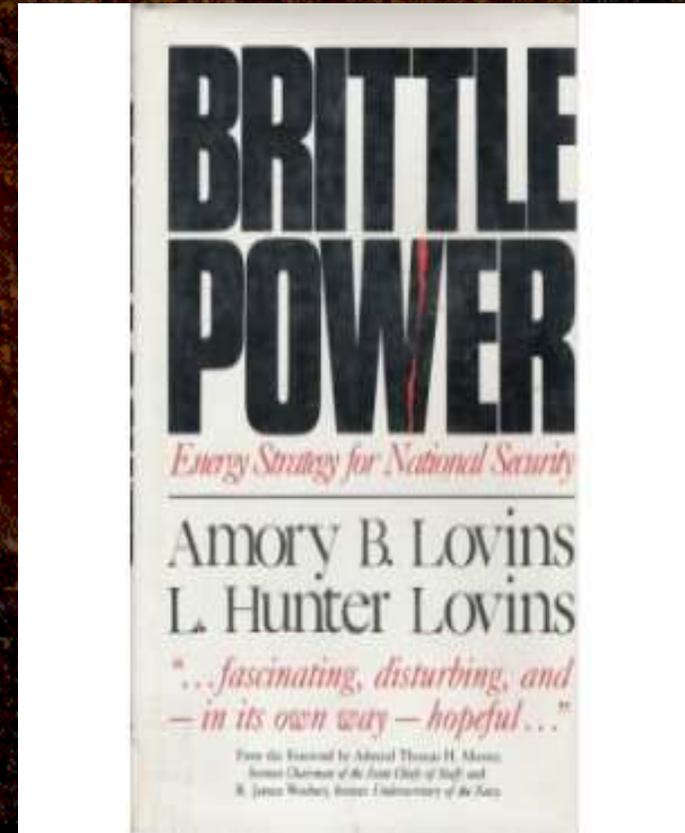


## Shots in the Dark

A look at the April 16 attack on PG&E's Metcalf Transmission Substation

- |  |   |  |   |  |   |   |
|--|---|--|---|--|---|---|
| <b>1</b>   | <b>2</b>  | <b>3</b>   | <b>4</b>  | <b>5</b>   | <b>6</b>  | <b>7</b>  |
| <b>12:58 a.m., 1:07 a.m.</b><br>Attackers cut telephone cables | <b>1:31 a.m.</b><br>Attackers open fire on substation | <b>1:41 a.m.</b><br>First 911 call from power plant operator | <b>1:45 a.m.</b><br>Transformers all over the substation start crashing | <b>1:50 a.m.</b><br>Attack ends and gunmen leave | <b>1:51 a.m.</b><br>Police arrive but can't enter the locked substation | <b>3:15 a.m.</b><br>Utility electrician arrives |

Sources: PG&E; Santa Clara County Sheriff's Dept.; California Independent System Operator; California Public Utilities Commission; Google (image) The Wall Street Journal



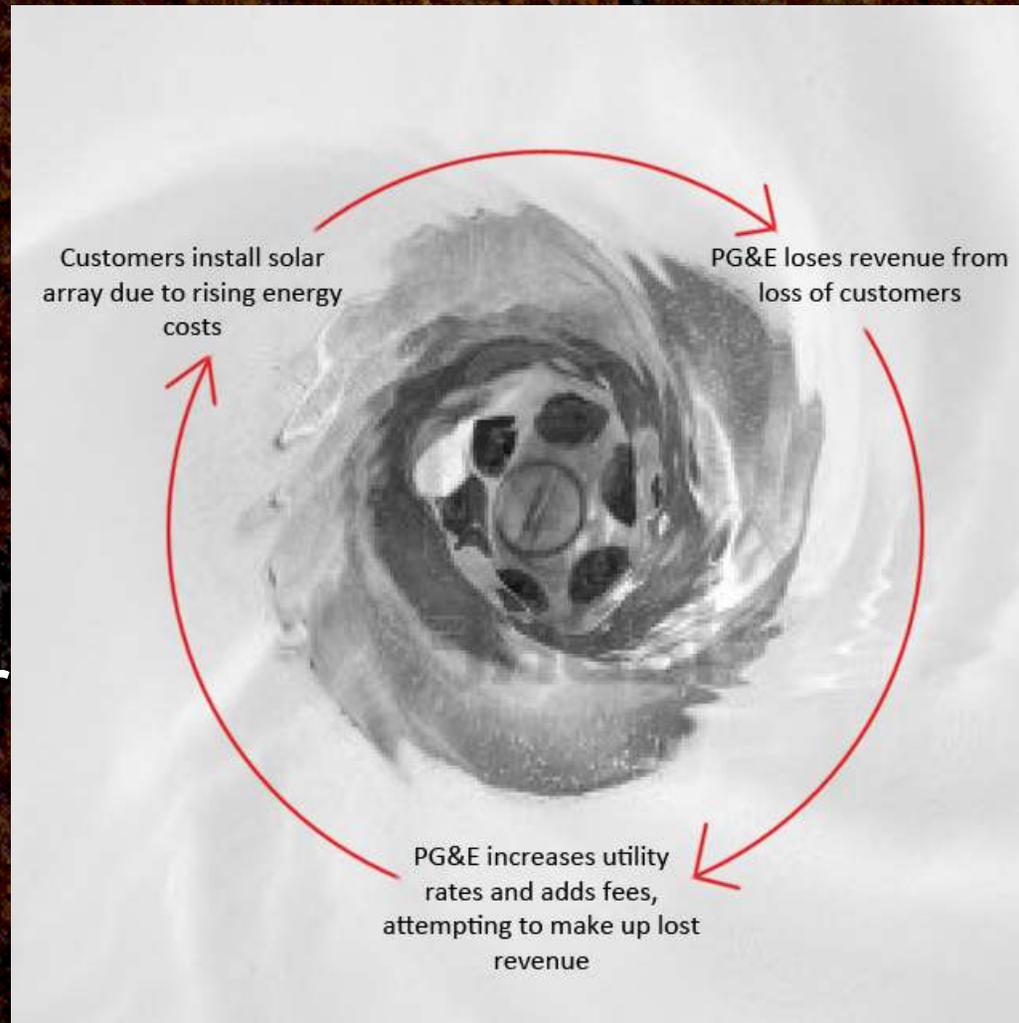
17 transformers shot out in 19 minutes – dress rehearsal?

“Utilities are in danger of being FedExed, Chu said, like the Post Office got FedExed, as rooftop solar modules drop in price”



# THE DEATH SPIRAL

Top 20 European utilities have lost \$600 billion in value over the past 5 years



Tesla is valued at more than half of GM – despite producing 300 times fewer cars





# NY Reforming the Energy Vision

“Stresses and opportunities indicate that a **business-as-usual approach should no longer be considered the only cost-effective way** to meet our responsibility....

Demand management can be used not as a last resort but rather as a cost effective, primary tool to manage distribution system flows, shape system load, and **enable customers to choose cleaner, more resilient power options**....

Integrate energy-consuming equipment, as well as distributed generation and storage, fully into the management architecture of the electric grid....

**Integrate DER as a primary means of meeting system needs.**