THE FUTURE OF PLANET EARTH:

A Changing Biosphere; Humans and Global Stewardship

by

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New Canaan Garden Club

New Canaan, CT

February 11, 2015


The Beauty of the Earth
This is the biosphere at its best!
(So what is the biosphere?)

Outline

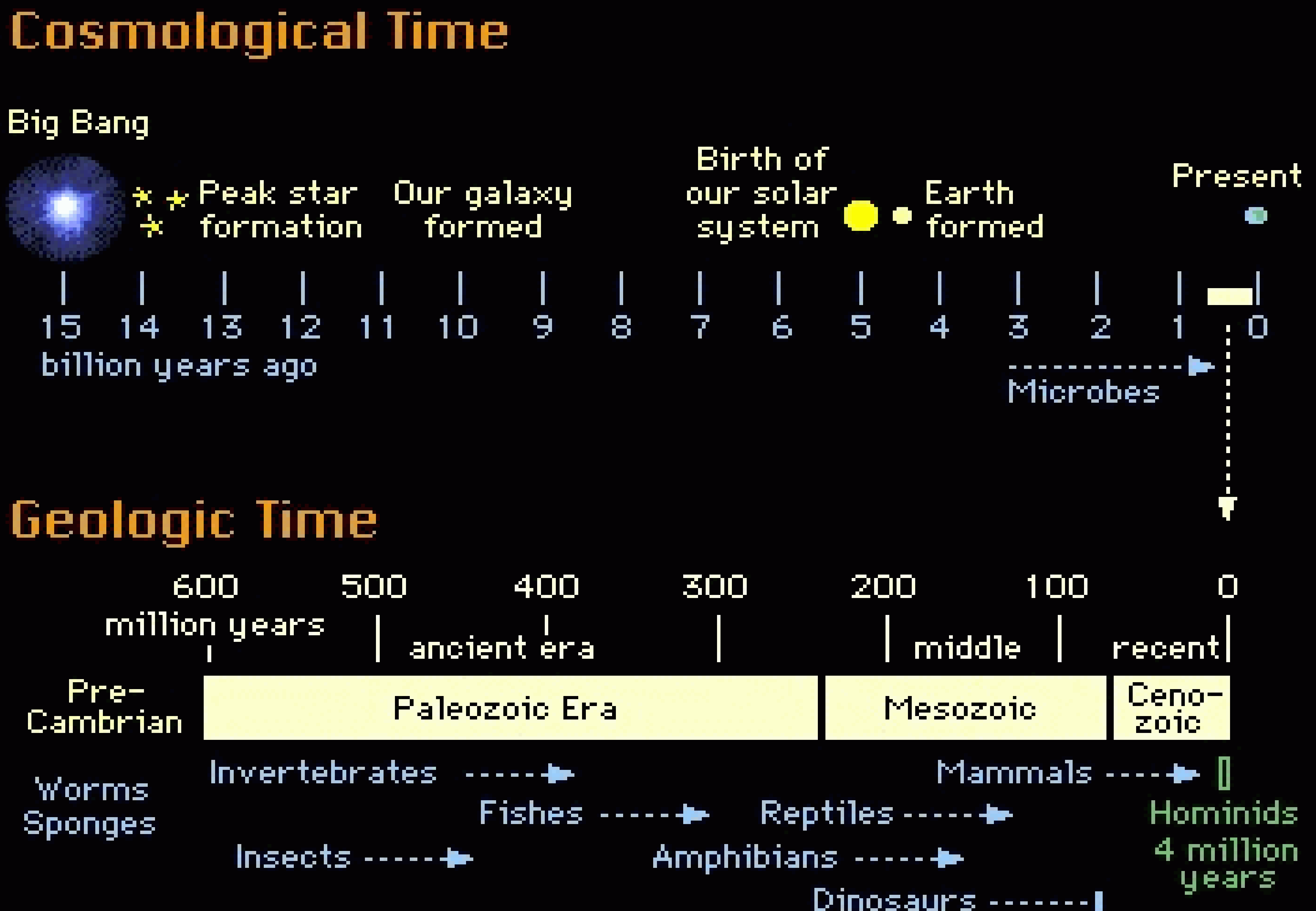
A Brief History of Planet Earth
and Natural Change.

The Anthropogenic (Human) Impact
on the Biosphere –Past and Present.

The Future –
Sustainability and Climate Change.
What is Happening and Why.
What We Can and Should Do About it.

This is the biosphere at its worst!


In the beginning………
13.8 billion years ago


Cosmological Time
Big Bang
Peak star formation
Our galaxy formed
Birth of our solar system
Earth formed
Present
15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
billion years ago
Microbes
Geologic Time
600 500 400 300 200 100 0
million years
ancient era
middle
recent
Pre-Cambrian
Paleozoic Era
Mesozoic
Ceno-zoic
Worms Sponges
Invertebrates
Fishes
Insects
Amphibians
Reptiles
Dinosaurs
Mammals
Hominids 4 million years

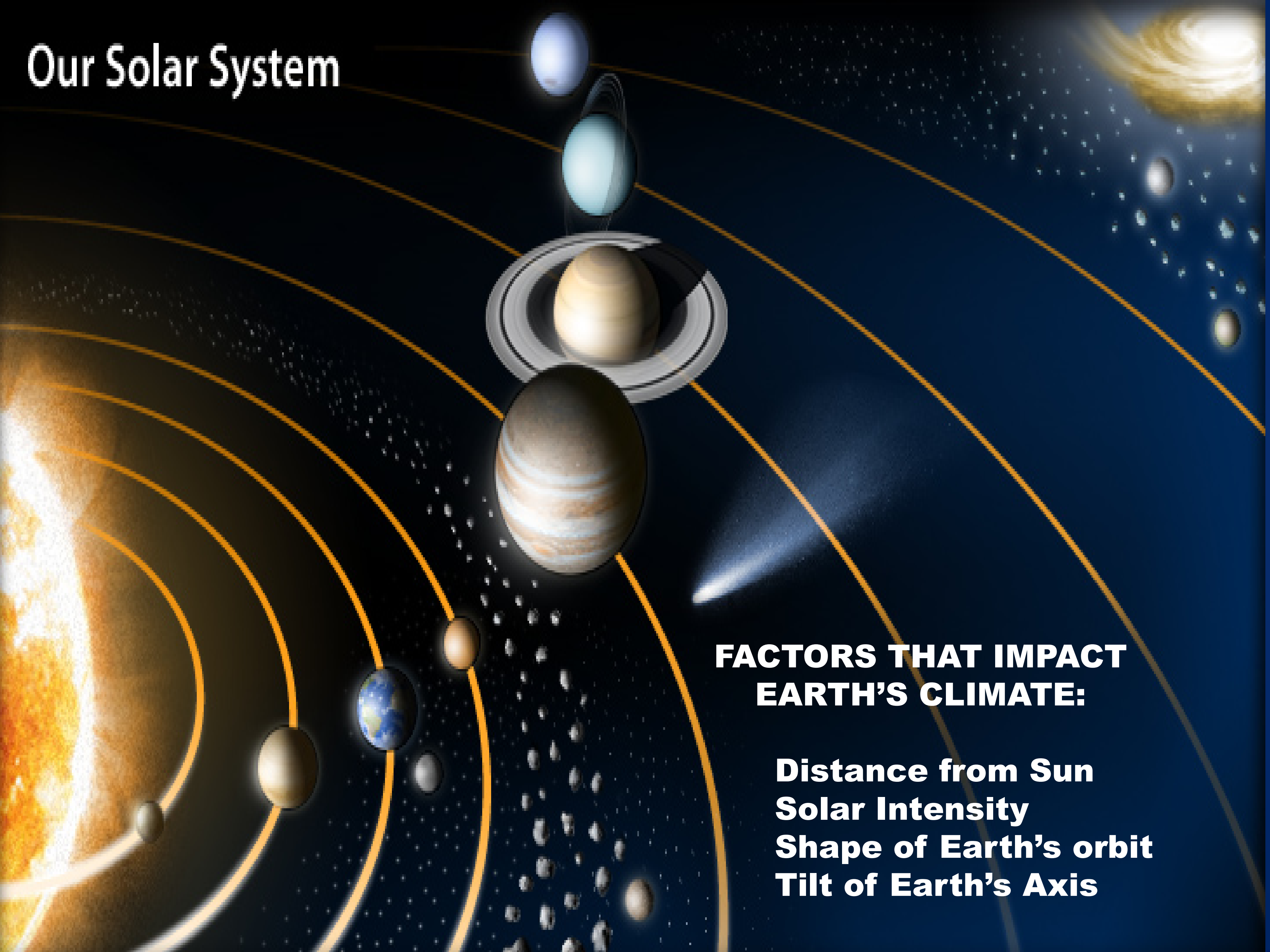
PLANET EARTH 2015

…. It has always been in a constant state of change.

… And, climate is not static !

AGENTS OF PLANETARY CHANGE

(On a Geological Time Scale)


Our Solar System
FACTORS THAT IMPACT EARTH'S CLIMATE:
Distance from Sun
Solar Intensity
Shape of Earth's orbit
Tilt of Earth's Axis

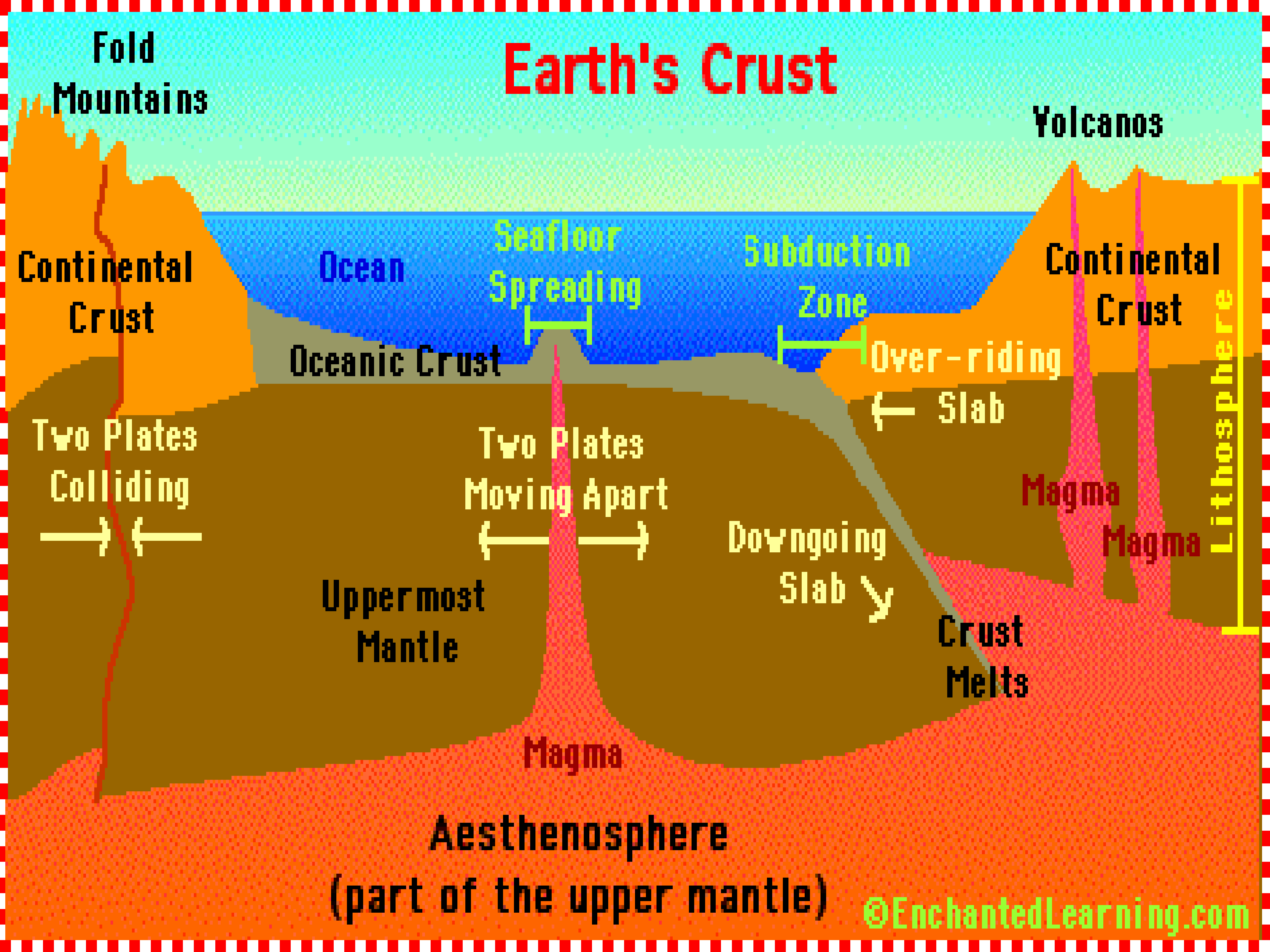
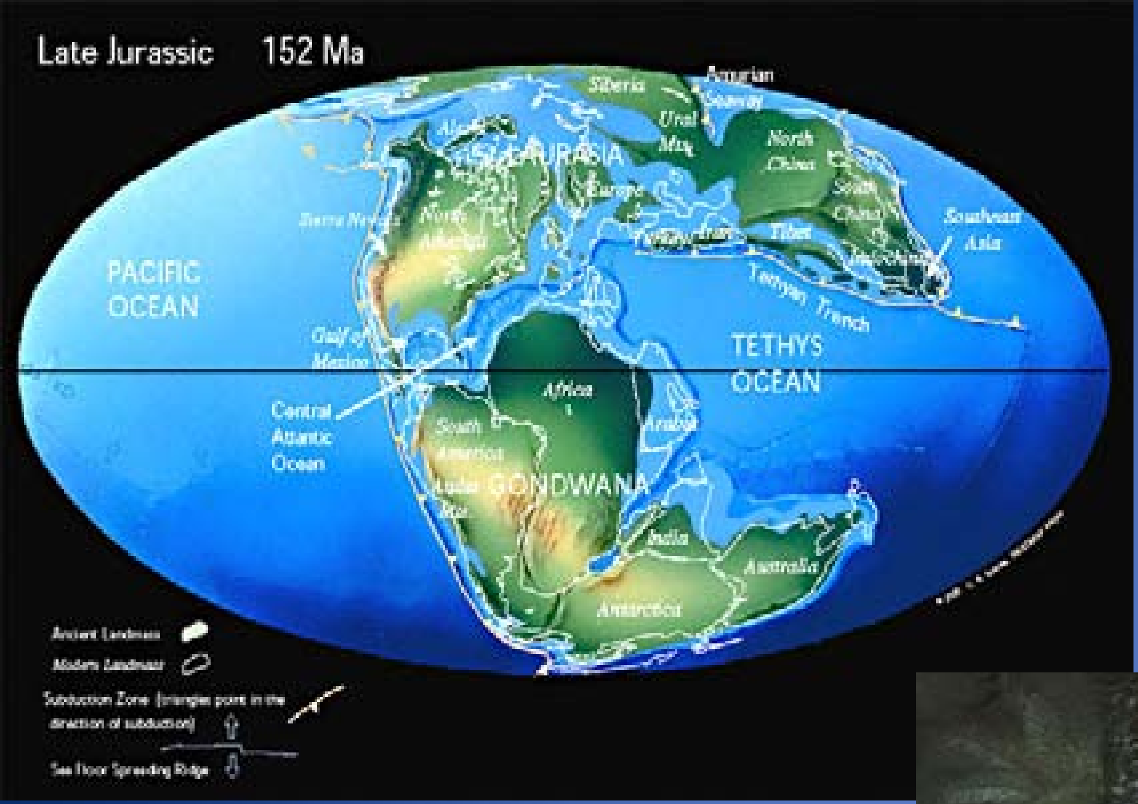

Earth's Crust
Fold Mountains
Volcanos
Continental Crust
Ocean
Seafloor Spreading
Subduction Zone
Continental Crust
Oceanic Crust
Over-riding Slab
Lithosphere
Two Plates Colliding
Two Plates Moving Apart
Magma
Magma
Downgoing Slab
Uppermost Mantle
Crust Melts
Magma
Aesthenosphere
(part of the upper mantle)
©EnchantedLearning.com

**PLATE TECTONICS
HAS CHANGED THE
LANDSCAPE AND BIOSPHERE**

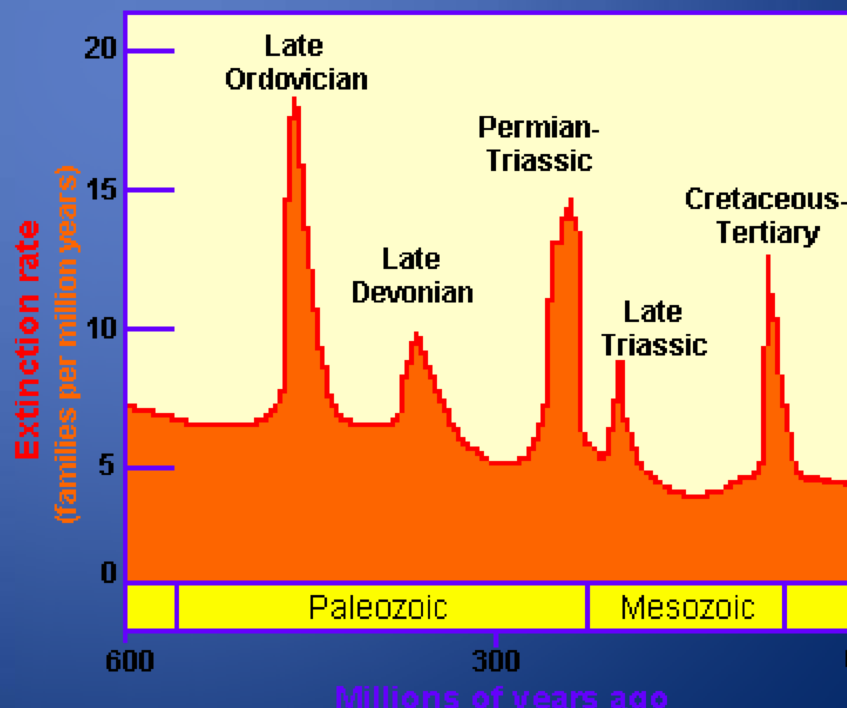
Factoid: ***The current spreading rate of the North Atlantic is about the same as the Growth of your fingernails.***
(This adds up in a million years!)



When dinosaurs roamed across Connecticut !

200 Million years ago! (See their tracks at the New Canaan Nature Center!)


MASS EXTINCTIONS IN THE
GEOLOGIC PAST

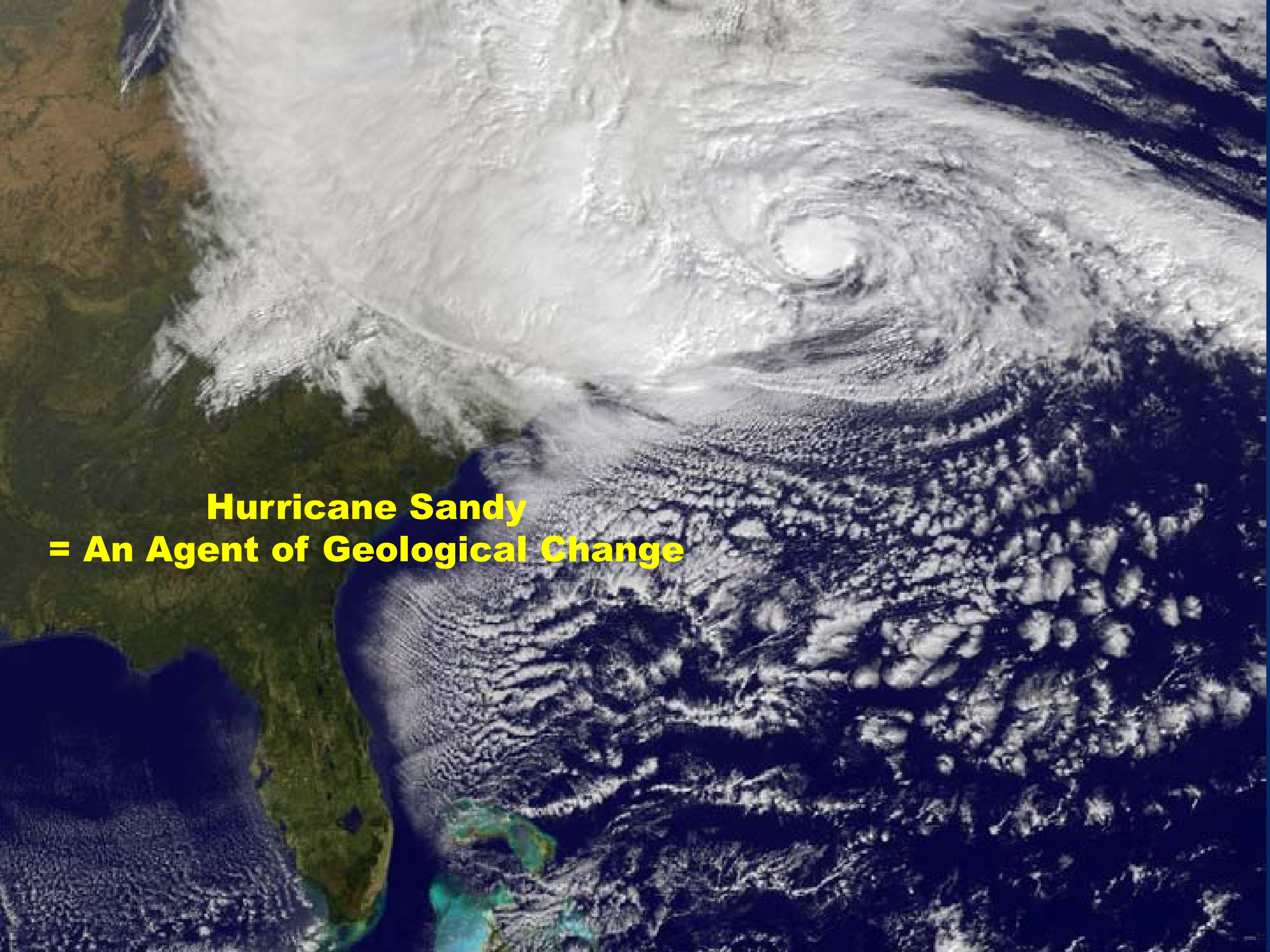

Late
Ordovician
Permian-
Triassic
Late
Devonian
Late
Triassic
Cretaceous-
Tertiary
20
15
10
5
0
Extinction rate
(families per million years)
Paleozoic
Mesozoic
600
300
0
Millions of years ago

Major Volcanic Eruptions = Geological Change

Tambora Eruption April 10, 1815
= Huge climate impact 1815-1818
32 cm snow in August 1816 – "Year without summer"
Global crop failures and famine

**Major Earthquakes =
Instant
Geological Change!**

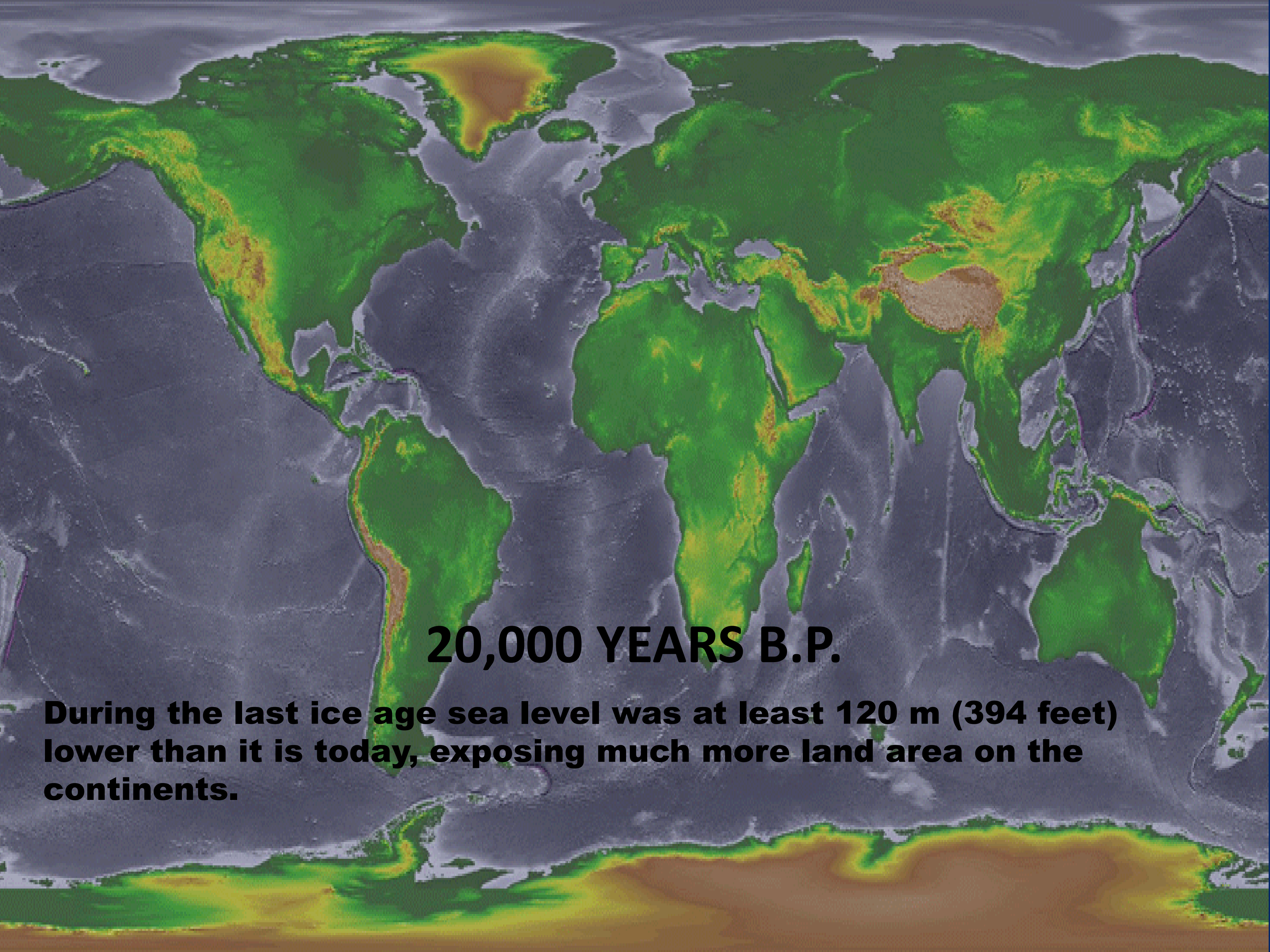
**... And, over time,
Result in significant
vertical and lateral
Movement.**


Hurricane Sandy
= An Agent of Geological Change

Major Flooding
= Geological Change

GEOLOGICALLY “RECENT” CLIMATE CHANGE

Maximum extent of ice sheets 18,000 years before the present. Courtesy of Dr. Alexander Moore.

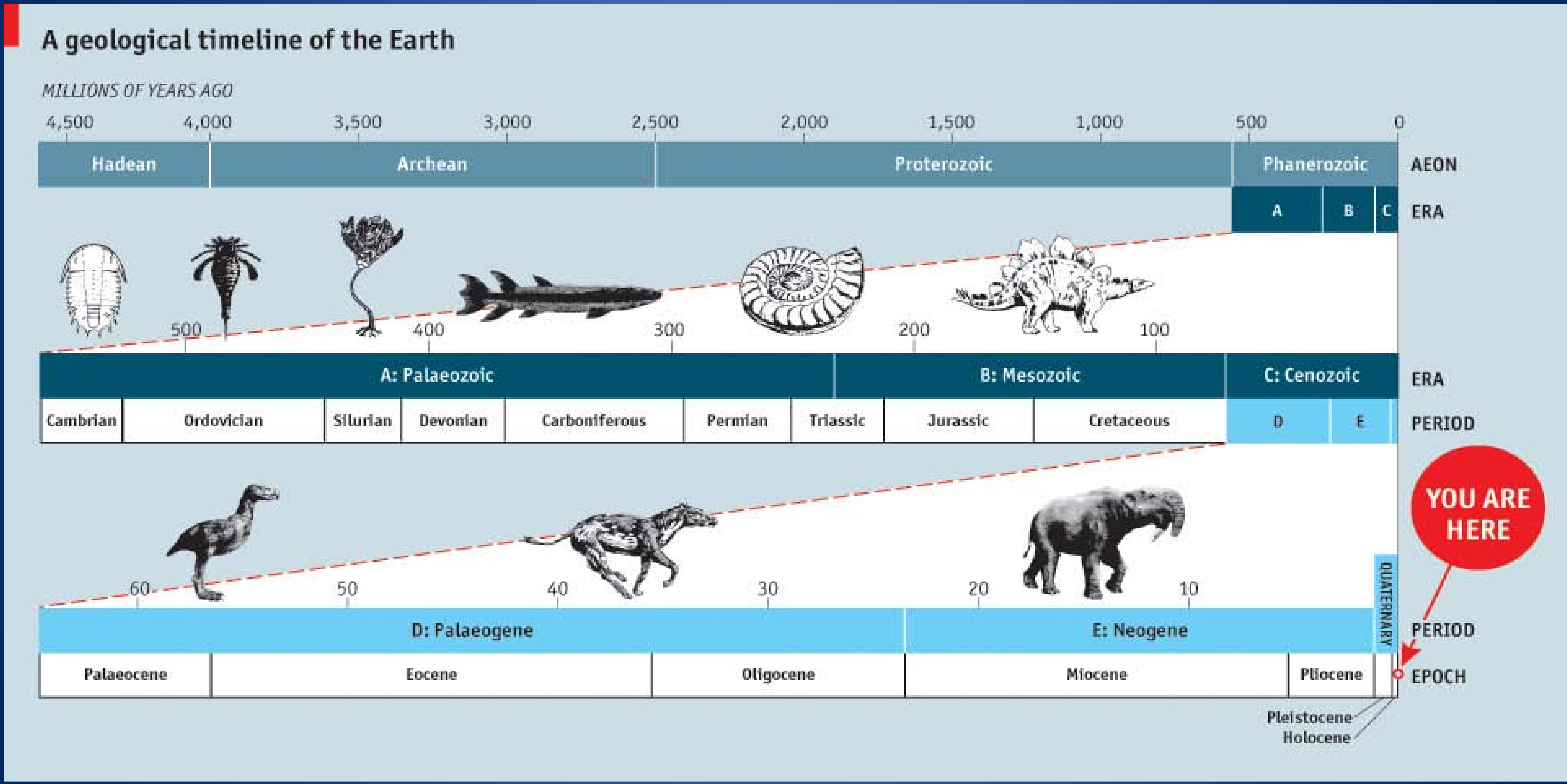


20,000 YEARS B.P.

During the last ice age sea level was at least 120 m (394 feet) lower than it is today, exposing much more land area on the continents.

Wildlife and humans moved freely between What is now the British Isles and Europe until about 8,000 years ago

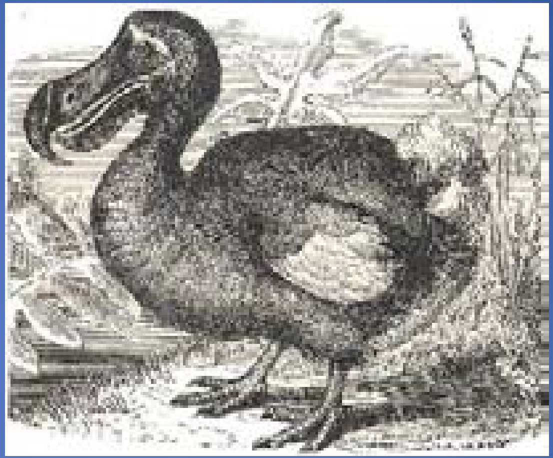
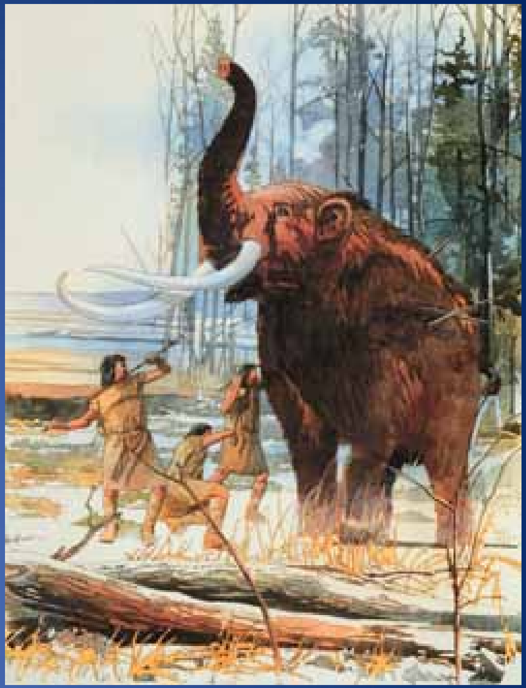
AGENTS OF PLANETARY CHANGE
Biological factors
(A Function of Geological Change And Evolution)



The issue now is the accelerated rate of change.

AGENTS OF PLANETARY CHANGE
Anthropogenic (Human) Factors

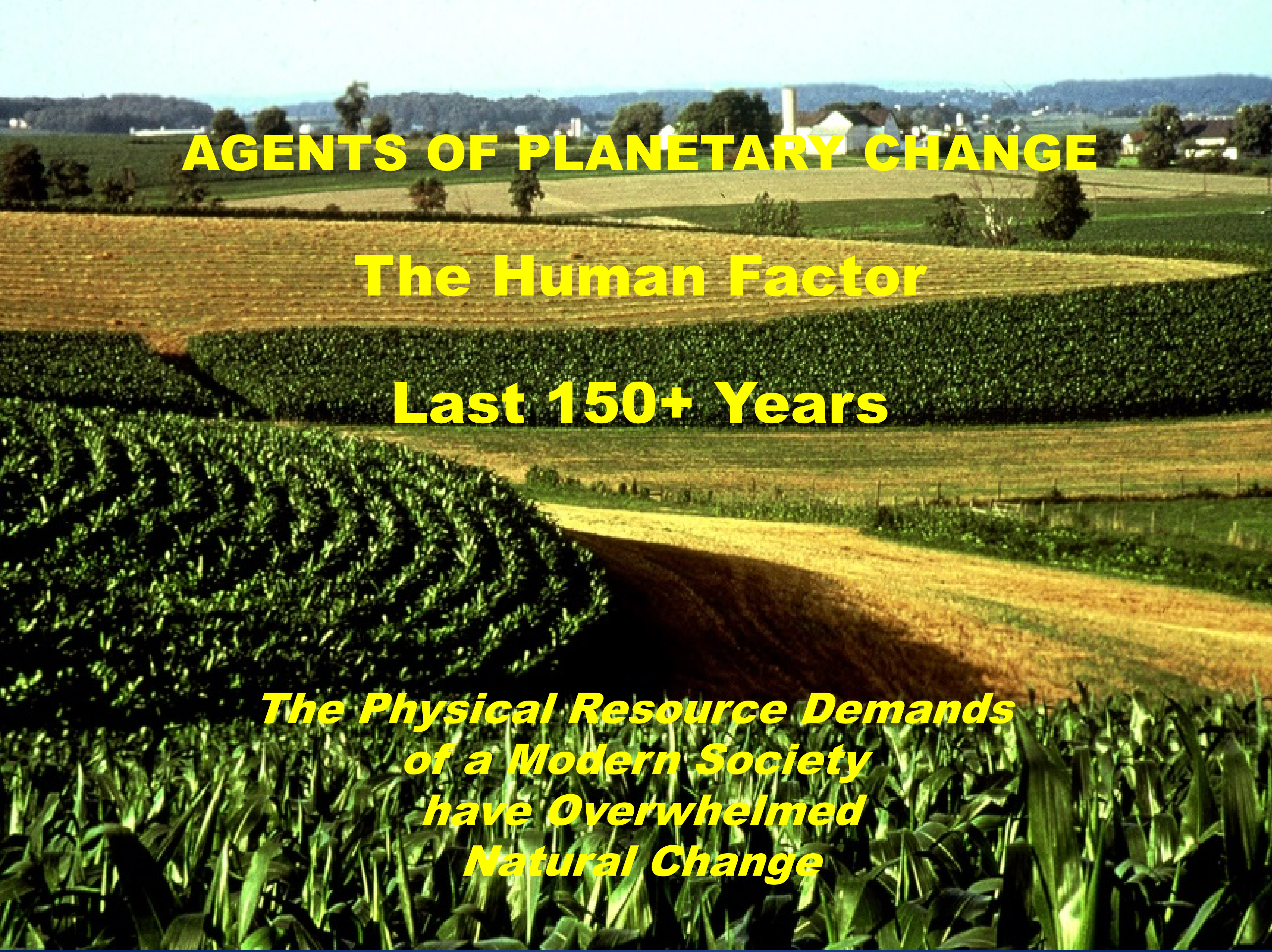
30,000 YEARS to circa 150 YEARS AGO


AGENTS OF PLANETARY CHANGE

The Human Factor

Last 150+ Years



The Physical Resource Demands of a Modern Society have Overwhelmed Natural Change

A MODERN SOCIETY DEMANDS:

- Food
- Water
- A Place to Live
- Modern Conveniences
- A Place to Work
- Recreation
- Transportation
- Infrastructure
- Energy to Run it all

This Impacts:

- The Landscape
- Water Resources
- Atmosphere
- Forests
- Oceans and Fisheries

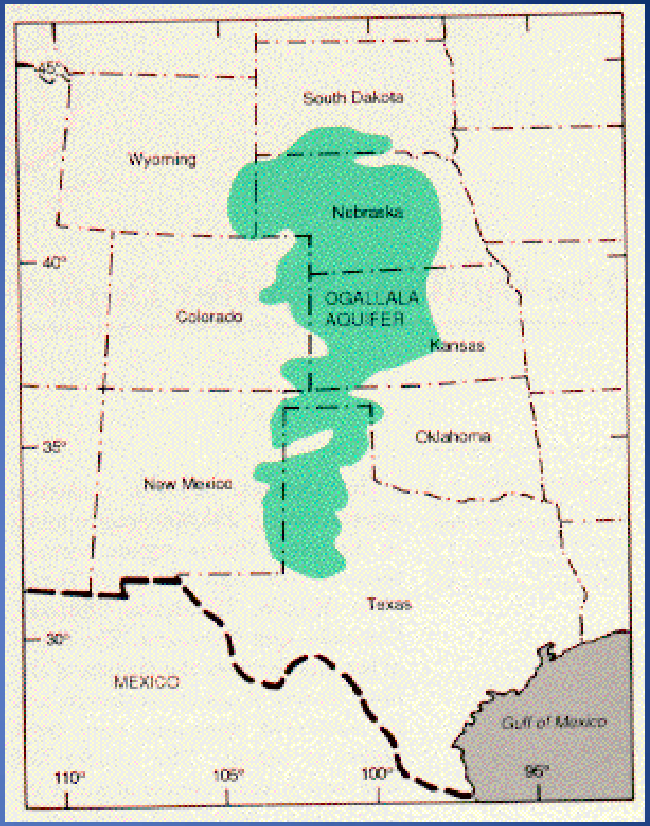
Society Creates Waste
= Pollution of air, rivers, oceans

Dig We Must for Natural Resources !

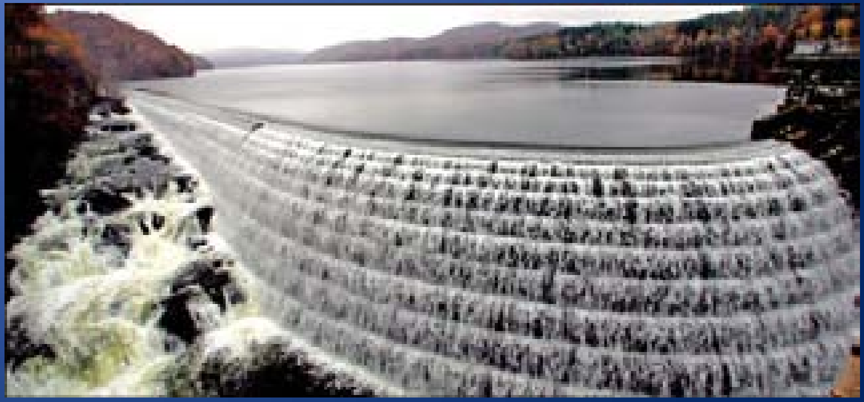
...Then the Raw Materials Must Be Processed !
= Energy Intensive
(And the products have to be be delivered to their markets)

Food, Shelter, Light & Heat

Drink We Must !



25 -160 ft.
Depletion
Since
1940

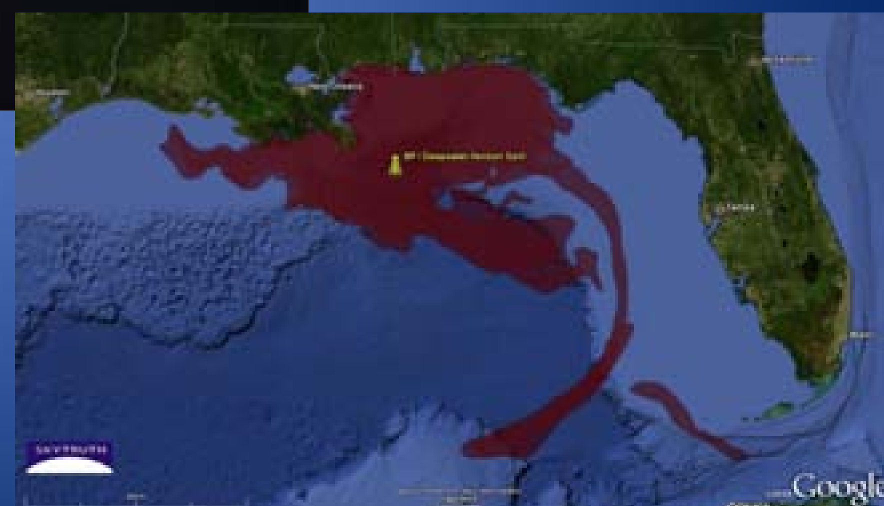


FOSSIL FUELS PROVIDE 80 % OF GLOBAL ENERGY

HUMANS AND AN AVOIDABLE LONG TERM IMPACT ON THE EARTH
(Good Stewardship Matters!)

DEEPWATER HORIZON

Hopefully this will not happen again,
But it could, and probably will.



AT WHAT POINT WILL THE OCEANS BE FISHED OUT?

(It's getting close for many species)

FACTOID:

Between 1970 and 2010, there has been a 52% global decline in overall vertebrate animal species as an expanding population In the developing world hunts animals to extinction for food.

The fastest decline has been in rivers and fresh water systems where the decline in populations has been 76%.

GWH Comment: This is simply not sustainable!

(Source: London Zoological Society and World Wildlife Fund October 2014).

Source: New York Times 1-25-2015

UNINTENDED CONSEQUENCES!

Mosquito nets donated to fight Malaria are being tied together to make fishing nets that are wiping out juvenile fish populations (and everything else that swims) in East African lakes.

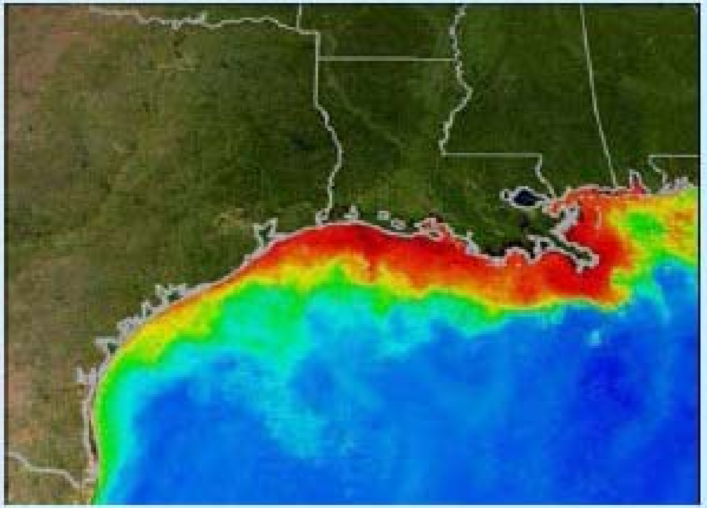
= Reduction in malaria mortality, but eventually no food!

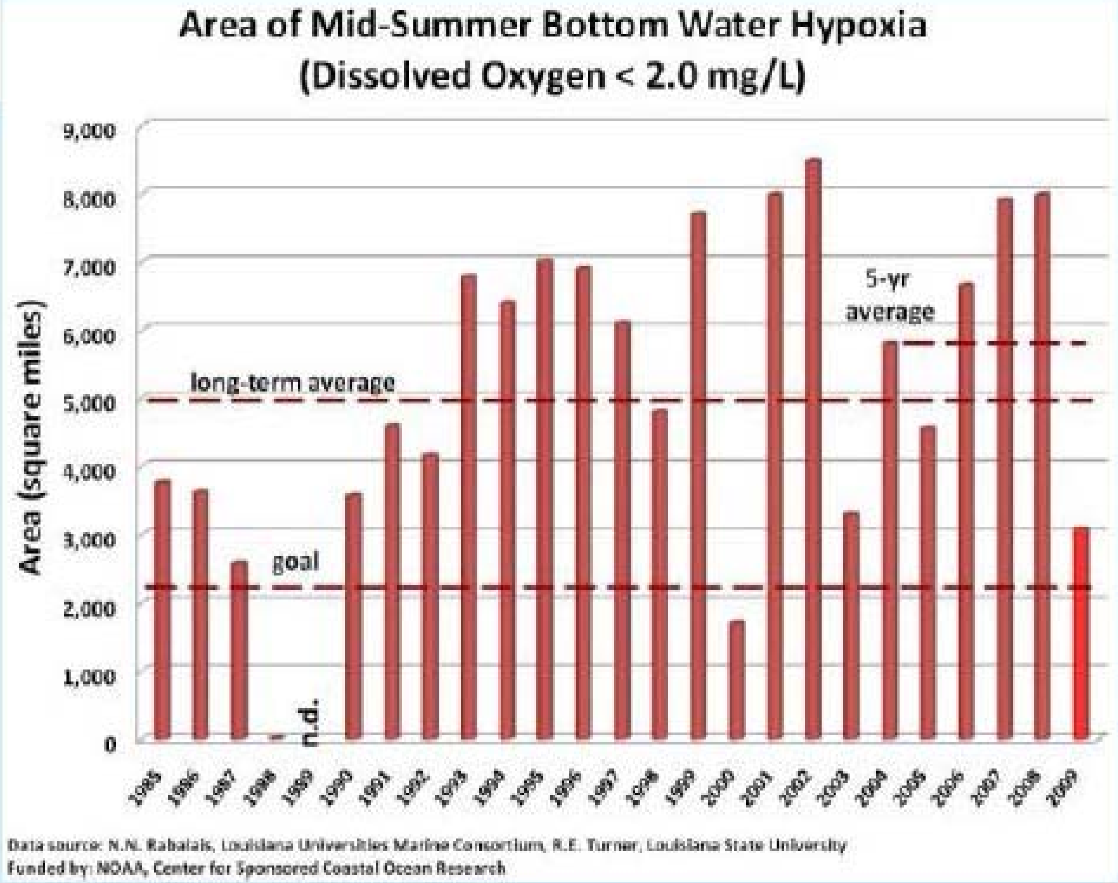
Oceans – land use issues

UNINTENDED CONSEQUENCES OF INTENSIVE AGRICULTURE

NOAA

Gulf of Mexico Hypoxic Zone



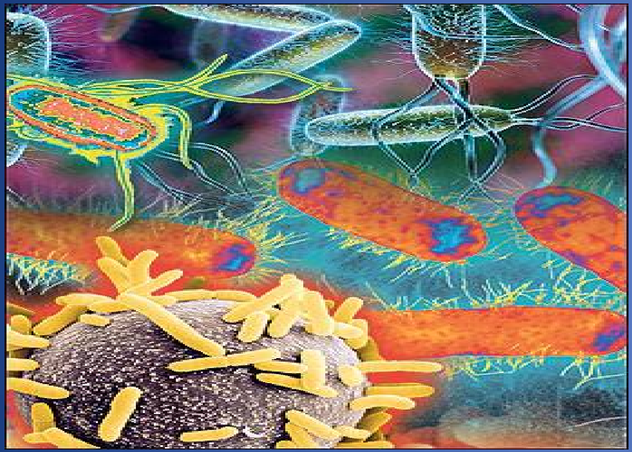


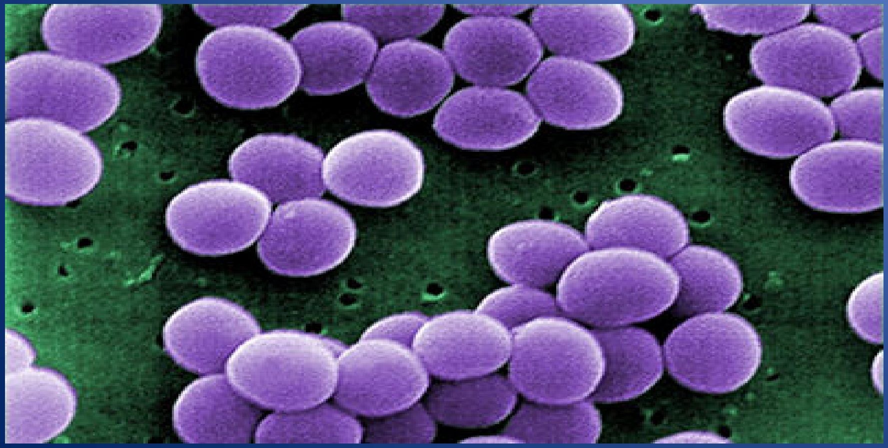

Will this be our legacy?
(We can be better stewards!)

CHANGE AT A MICRO-SCALE !

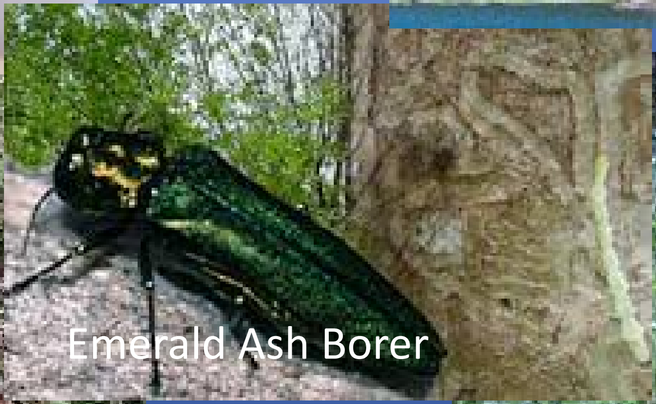
ANTI-BIOTIC RESISTANT "SUPER BUGS"

Millions are developing infections every year
For which there is now no simple cure.
23,000 deaths in USA in 2012

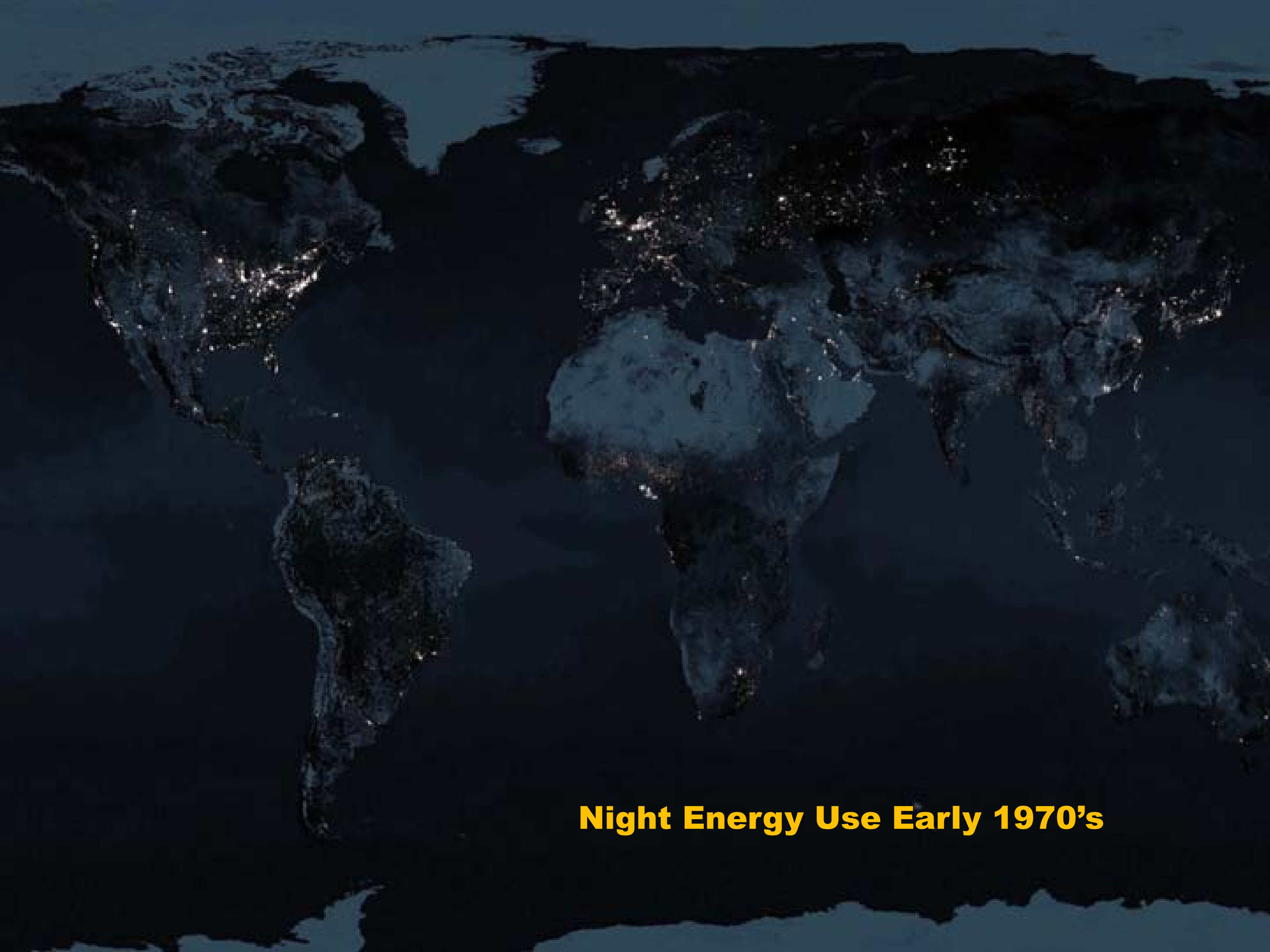




GLOBALIZATION = INVASIVE SPECIES



Nature cannot keep up with these changes!


Night Energy Use Early 1970’s

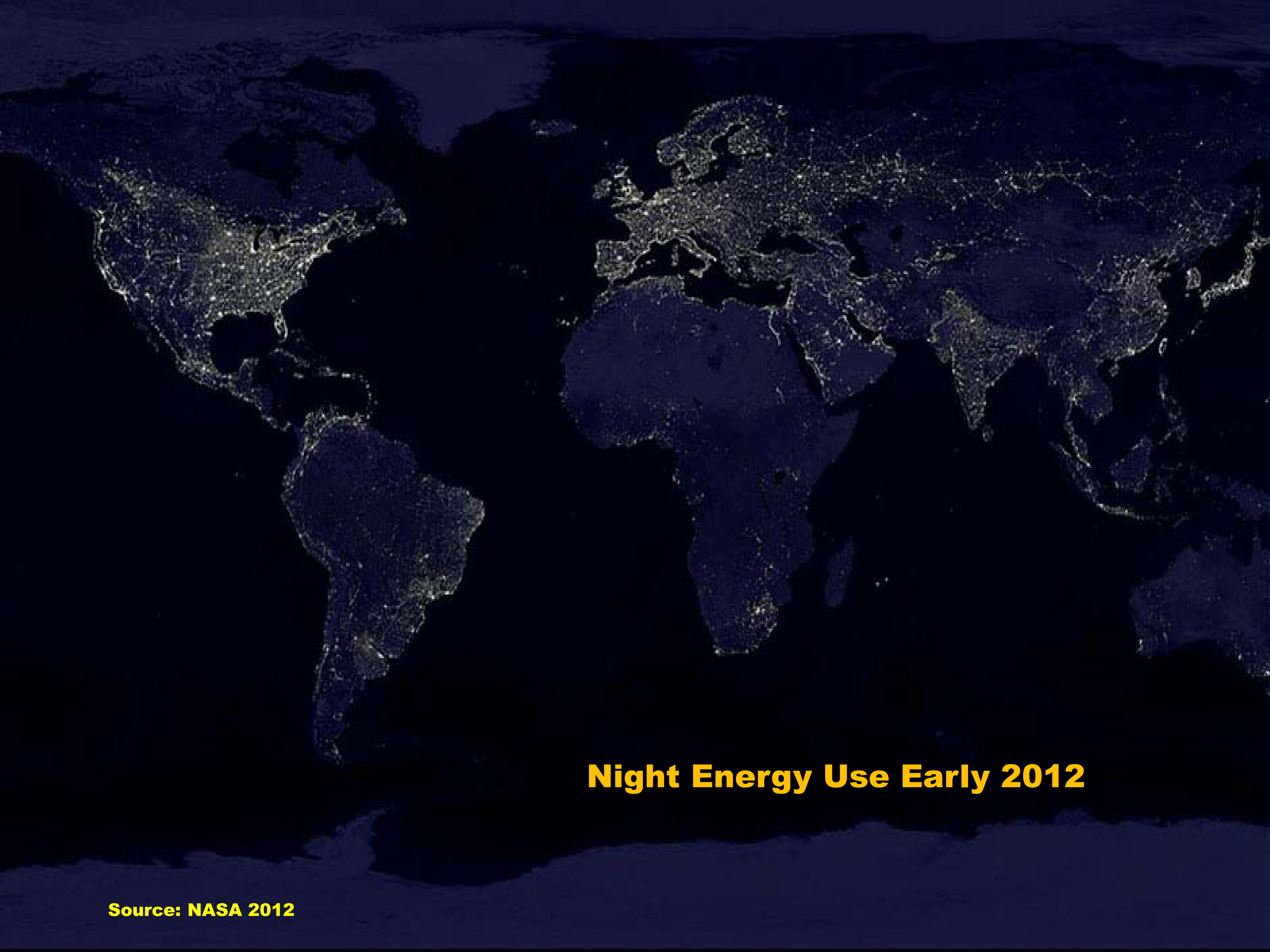
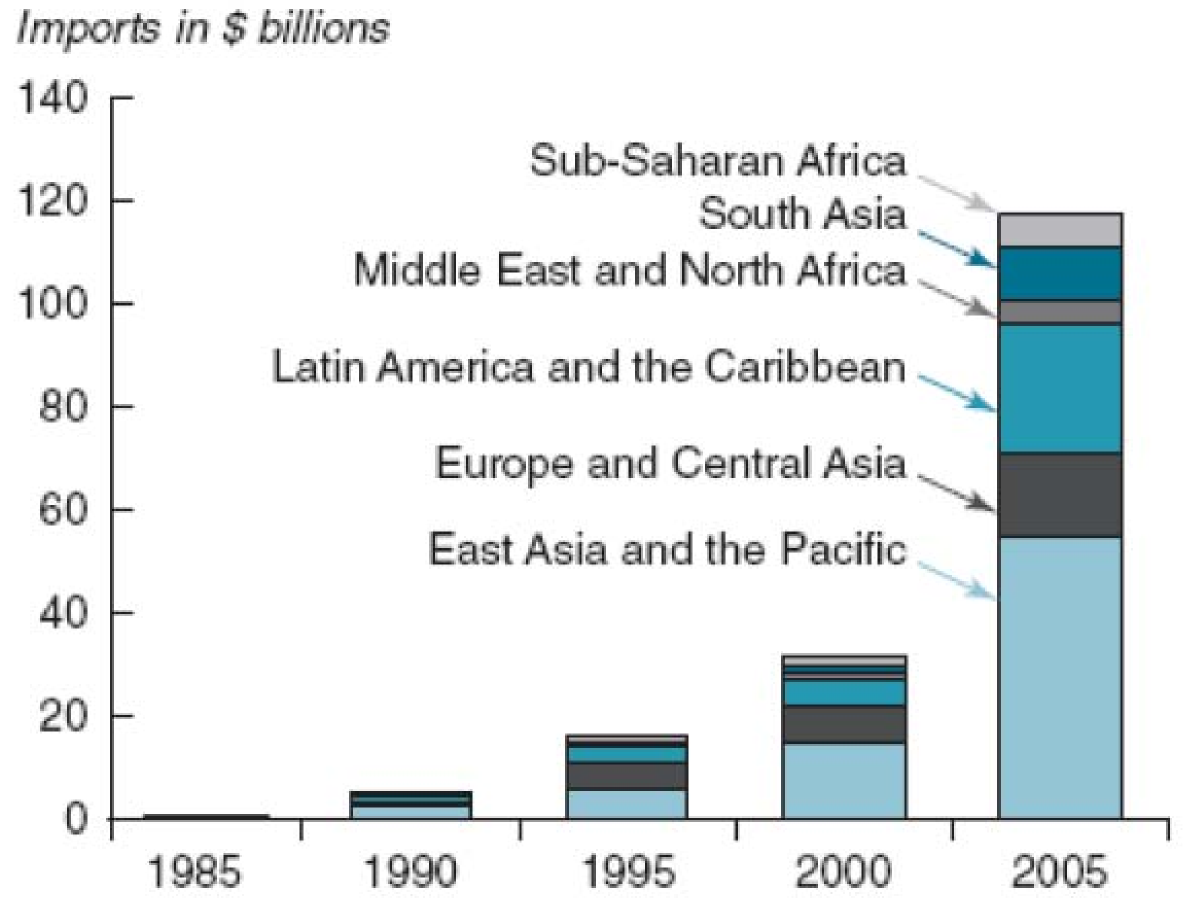

Night Energy Use Early 2012
Source: NASA 2012

CHART 1-8: EMERGING ECONOMY NON-OIL IMPORTS

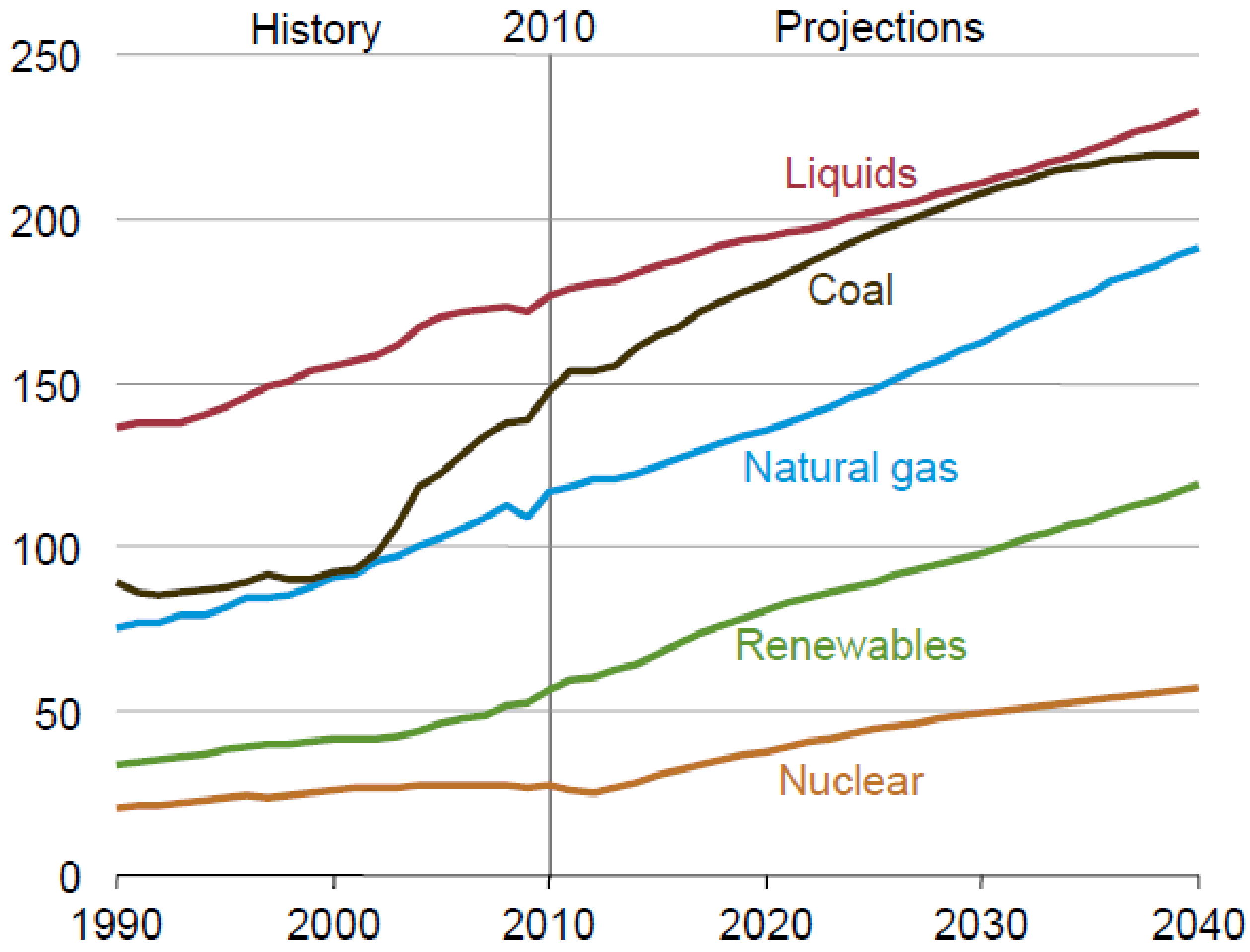


Source: World Bank staff calculations.

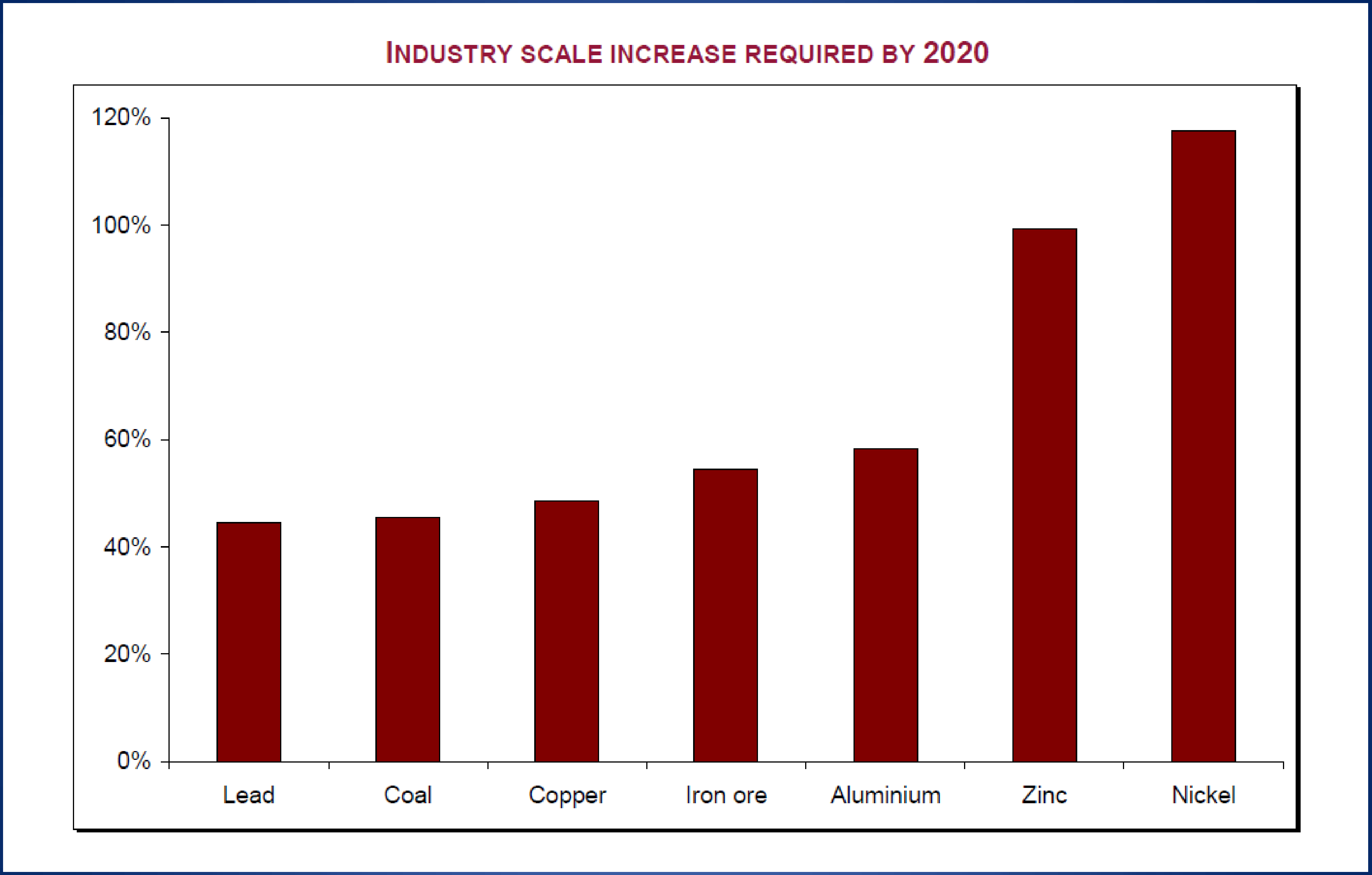
Global Consumption Is soaring!

GLOBAL ENERGY GROWTH

Figure 2. World energy consumption by fuel type, 1990-2040 (quadrillion Btu)

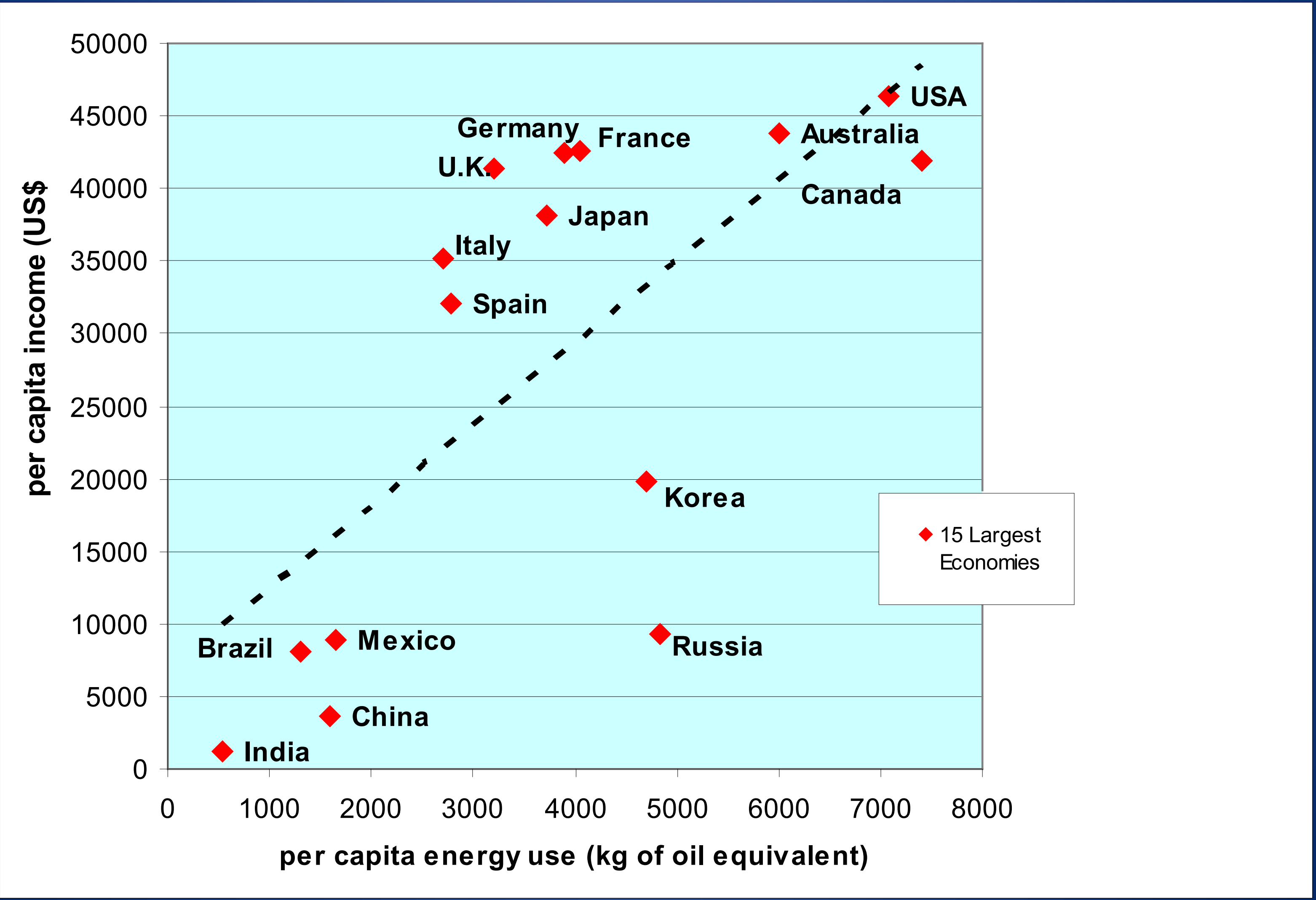


Source: EIA International Energy Outlook 2013



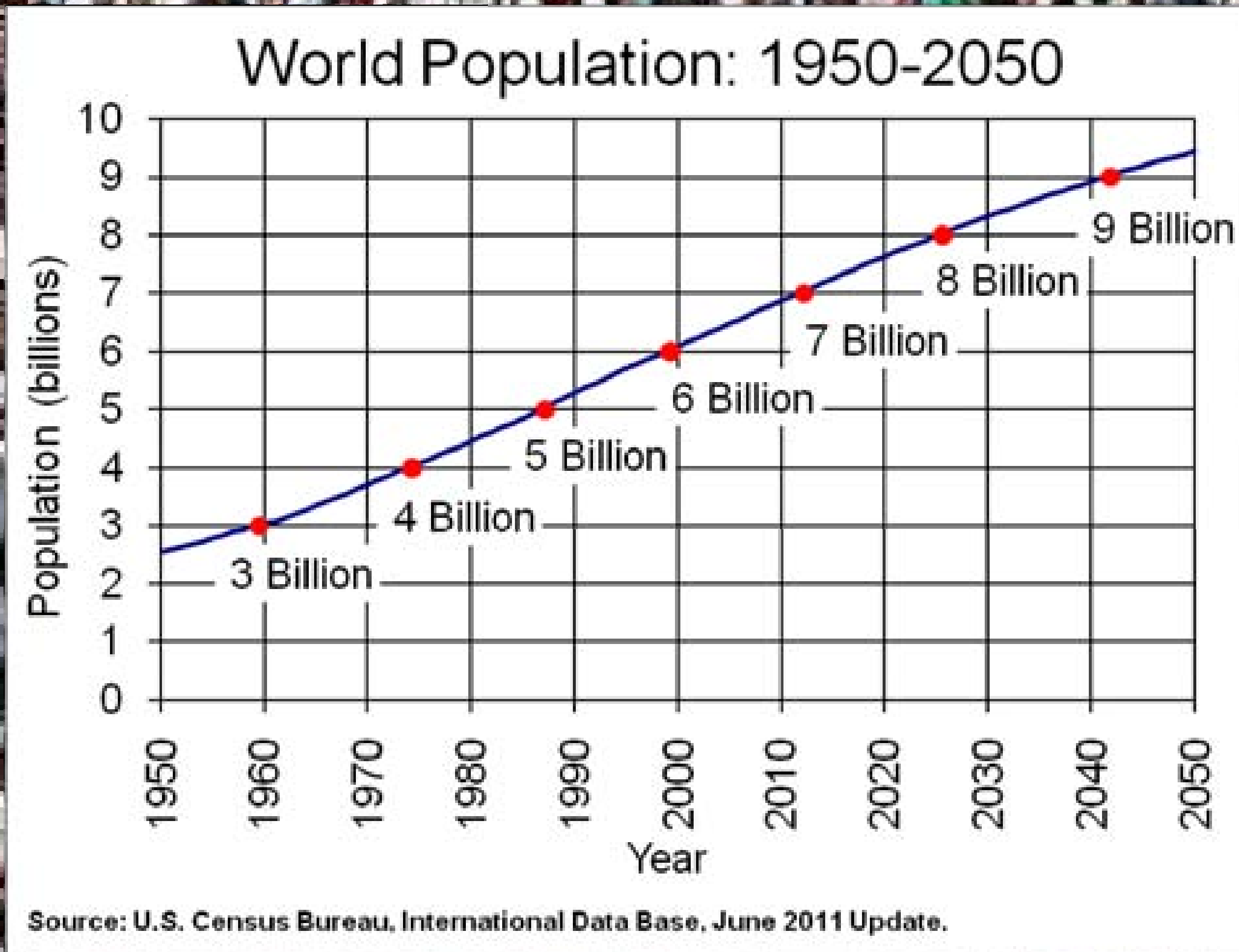
Source: Access Economics Pty for Minerals Council of Australia , 2008

Energy Consumption as an Indicator of the Wealth of Nations



Source: The World Bank, 2009 Data

THIS IS THE GREATEST FACTOR DRIVING GLOBAL CHANGE



MAGNUM PHOTOS

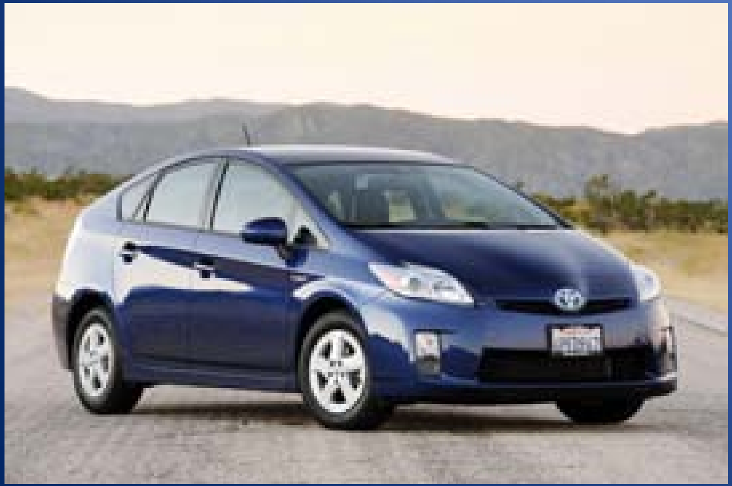
Our dilemma as concerned citizens - We live here and consume a huge amount of natural resources...

......But what about........

… Those that live here?

Are we prepared to change our lifestyles so that the developing world can enjoy a decent standard of living?
Do anything?

i.e……There are Transportation Options !




PLANET EARTH
The Next 100 Years


ENERGY AND CLIMATE CHANGE
Cheap and abundant fossil fuels
have energized America
And the world’s economies.


However, we now know that
there is an environmental price………
The business model must
change for the
good of planet earth.

WHY DOES CLIMATE CHANGE TODAY MATTER?

The biosphere must be able to adapt to the current rate of change. It cannot!

The impact on humans; where and how they live; the global economy; and geopolitics will be disruptive and severe.

We must deal with this now!

CONTROVERSIAL SCIENTIFIC THEORIES THROUGH TIME

The earth is round.
The earth revolves around the sun.
Man is descended from the apes.
The continents move about.

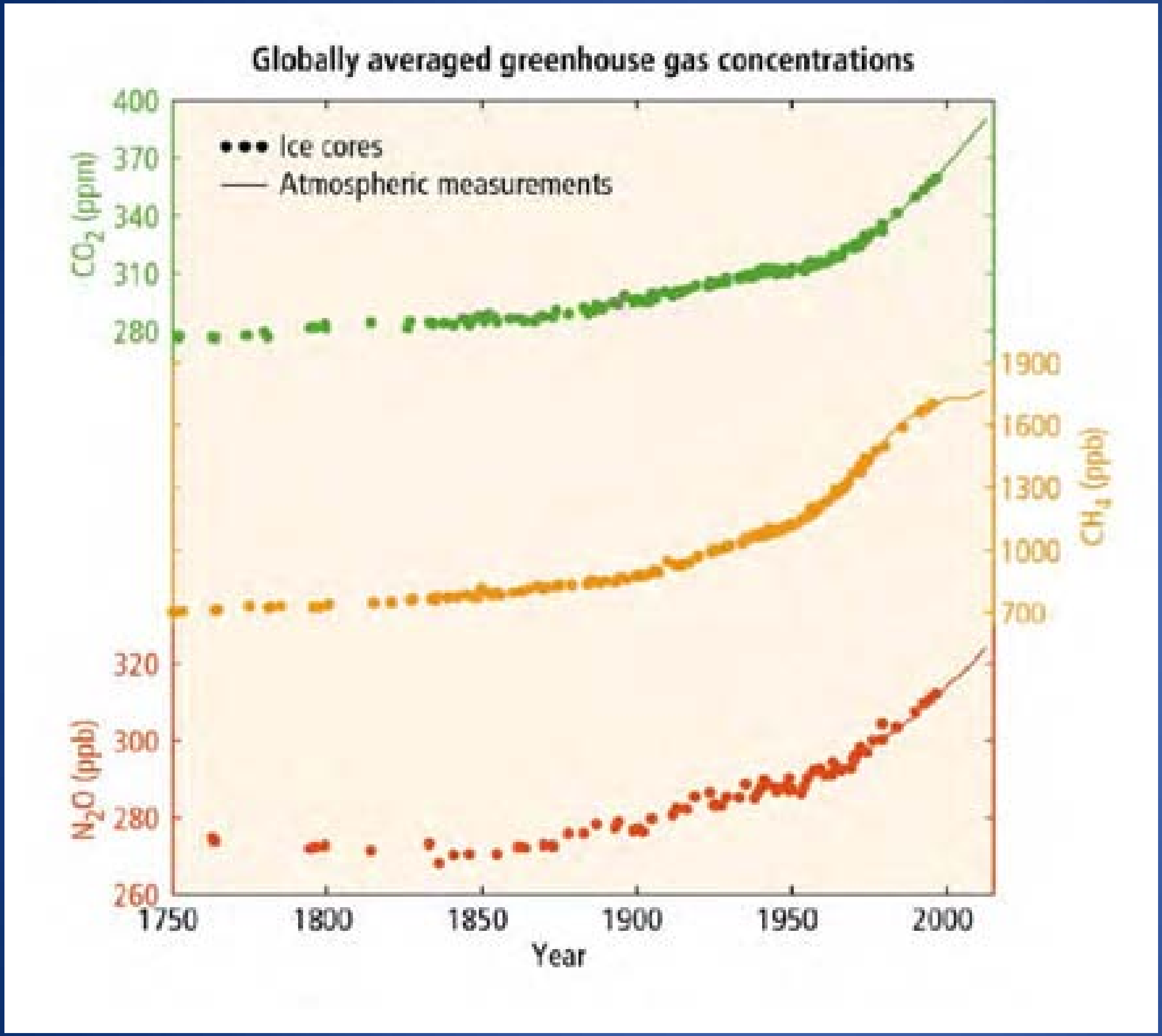
Now………..

Anthropogenic CO_2
Is causing (or accelerating) global warming.

"My friends, the debate is over , despite what you read in the Wall Street Journal."

(Skip Hobbs – Former President, American Geological Institute)

FACT: GREENHOUSE GASES RAISE ATMOSPHERIC TEMPERATURES

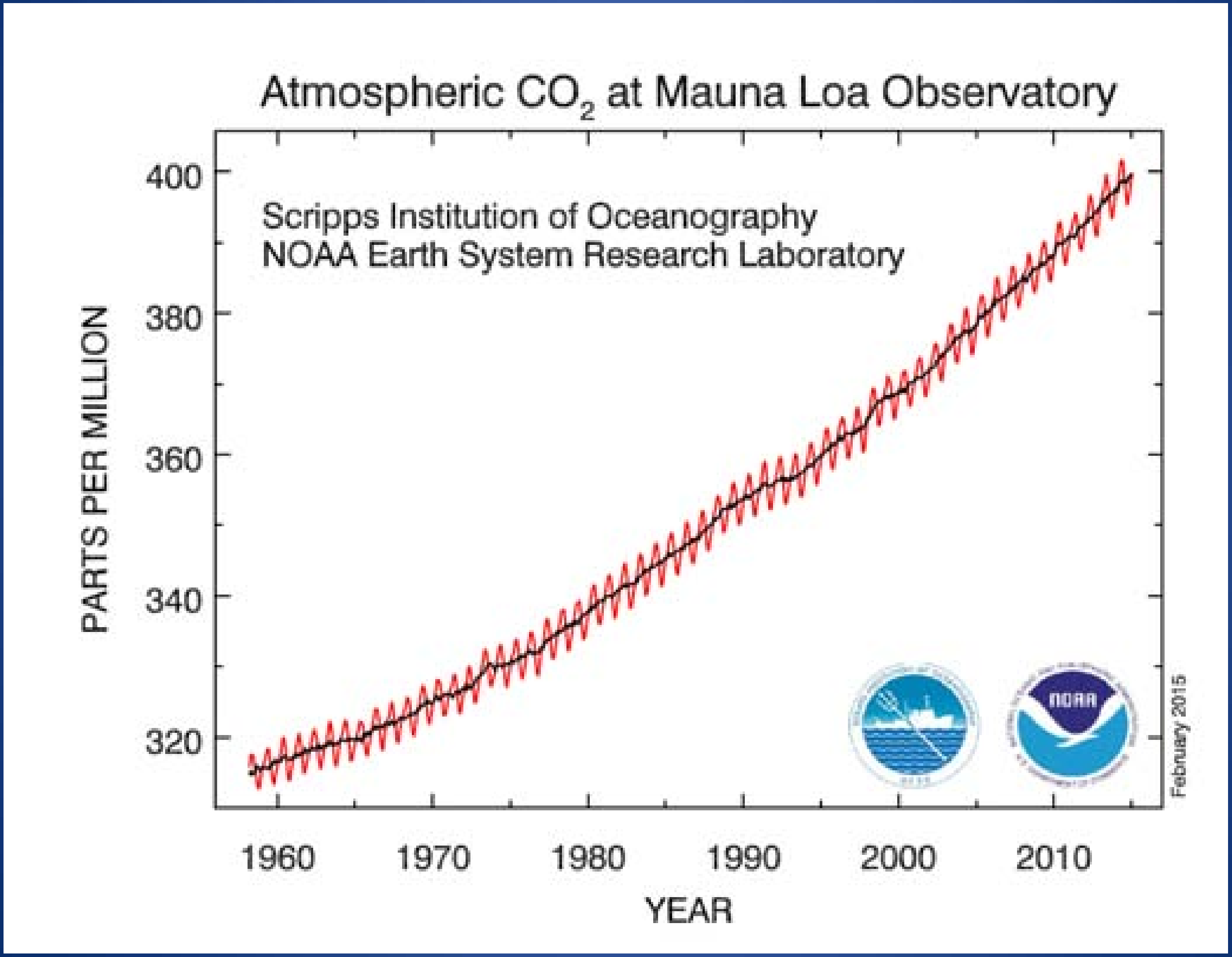


Water vapor is also
A greenhouse gas,
but the atmosphere
can only hold so much,
and then it rains!

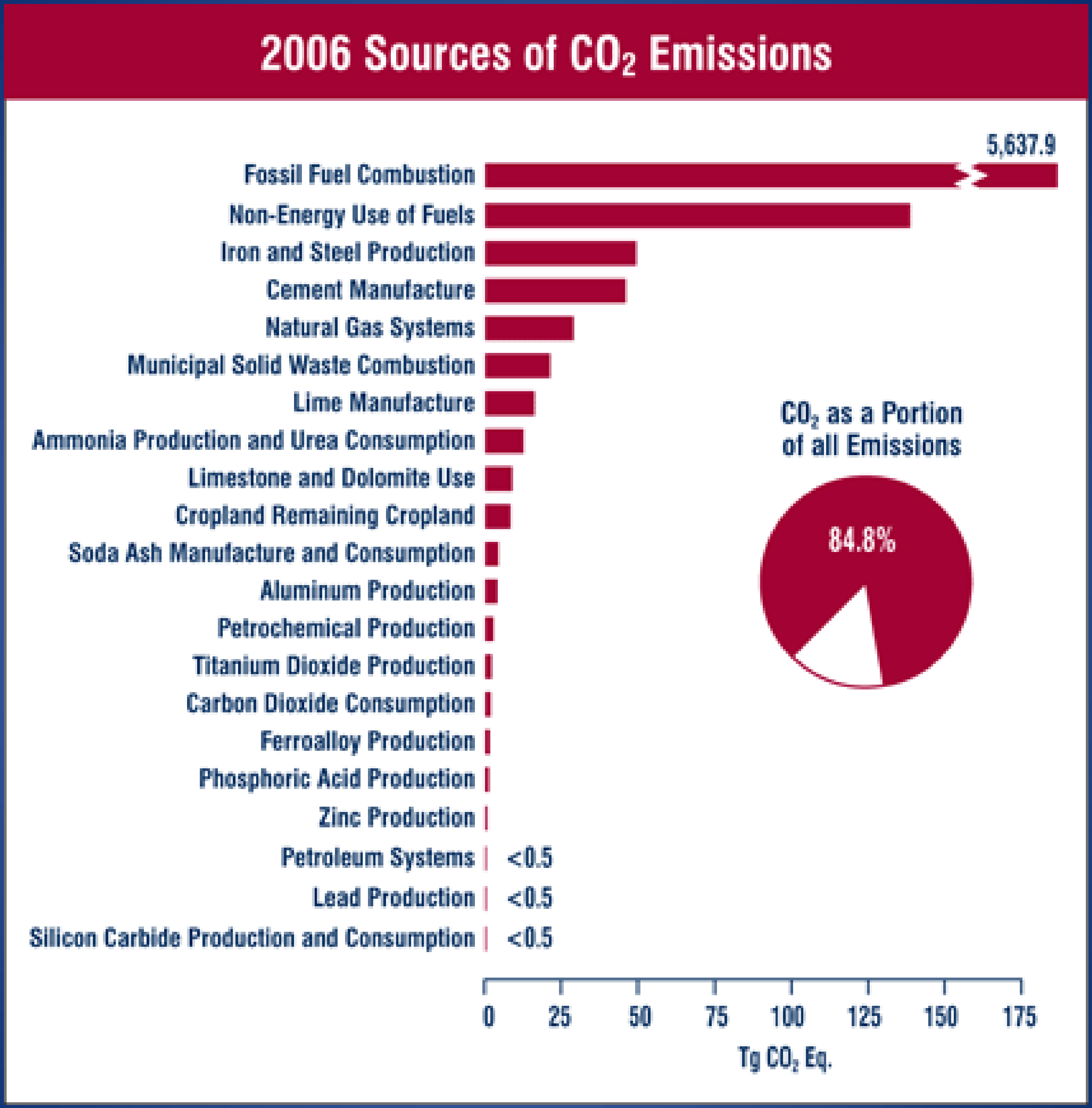
Atmospheric concentrations of greenhouse gases are at levels that are unprecedented in at least the last 800,000 years.

Source: IPCC 5th Assessment, Nov 2014

ATMOSPHERIC CO2 NOW AT 400 PPM



Source: NOAA Feb 2015

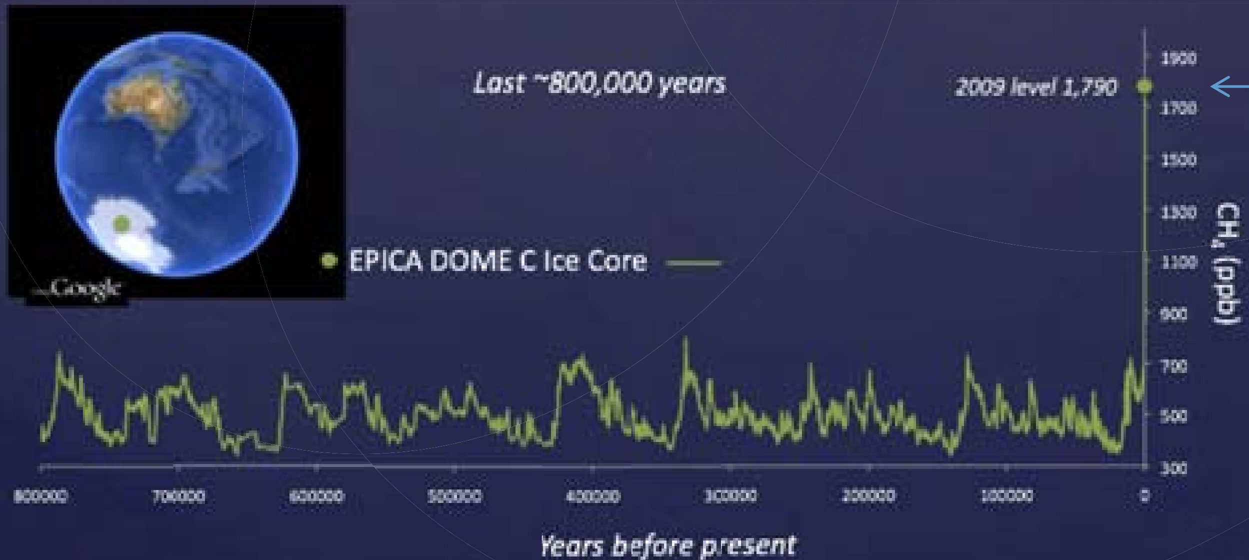


2006 Sources of CO_2 Emissions
5,637.9
Fossil Fuel Combustion
Non-Energy Use of Fuels
Iron and Steel Production
Cement Manufacture
Natural Gas Systems
Municipal Solid Waste Combustion
Lime Manufacture
Ammonia Production and Urea Consumption
Limestone and Dolomite Use
Cropland Remaining Cropland
Soda Ash Manufacture and Consumption
Aluminum Production
Petrochemical Production
Titanium Dioxide Production
Carbon Dioxide Consumption
Ferroalloy Production
Phosphoric Acid Production
Zinc Production
Petroleum Systems <0.5
Lead Production <0.5
Silicon Carbide Production and Consumption <0.5
0 25 50 75 100 125 150 175
Tg CO_2 Eq.
CO_2 as a Portion of all Emissions
84.8%

Source: EPA

ANTARCTIC ICE CORE DATA

CO_2 and CH_4
Greenhouse Gases
At 800,000 year peak



Source: NOAA, Elsig, J. et al, 2009 EPICA Dome C Ice Core Holocene d13CO2 Data-Antarctica

When was CO2 last at today's level, and what was the world like then?

5.2 - 2.6 million years ago (during the Pliocene), CO^2 concentrations in the atmosphere reached between 330 and 400 ppm. Global temperatures were 2-3°C higher than now, and sea levels were higher by 10 – 25 metres.

Large fluctuations in ice cover on Greenland and West Antarctica during the Pliocene. During the warm intervals those areas were probably largely free of ice. Some ice may also have been lost from parts of East Antarctica during the warm intervals. Coniferous forests replaced tundra in the high latitudes of the Northern Hemisphere, and the Arctic Ocean may have been seasonally free of sea-ice.

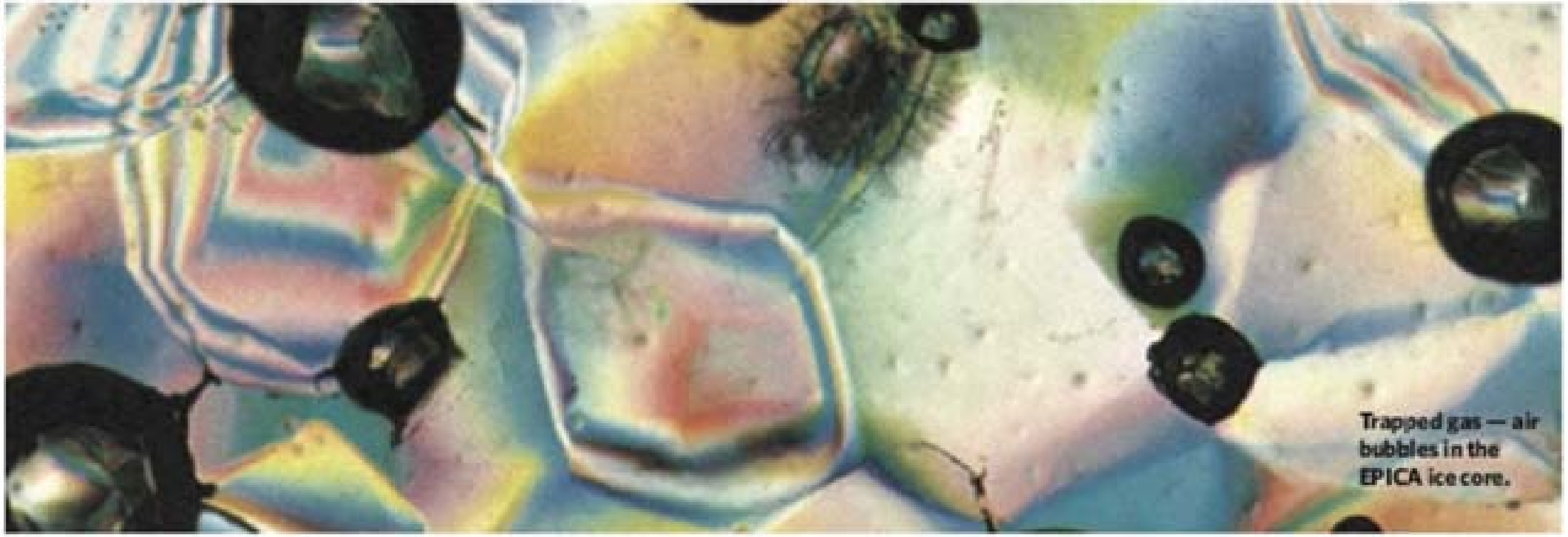
Source: Climate Policy Statement of the Geological Society of London

Note: Paleocene-Eocene Thermal Maximum (PETM) 55 million years ago
Temperatures rose 5-9°C over 10,000 years; CO2 possibly up to 2000 ppm;
Semi-tropical conditions in arctic, no ice;
Cause – kimberlite eruptions (?), CH_4 hydrates melted (?).
= Major ecological changes

Vol 453|15 May 2008 nature

NEWS & VIEWS

THE EPICA COLLABORATION



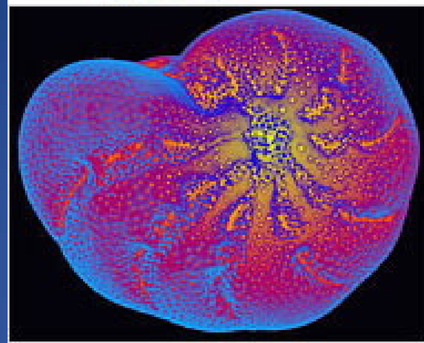
Trapped gas — air bubbles in the EPICA ice core.

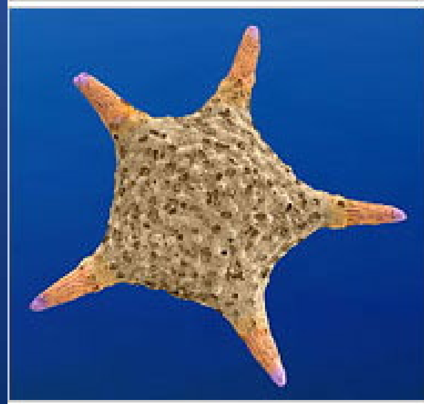
PALAEOCLIMATE

Windows on the greenhouse

Ed Brook

Data laboriously extracted from an Antarctic ice core provide an unprecedented view of temperature, and levels of atmospheric carbon dioxide and methane, over the past 800,000 years of Earth's history.



FORAMINIFERA:
ONE CELLED ANIMALS THAT MAKE A CARBONATE SHELL

MEASURE: $^{18}O/^{16}O$ Ratio

High- ice age

Low- interglacial

ipcc

INTERGOVERNMENTAL PANEL ON climate change

WORKING GROUP I – TWELFTH SESSION
Stockholm, 23-26 September 2013

WG-I: 12th/Doc. 2b, Add.1
(22.IX.2013)
Agenda Item: 5
ENGLISH ONLY

WORKING GROUP I CONTRIBUTION TO THE IPCC FIFTH ASSESSMENT REPORT
CLIMATE CHANGE 2013: THE PHYSICAL SCIENCE BASIS

Final Draft Underlying Scientific-Technical Assessment

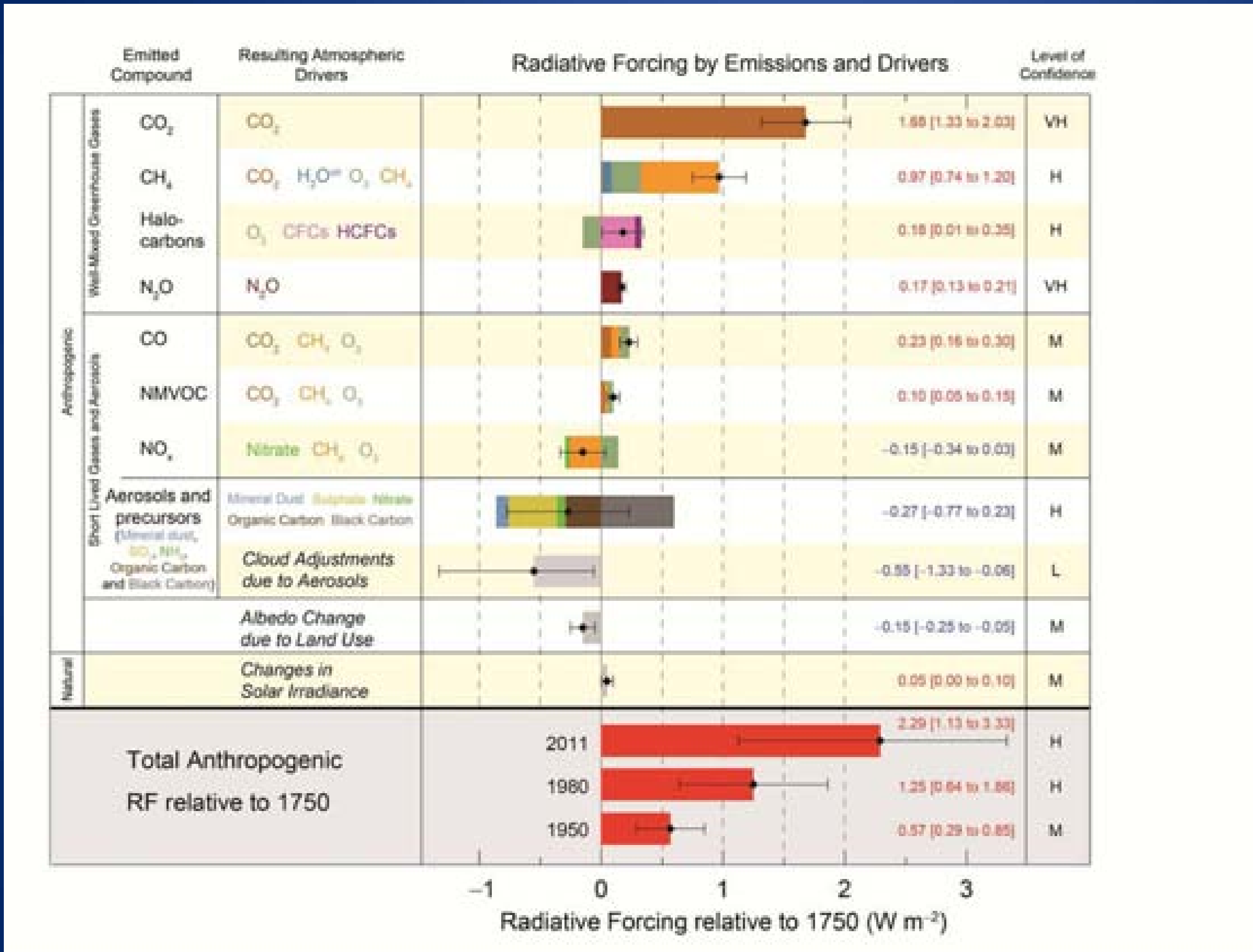
Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased (see Figures SPM.1, SPM.2, SPM.3 and SPM.4). {2.2, 2.4, 3.2, 3.7, 4.2–4.7, 5.2, 5.3, 5.5–5.6, 6.2, 13.2}

The rate of sea level rise since the mid-19th century has been larger than the mean rate during the previous two millennia (*high confidence*). Over the period 1901–2010, global mean sea level rose by 0.19 [0.17 to 0.21] m (see Figure SPM.3). {3.7, 5.6, 13.2}

Human influence has been detected in warming of the atmosphere and the ocean, in changes in the global water cycle, in reductions in snow and ice, in global mean sea level rise, and in changes in some climate extremes (Figure SPM.6 and Table SPM.1). This evidence for human influence has grown since AR4. It is *extremely likely* that human influence has been the dominant cause of the observed warming since the mid-20th century. {10.3–10.6, 10.9}

Note: "*extremely likely*" defined as 95-100% probability

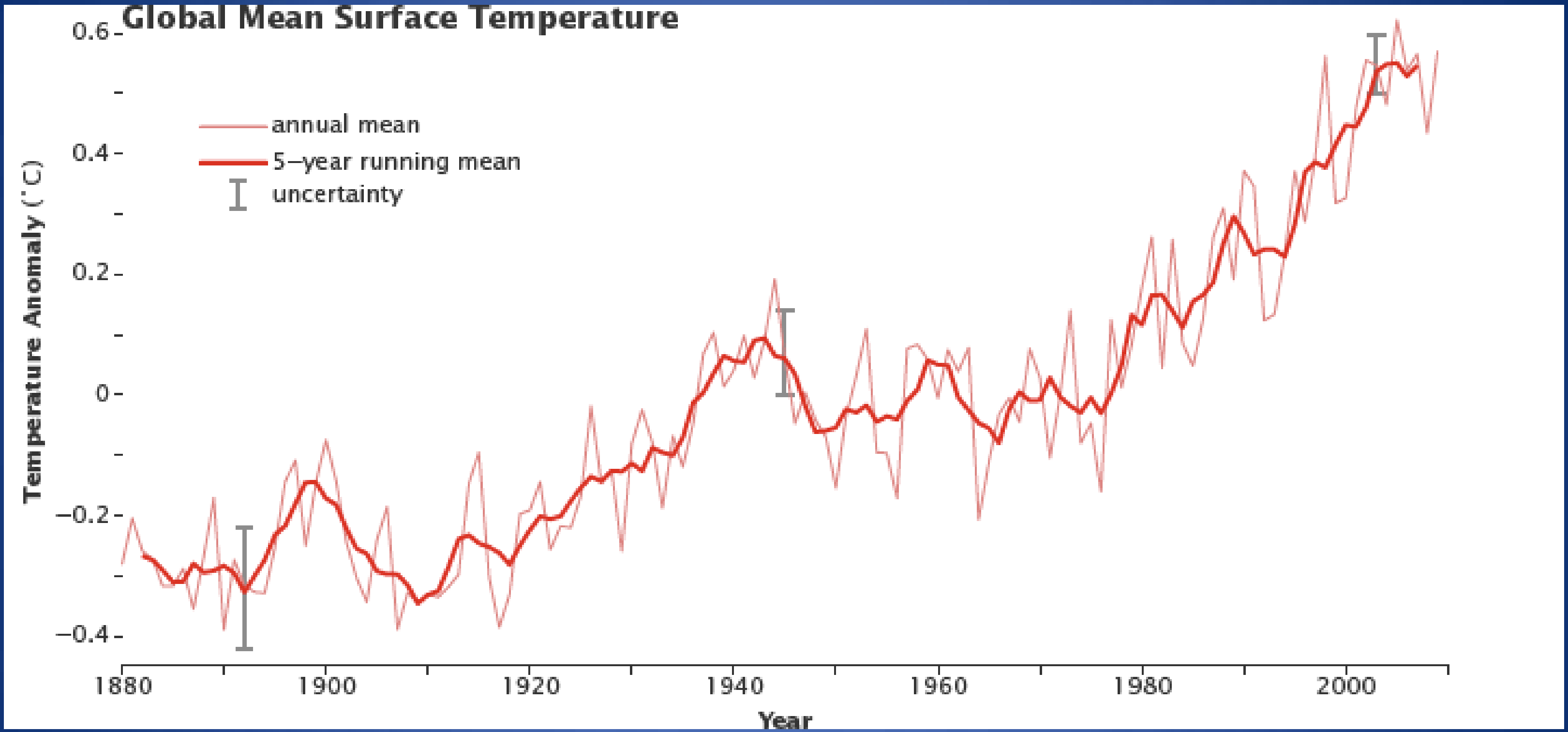
RELATIVE IMPACT OF ANTHROPOGENIC EMISSIONS ON ATMOSPHERIC TEMPERATURE



Human emissions have overwhelmed natural Forces!

IPCC Report Sept. 2013

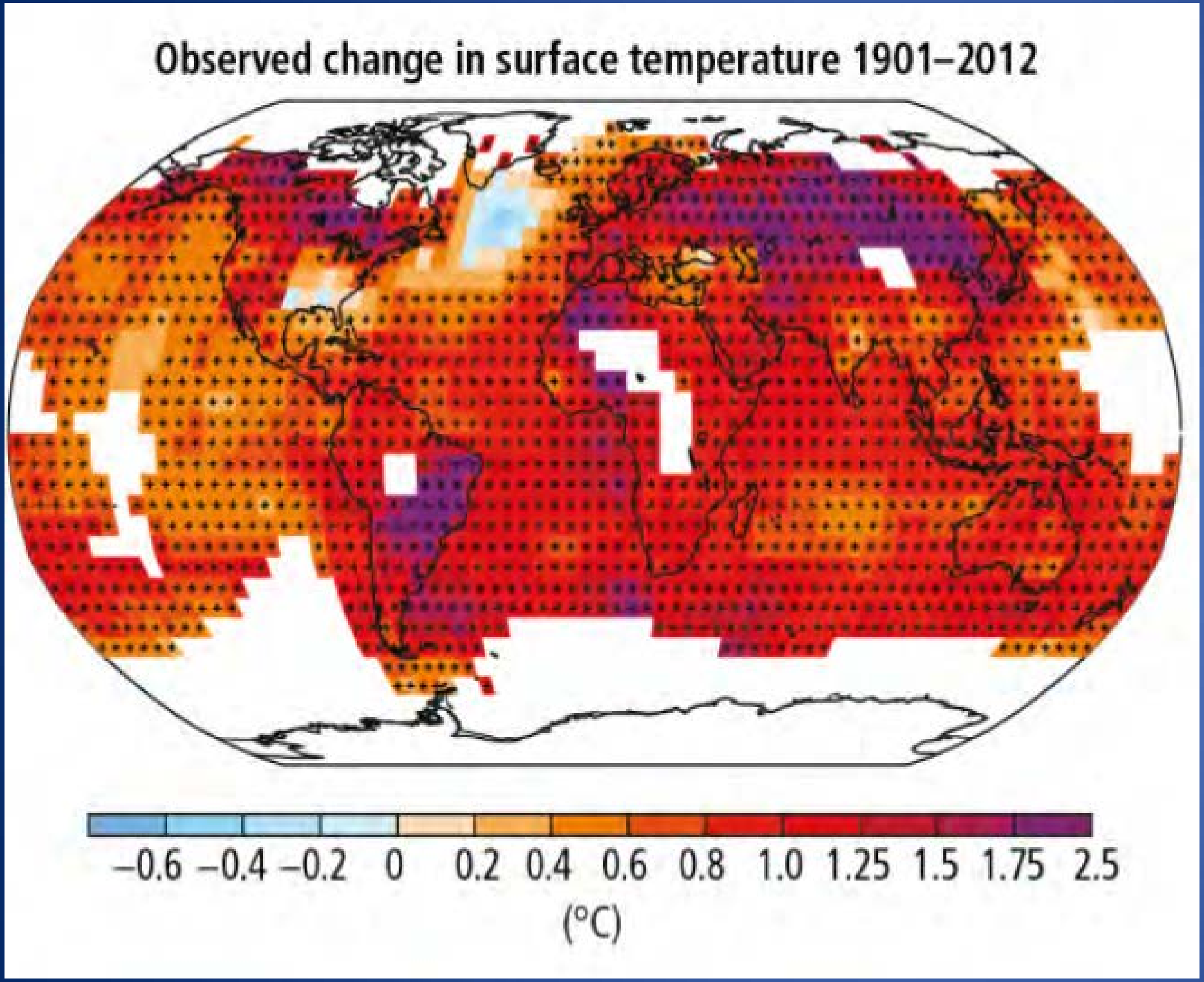
GLOBAL WARMING SINCE 1880



Average global temperature has risen about 0.8°C (1.4°F) since 1880

Source: NASA-GISS, Jan 2015

GLOBAL WARMING OVER THE PAST CENTURY

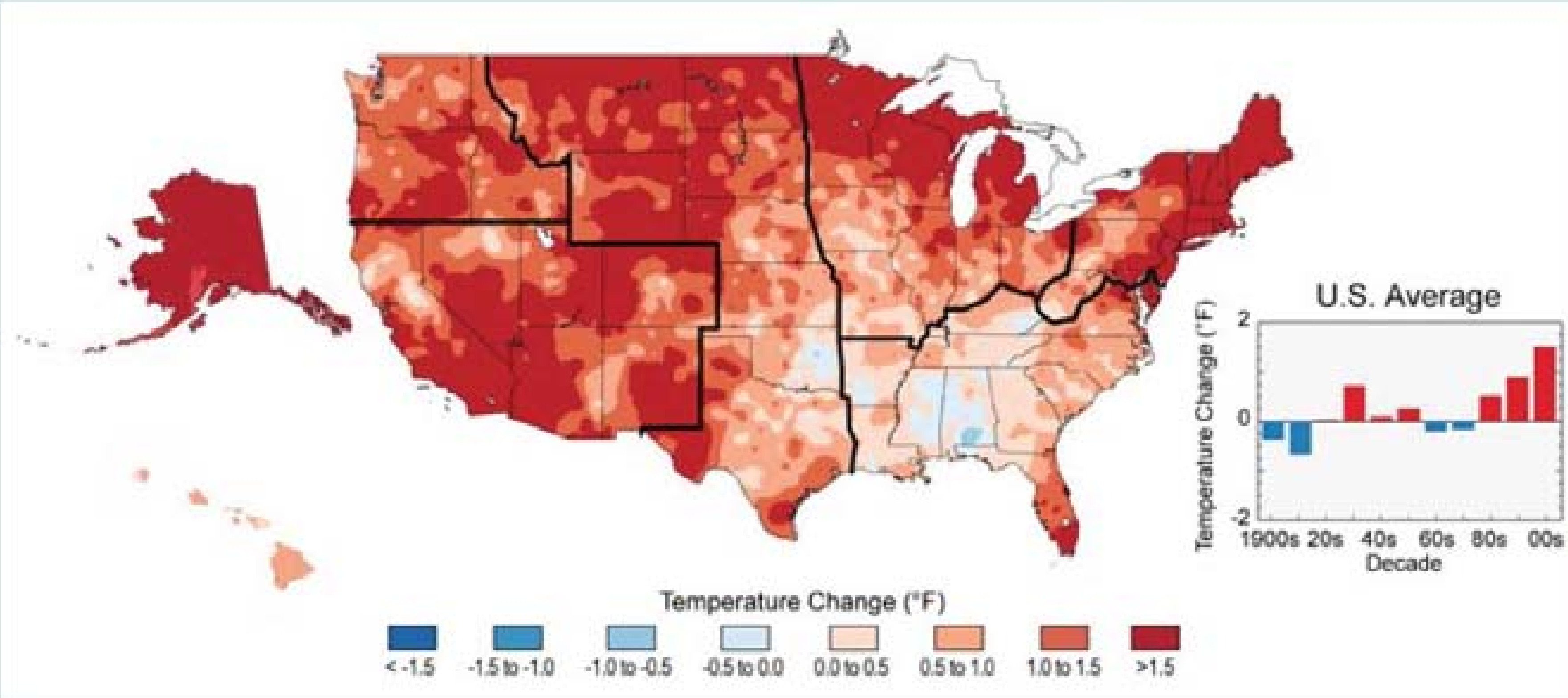


The period between 1983-2012 was very likely the warmest 30-year period of the last 800 years in the Northern Hemisphere (IPCC).

2014 was the warmest year since 1880, with temp 5-7°F above average in Alaska (NOAA).

Source: IPCC 5th Assessment, Nov 2014

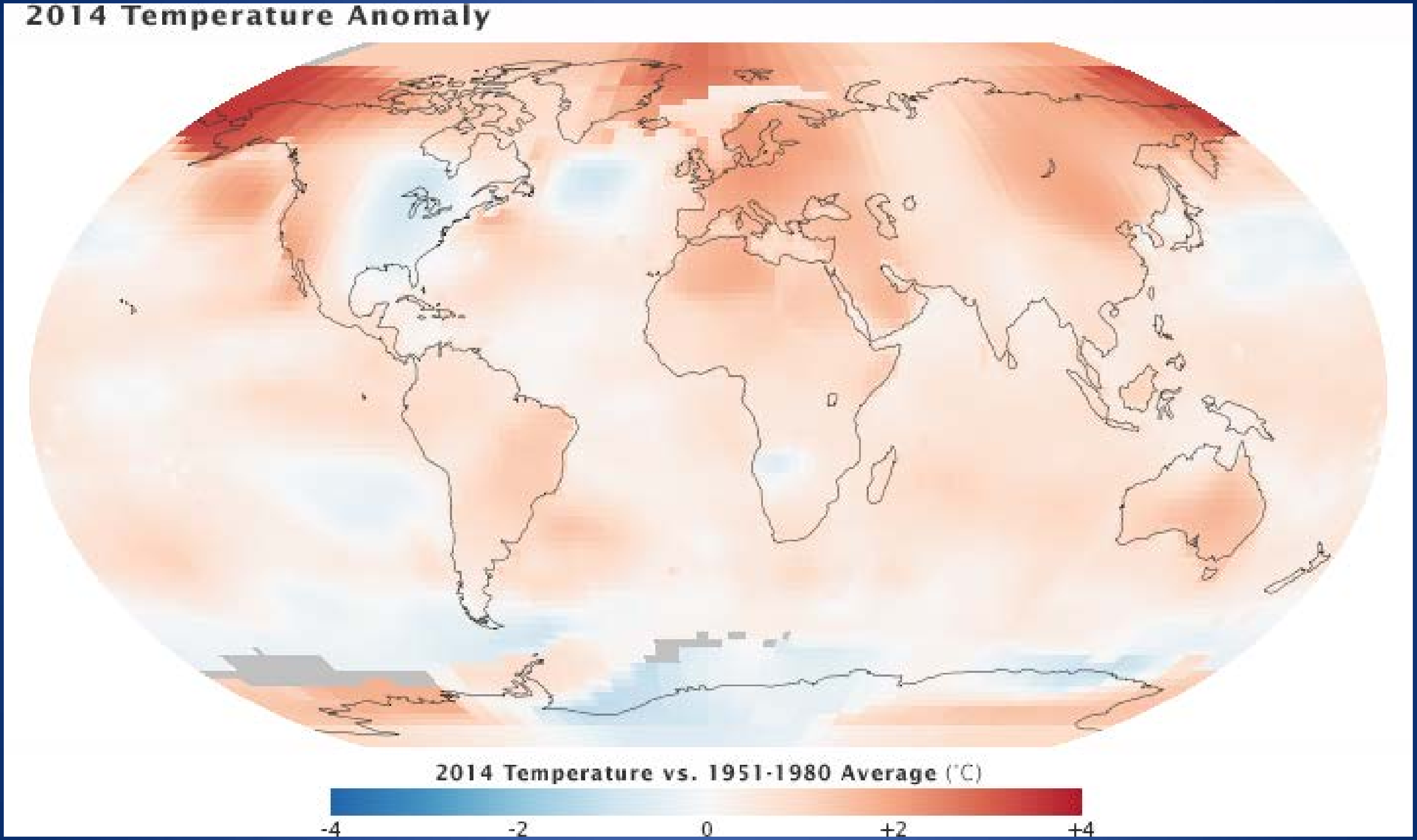
Observed U.S. Temperature Change



The colors on the map show temperature changes over the past 22 years (1991-2012) compared to the 1901-1960 average for the contiguous U.S., and to the 1951-1980 average for Alaska and Hawaii. The bars on the graph show the average temperature changes for the U.S. by decade for 1901-2012 (relative to the 1901-1960 average). The far right bar (2000s decade) includes 2011 and 2012. The period from 2001 to 2012 was warmer than any previous decade in every region. (Figure source: NOAA NCDC / CICS-NC).

Source: U.S. National Climate Assessment 2014

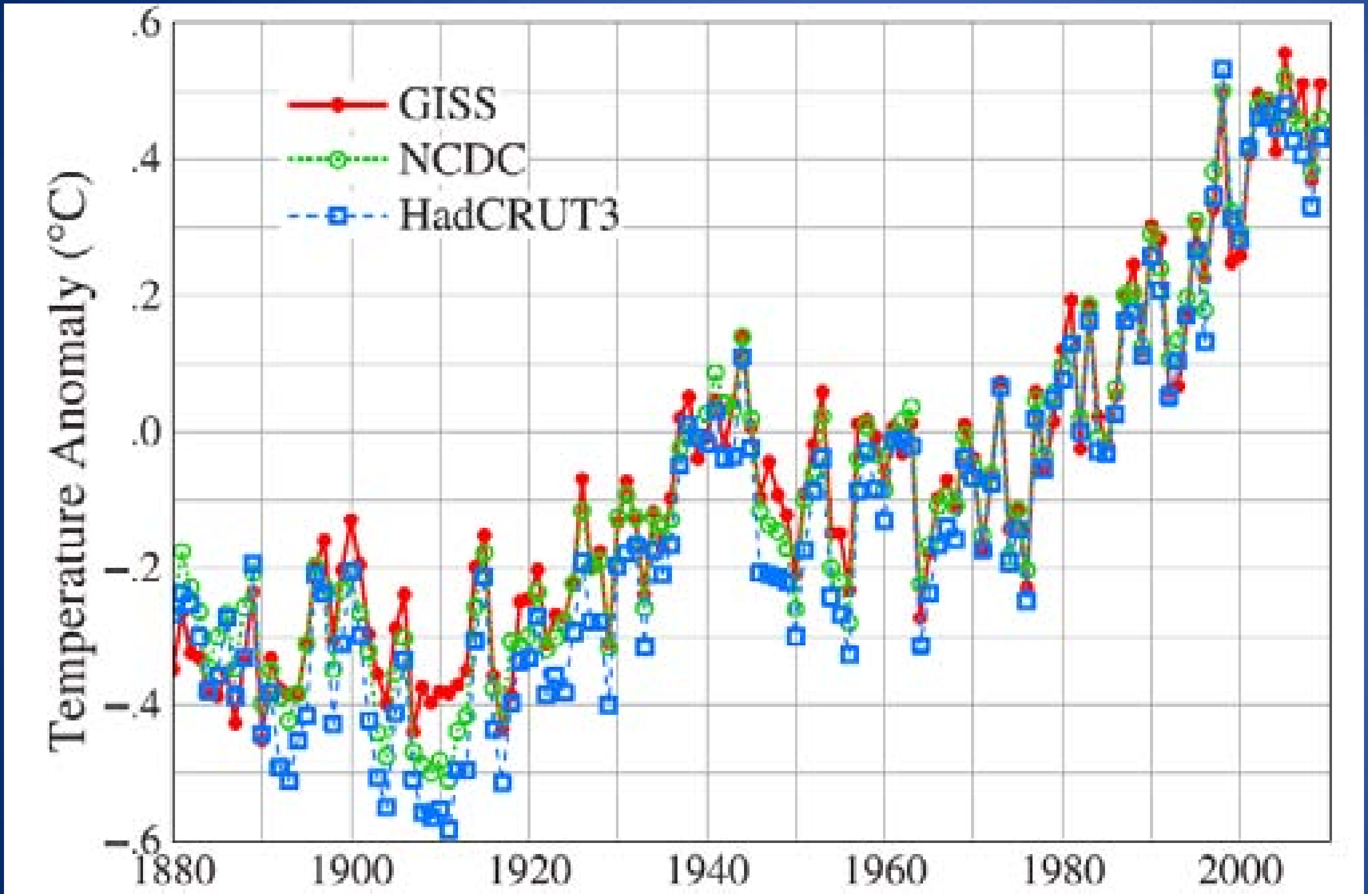
2014 WAS THE HOTTEST YEAR!



A global average is meaningless if you live in Nome, Alaska

Source: NASA 2015

GLOBAL WARMING HIATUS ?
Global Land-Ocean Surface Temperature Anomalies
(Base Period 1961-1990)



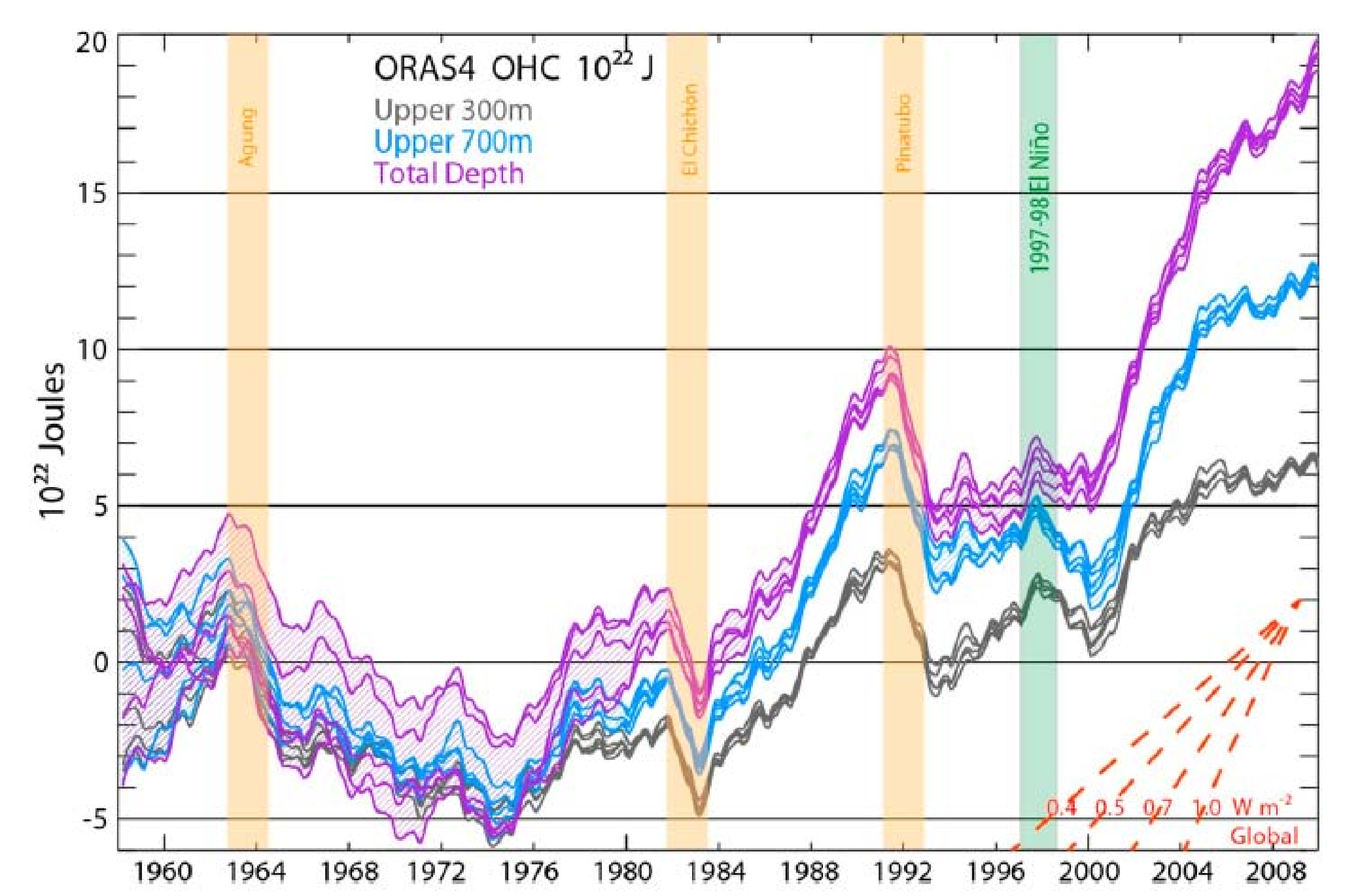
Atmosphere – yes
Earth – No

Oceans absorb
90% of heat
Atmosphere = 1%

Note: These data are not based on a model.

Source: Hansen et al (NASA), 2010

RISING OCEAN TEMPERATURE
(…..This is where the atmospheric heat is going)

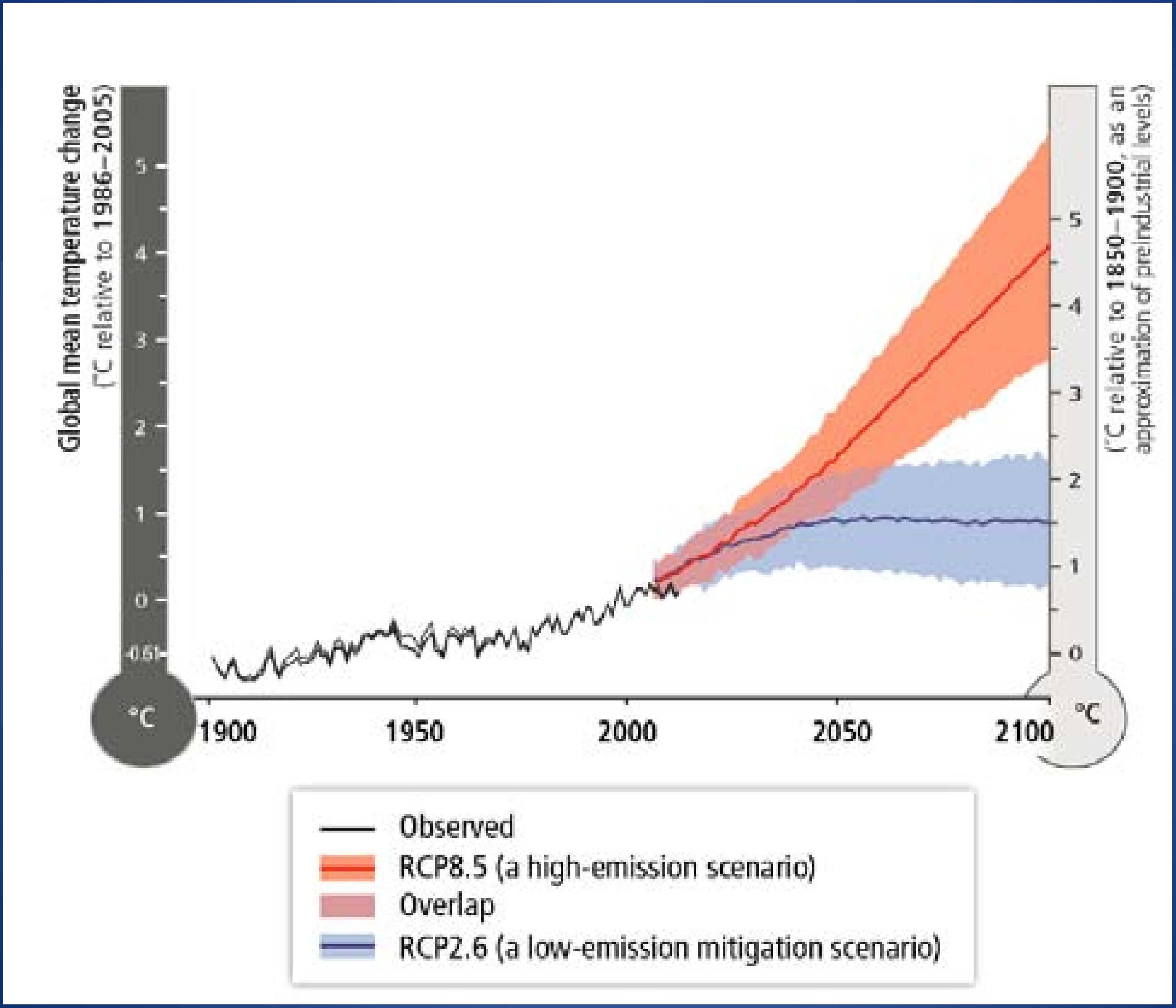


Beginning in 2000, the oceans have experienced the most sustained warming trend on record, and at rates below 700m that appear to be unprecedented.

(Note: Orange bands are major volcanic eruptions that resulted in significant cooling.
Green band is El Nino event of 1997-1998 that resulted in warmest year on record as heat came out of ocean)

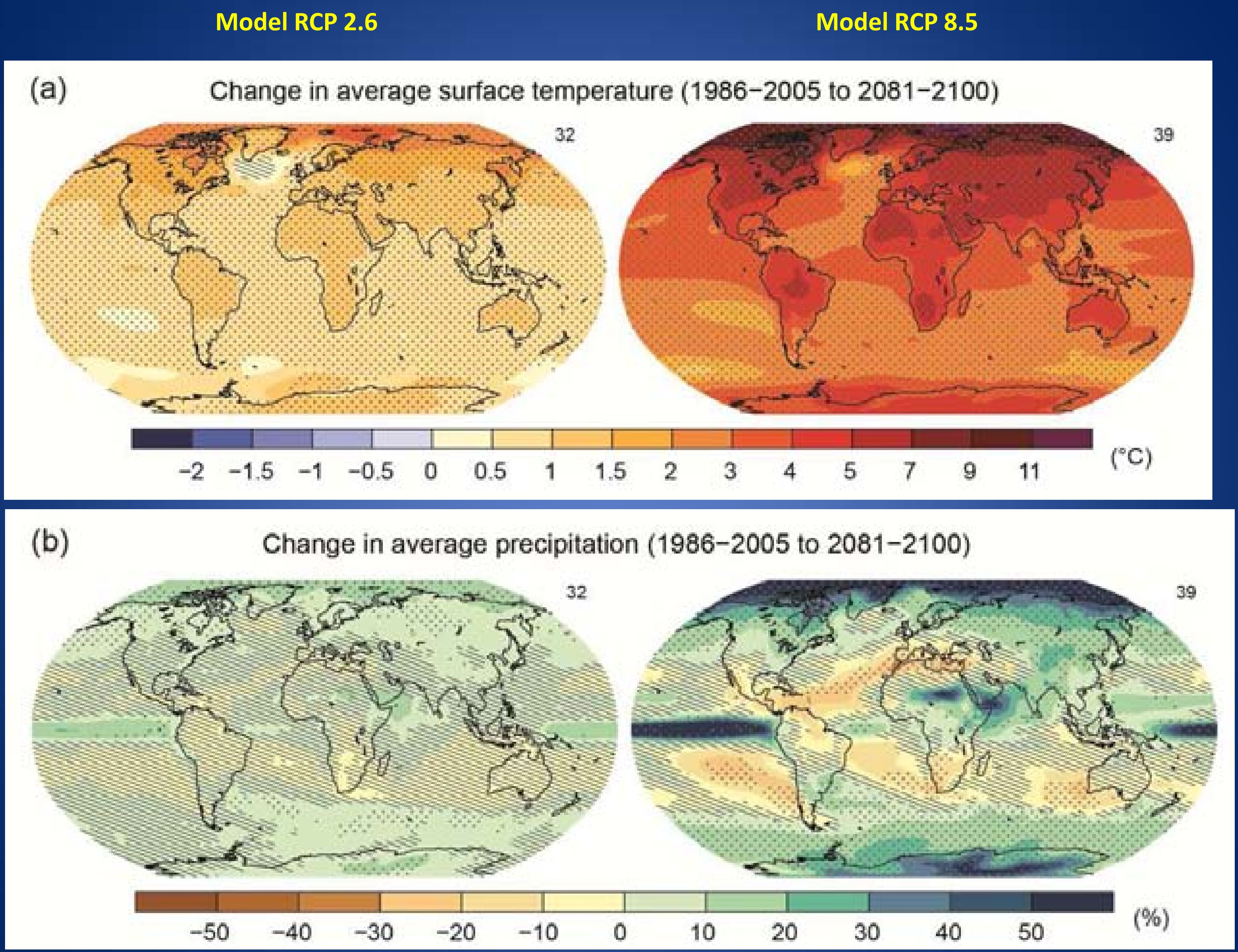
Source: Balmaseda et al., Geophysical Research Letters, vol 40, 1754-1759, May 2013

GLOBAL WARMING – THE FUTURE



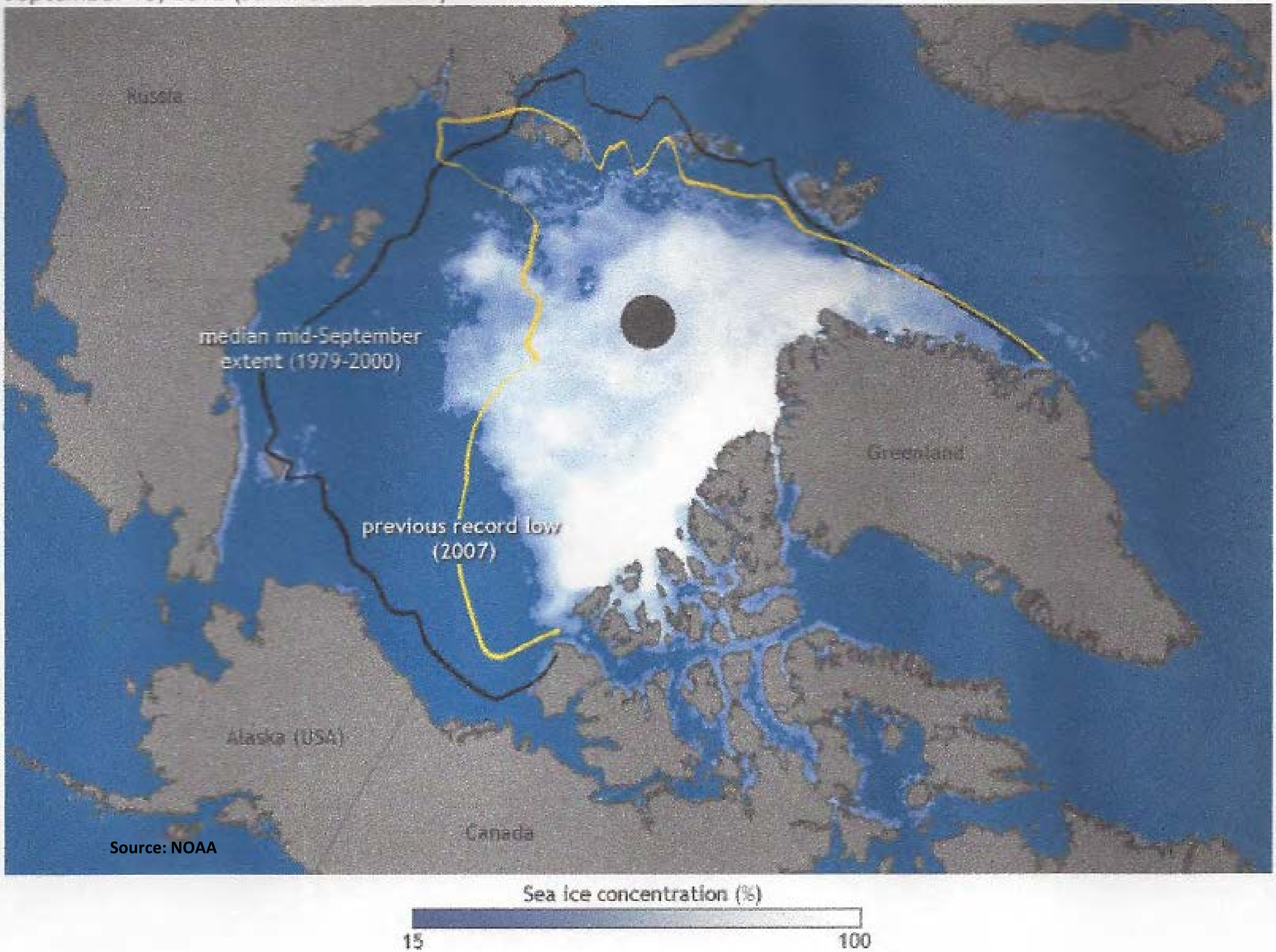
Source: IPCC 2014

Note: Projections are based on models.

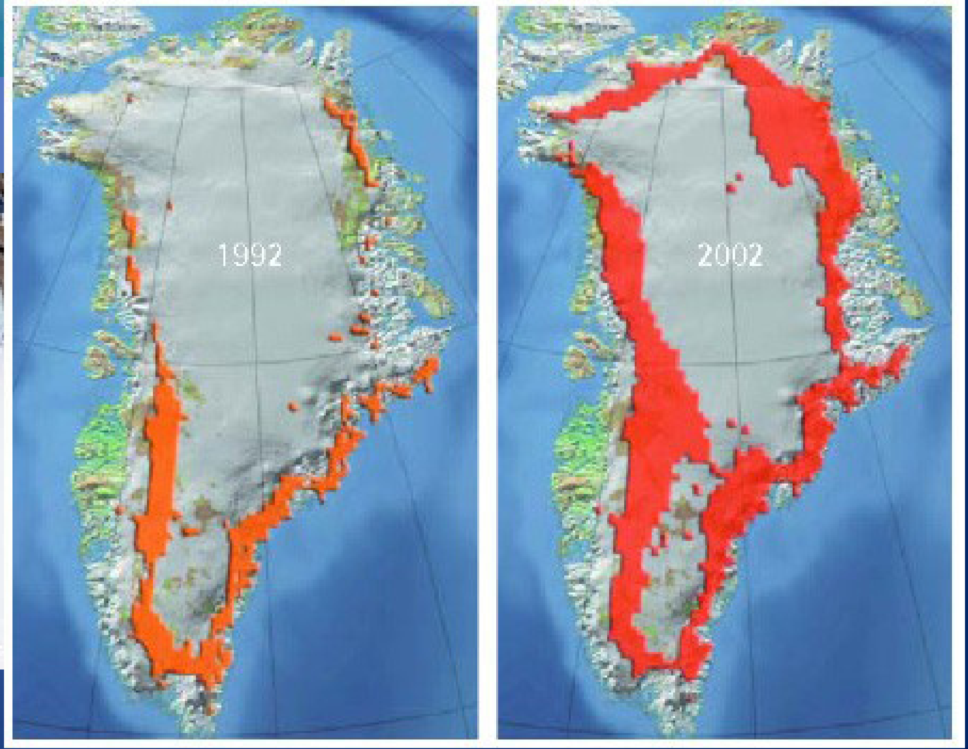


IPCC Report Sept. 2013

September 16, 2012 (summer minimum)

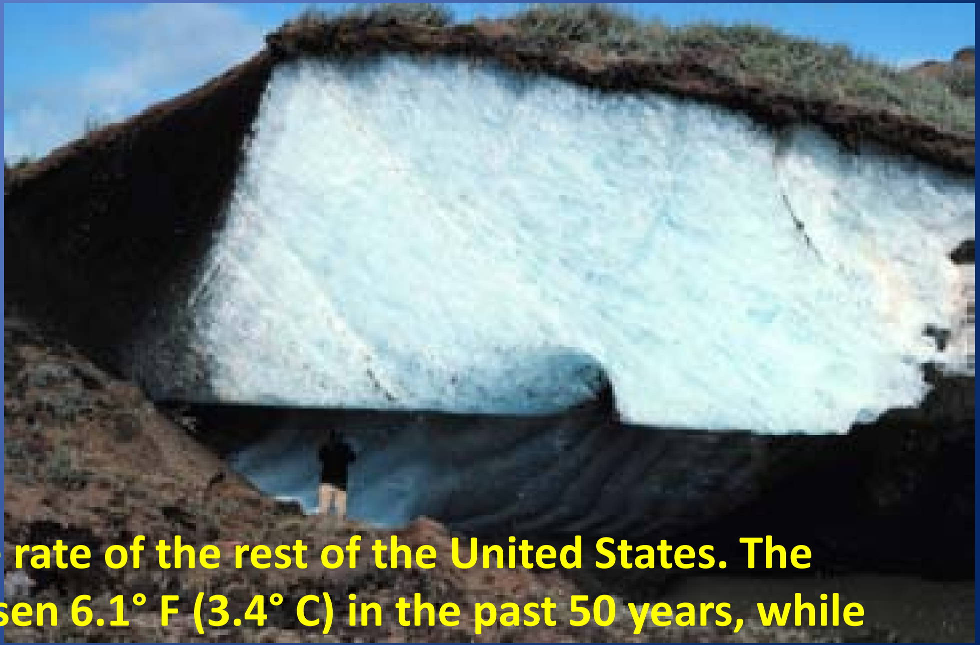


Greenland’s Glaciers are Melting!



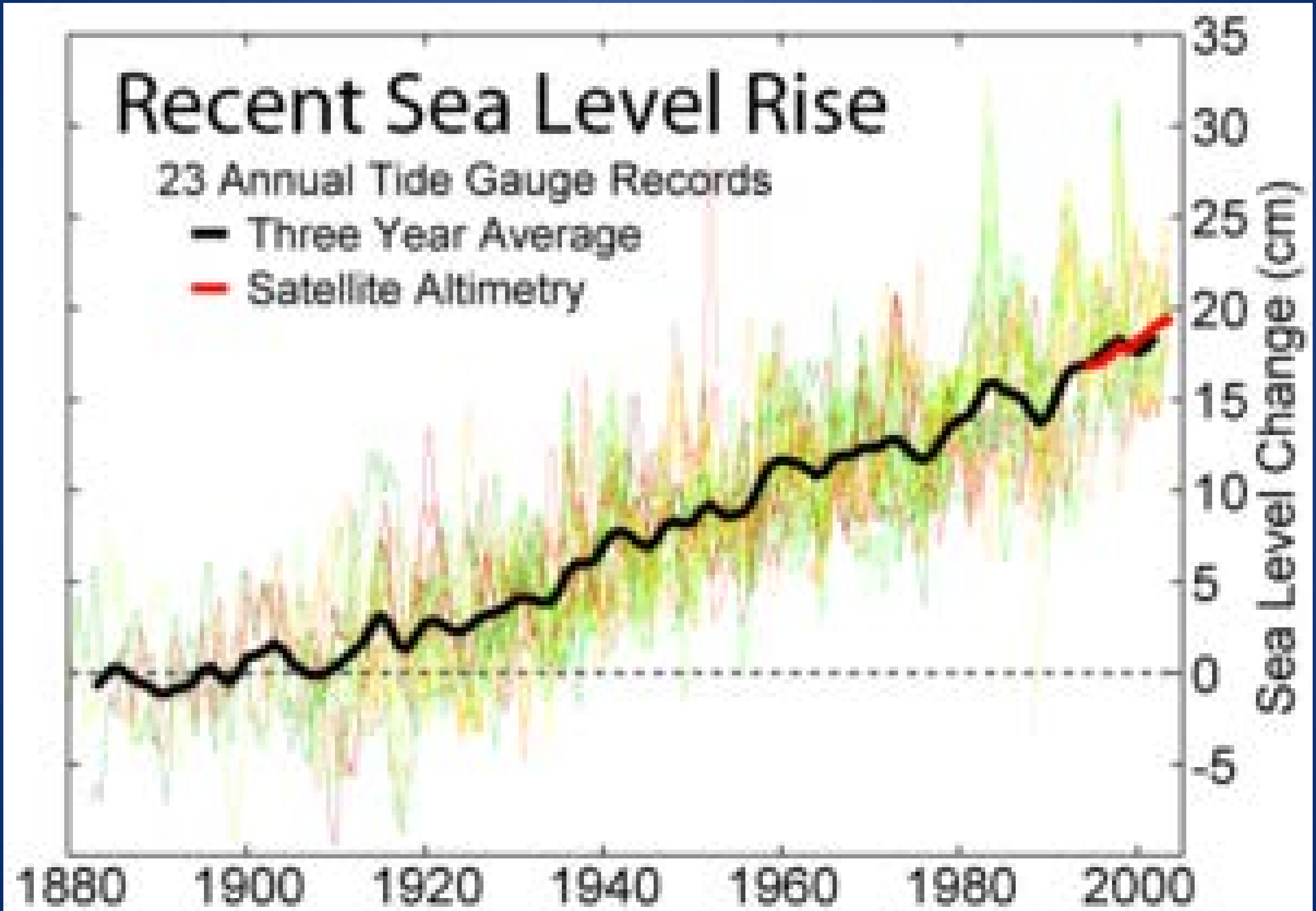
IT'S GETTING WARMER !

PERMAFROST IS MELTING IN ALASKA



Alaska is warming at around twice the rate of the rest of the United States. The average annual air temperature has risen 6.1° F (3.4° C) in the past 50 years, while winters have warmed by 11.3° F (6.3° C).[2,3]

RISING TEMPERATURES =
MELTING ICE + OCEAN THERMAL EXPANSION = SEA LEVEL RISE



SEA LEVEL RISE ON THE NORTH CAROLINA COAST

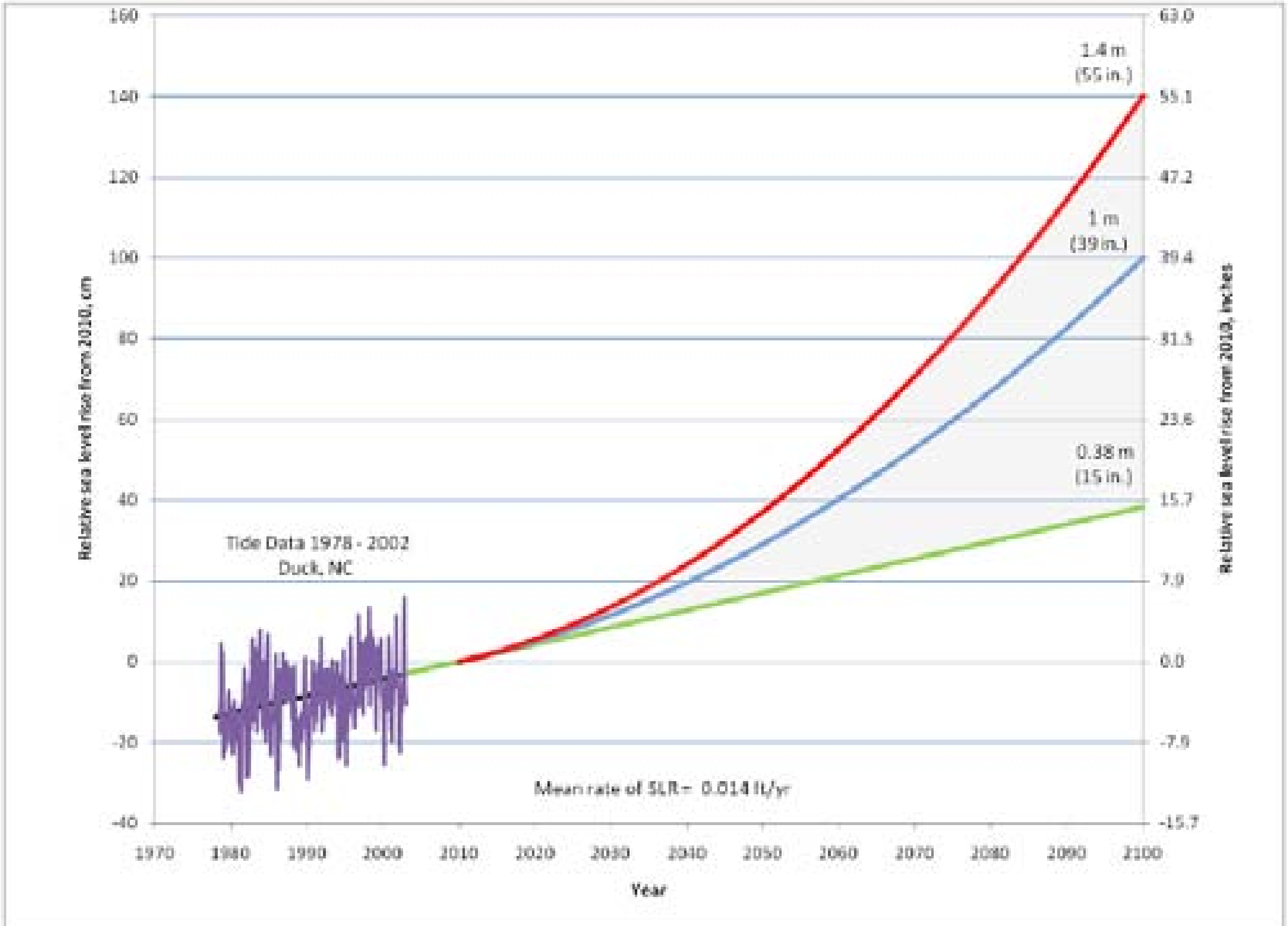
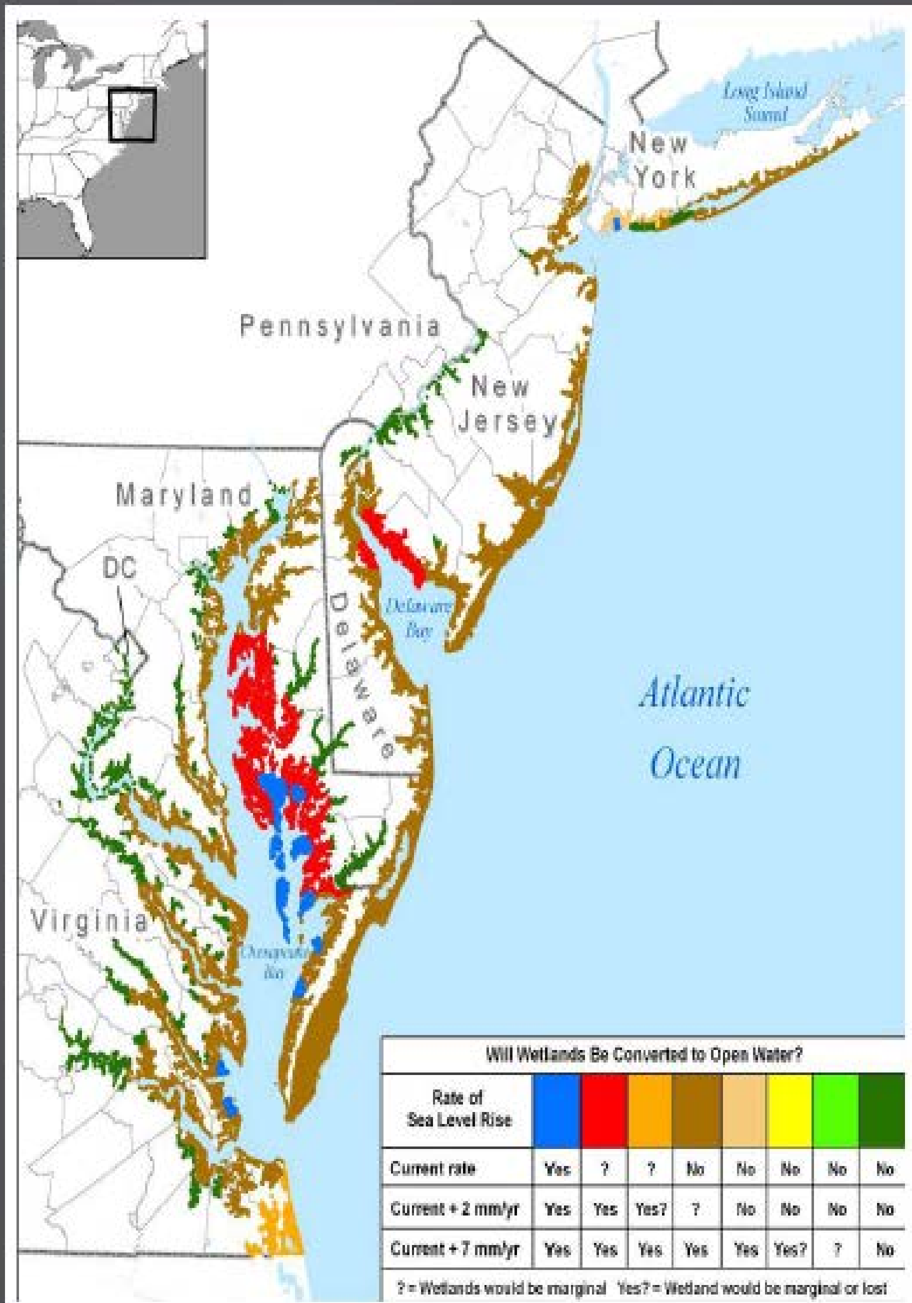


Figure 2. This chart illustrates the magnitude of SLR resulting from differing rates of acceleration. The most likely scenario for 2100 AD is a rise of 0.4 meter to 1.4 meters (15 inches to 55 inches) above present.

Source: North Carolina Sea-Level Rise Assessment Report
N.C. Coastal Resources Commission, March 2010

Mid-Atlantic Wetlands Assessment



Will Wetlands Be Converted to Open Water?

Rate of Sea Level Rise	Blue	Red	Orange	Brown	Tan	Yellow	Light green	Dark green
Current rate	Yes	?	?	No	No	No	No	No
Current + 2 mm/yr	Yes	Yes	Yes?	?	No	No	No	No
Current + 7 mm/yr	Yes	Yes	Yes	Yes	Yes	Yes?	?	No

? = Wetlands would be marginal Yes? = Wetland would be marginal or lost

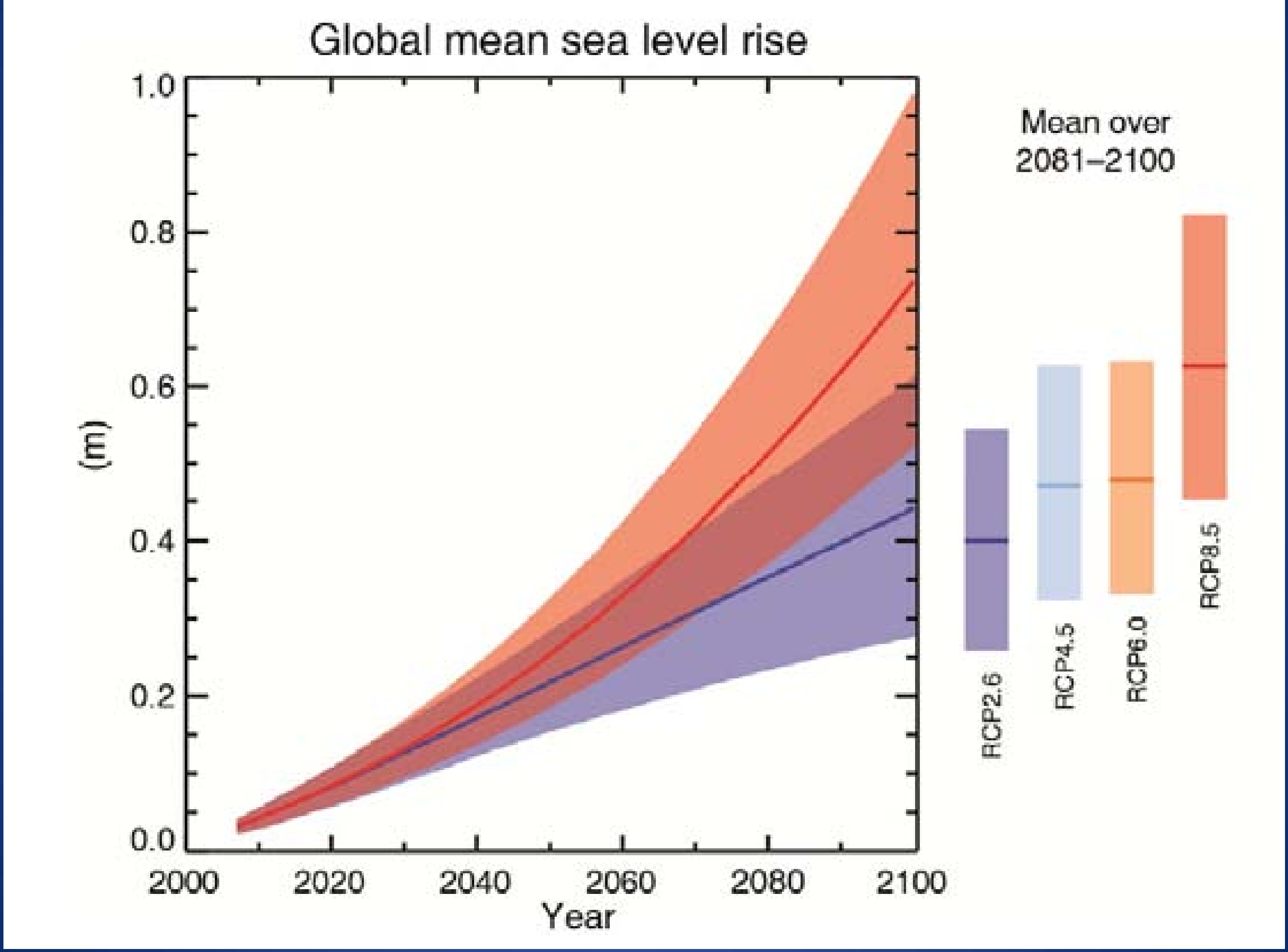
SEA LEVEL RISE CLOSE TO HOME
Davis Farm
Stonington, CT

1943

2013

These photographs are not exactly the same view. However, Mr. Davis Estimates that sea level has risen about 8 inches since he was a young boy.

RISING TEMPERATURES =
MELTING ICE + THERMAL EXPANSION = SEA LEVEL RISE



Source: IPCC Report Sept. 2013

Increased Flood Risk in New York City

The light blue area above depicts today's FEMA 100-year flood zone for the city (the area of the city that is expected to be flooded once every 100 years). With rising sea levels, a 100-year flood at the end of this century (not mapped here) is projected to inundate a far larger area of New York City, especially under the higher emissions scenario.[91] Critical transportation infrastructure located in the Battery area of lower Manhattan could be flooded far more frequently unless protected. The increased likelihood of flooding is causing planners to look into building storm-surge barriers in New York Harbor to protect downtown New York City. [234,370,371]

A 1 meter sea level Rise by 2100 will be physically and financially devastating to coastal cities and Communities around the globe.

… and long before 2100

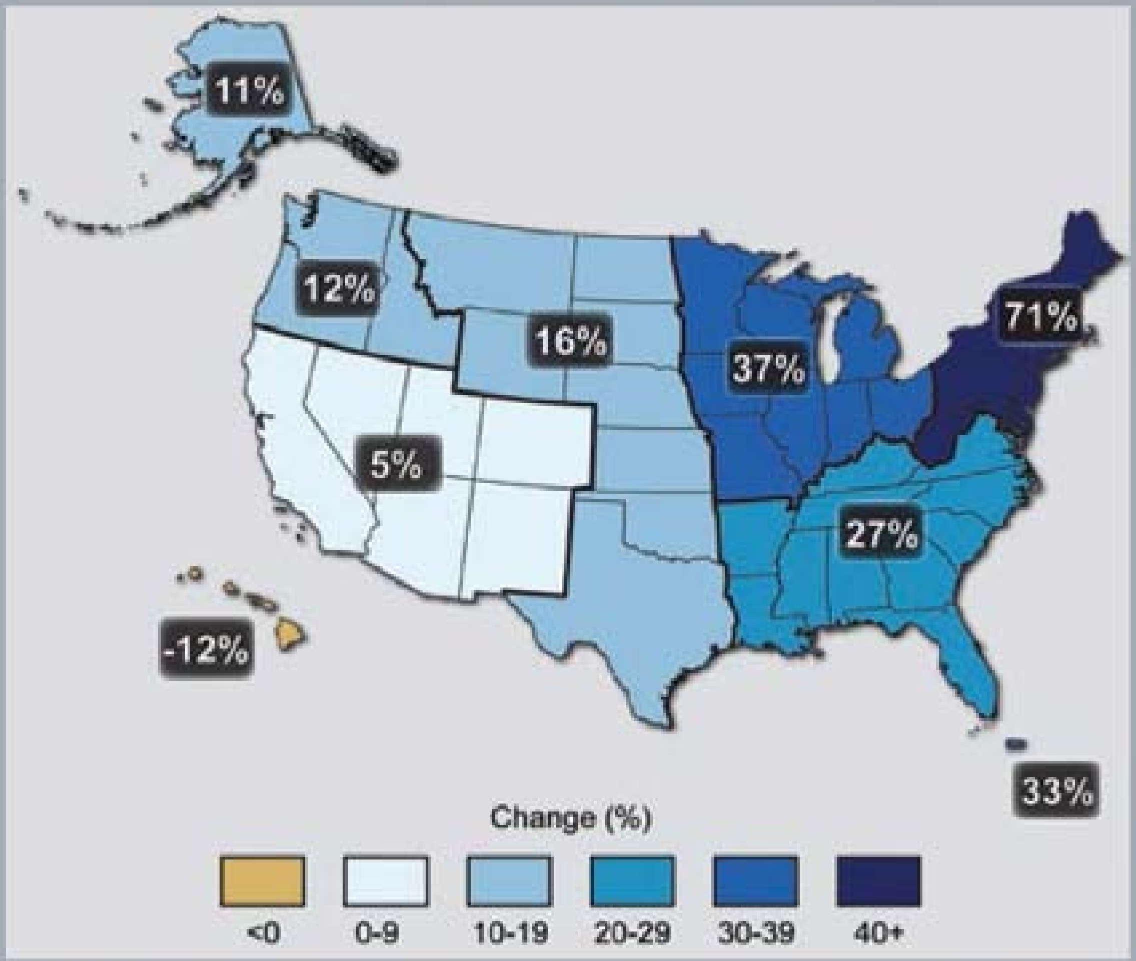
A WARMER ATMOSPHERE = MORE MOISTURE
MELTING ARCTIC ICE
= CHANGES IN ATMOSPHERIC
AND OCEAN CURRENTS

Expect More Frequent and Severe Storms!




The insurance
Companies and
FEMA
Recognize this!

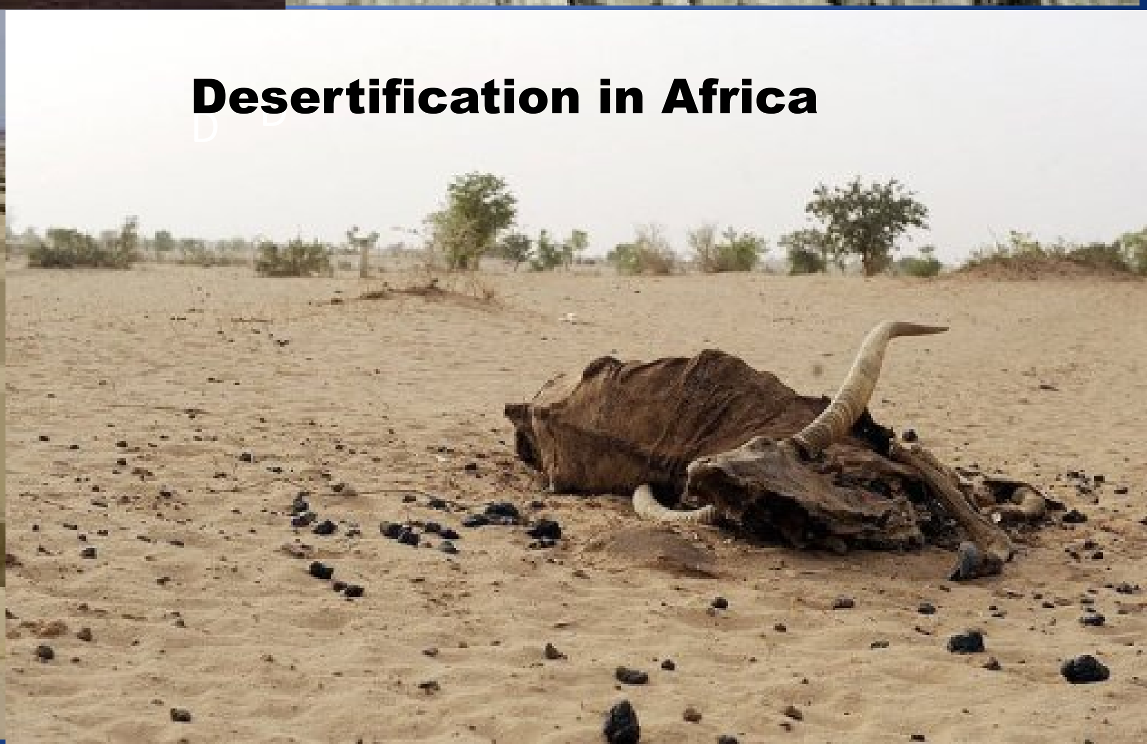
Observed Change in Very Heavy Precipitation



Percent changes in the amount of precipitation falling in very heavy events (the heaviest 1%) from 1958 to 2012 for each region. There is a clear national trend toward a greater amount of precipitation being concentrated in very heavy events, particularly in the Northeast and Midwest. (Figure source: updated from Karl et al. 2009[c]).

Source: U.S. National Climate Assessment 2014

Desertification in Africa

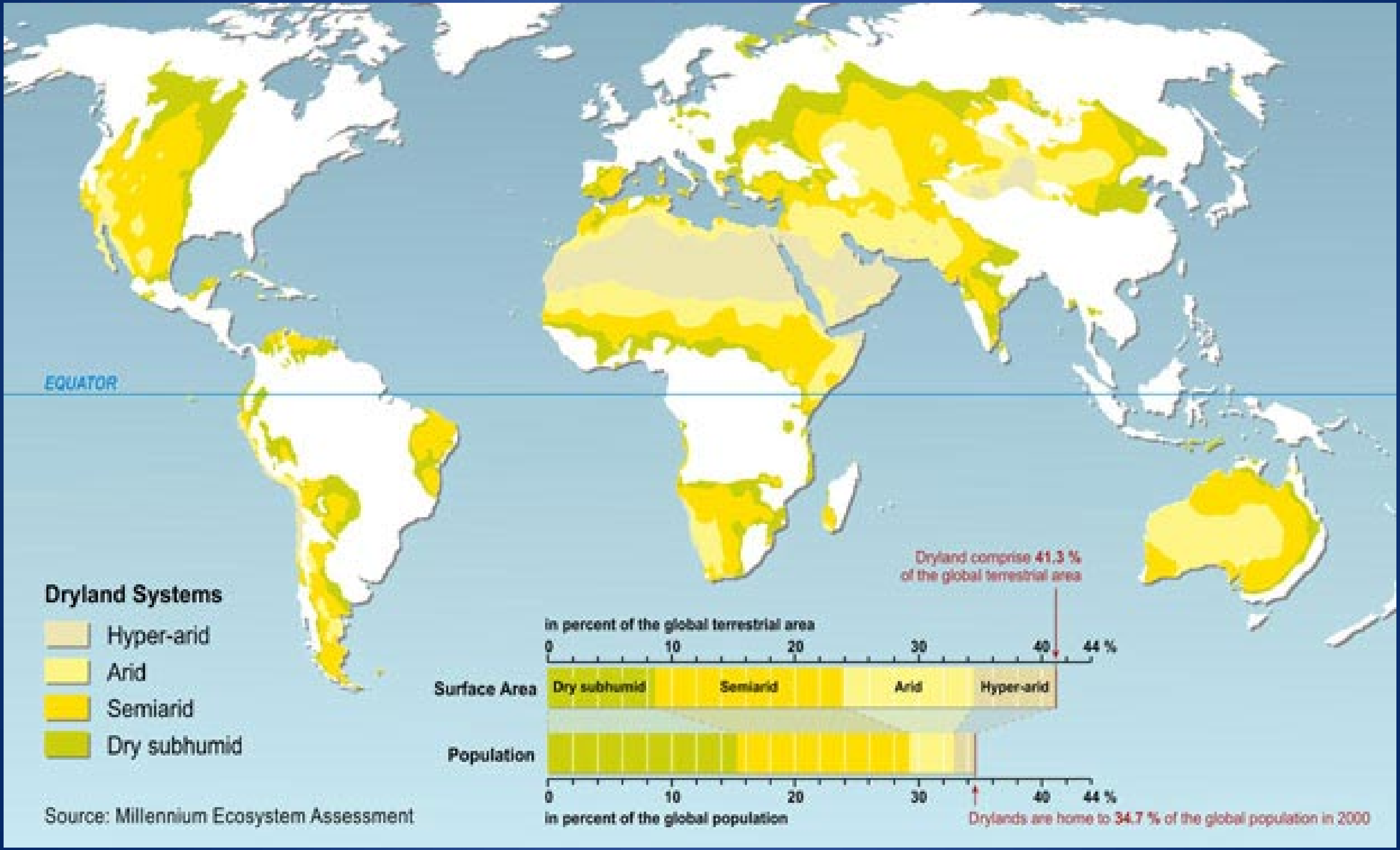


DESERTIFICATION IN THE USA

Oklahoma in the 1930's

Dust Storm in Phoenix August 26, 2013

CURRENT AND FUTURE WATER SHORTAGES ARE A MAJOR GLOBAL ISSUE

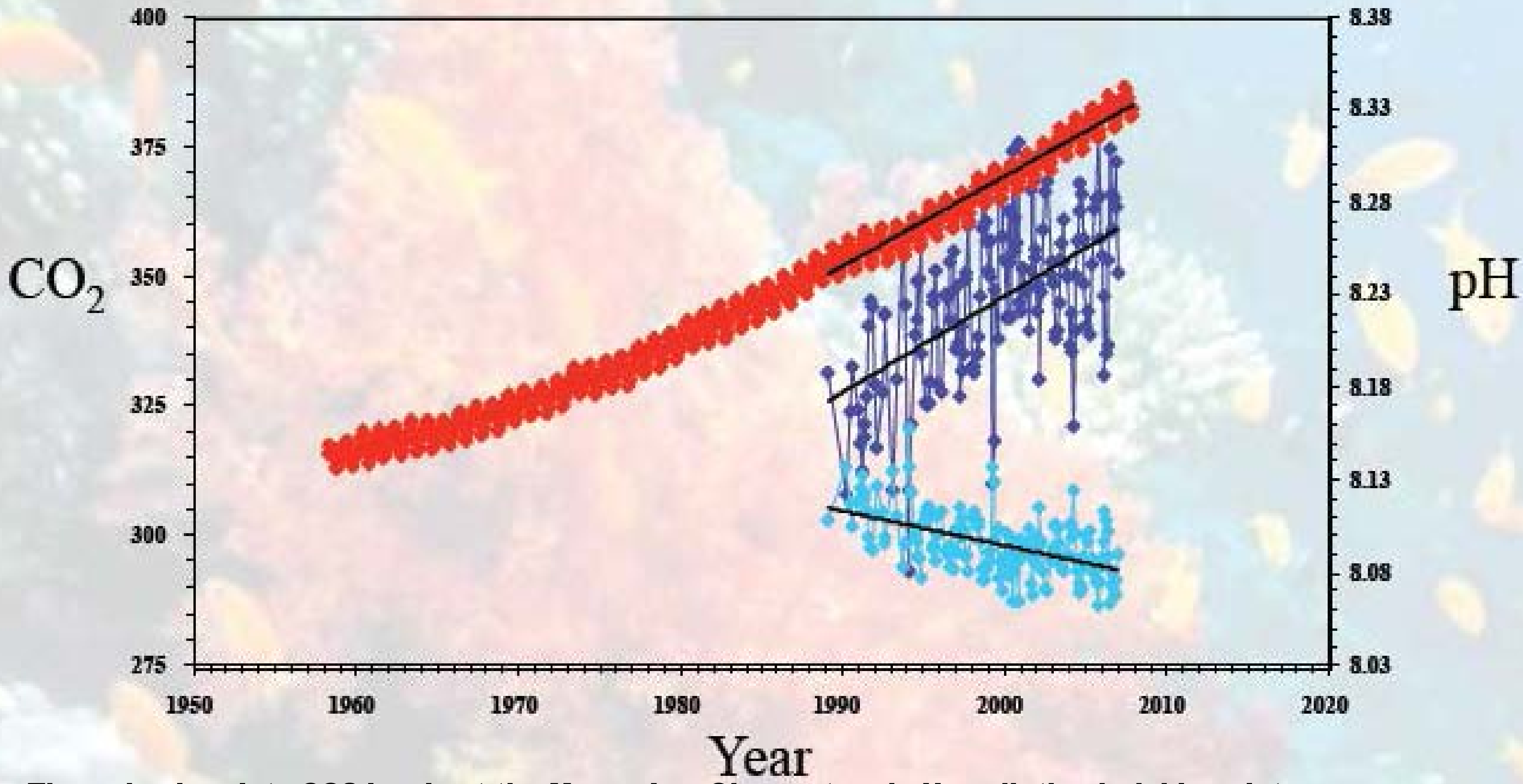


Forest Fires are on the Rise

Ocean Acidification: The Other CO_2 Problem
Council of Scientific Society Presidents
2 May 2010

Richard A. Feely
NOAA/Pacific Marine Environmental Laboratory

With special thanks to: Chris Sabine, Simone Alin, and Sylvia Musielewicz



The red color plots CO2 levels at the Mauna Loa Observatory in Hawaii; the dark blue plots ocean surface CO2 and the light blue plots pH at the ALOHA Station site in the Pacific Ocean north of Hawaii.

Pacific Northwest Oyster Emergency
Willapa Bay Seed Crisis

- Failure of larval oyster recruitments in recent years
- Commercial oyster hatchery failures threatens $100M industry (3000 Jobs)
- Low pH "upwelled" waters a possible leading factor in failures
- Larval oyster may be "canary in goldmine" for near-shore acidification?

Shells Dissolve in Acidified Ocean Water

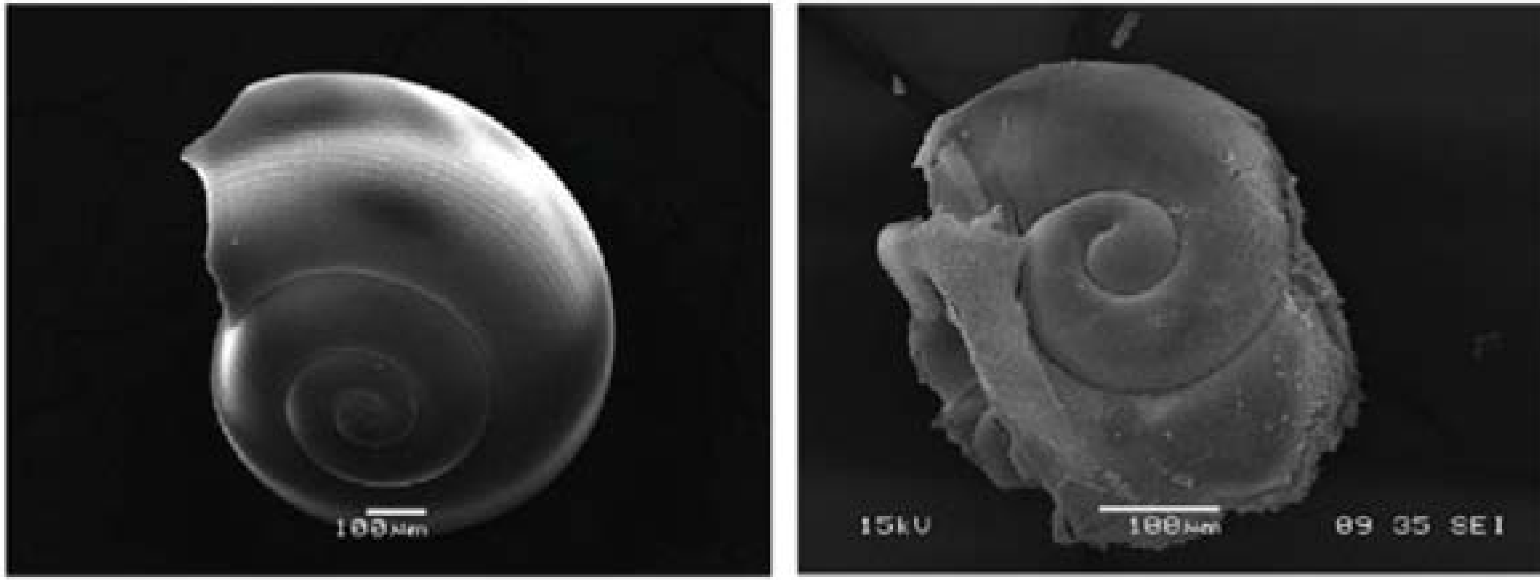
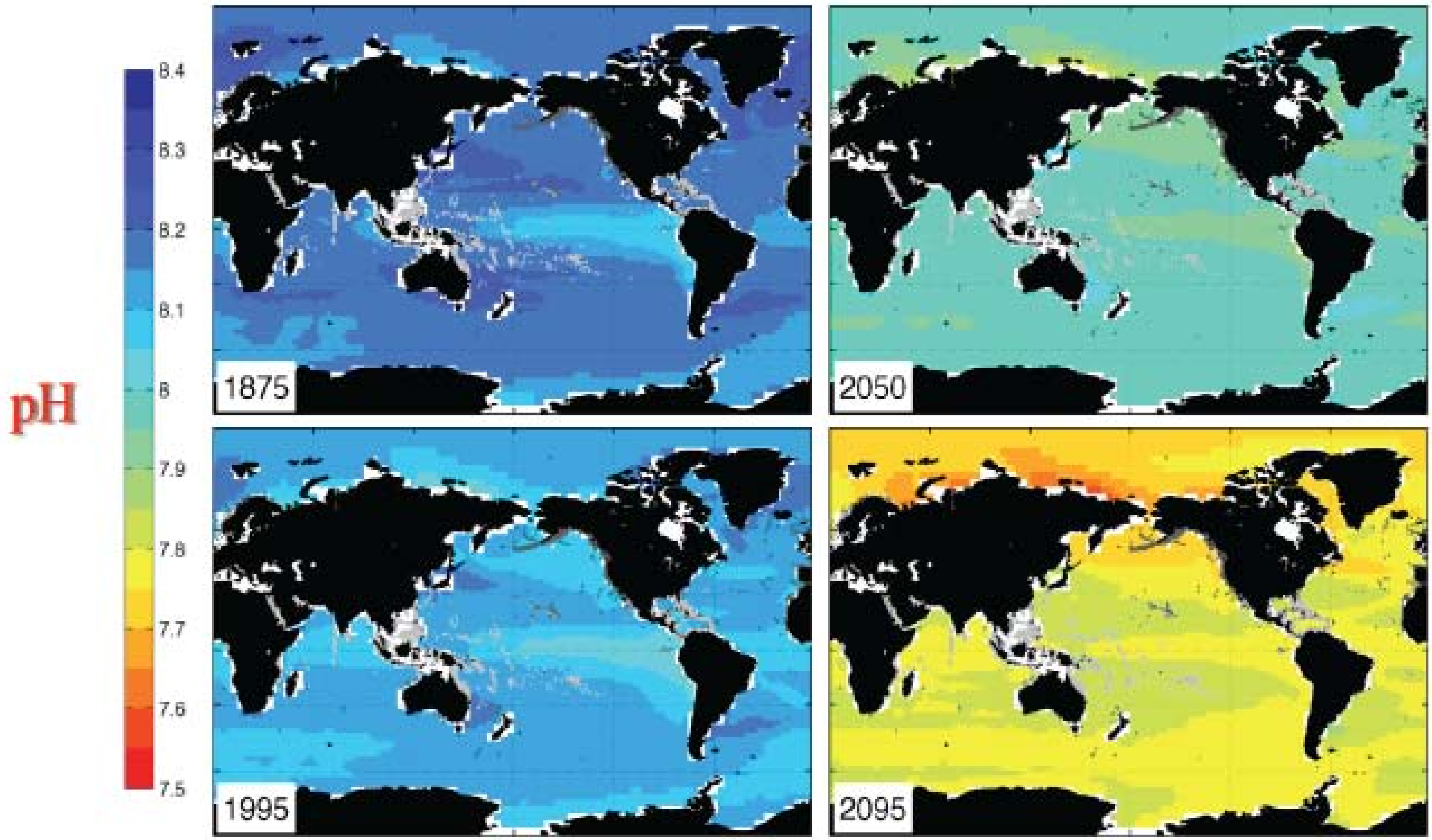


Figure 2.31. Pteropods, or "sea butterflies," are free-swimming sea snails about the size of a small pea. Pteropods are eaten by marine species ranging in size from tiny krill to whales and are an important source of food for North Pacific juvenile salmon. The photos above show what happens to a pteropod's shell in seawater that is too acidic. The left panel shows a shell collected from a live pteropod from a region in the Southern Ocean where acidity is not too high. The shell on the right is from a pteropod collected in a region where the water is more acidic (Photo credits: (left) Bednaršek et al. 2012;[168] (right) Nina Bednaršek).

pH distribution in surface waters from the NCAR CCSM3 model projections using the IPCC A2 CO_2 Emission Scenarios



Light gray = warm water corals
Dark gray = deep water corals

Feely, Doney and Cooley, Oceanography (2009)

Finding Balance: Advancing Sustainability

PRIORITY # 1

Reduce our carbon footprint

This will require tax "sticks and carrots"
A carbon tax is a good place to start.

PRIORITY #2

Maximize energy efficiency and conservation

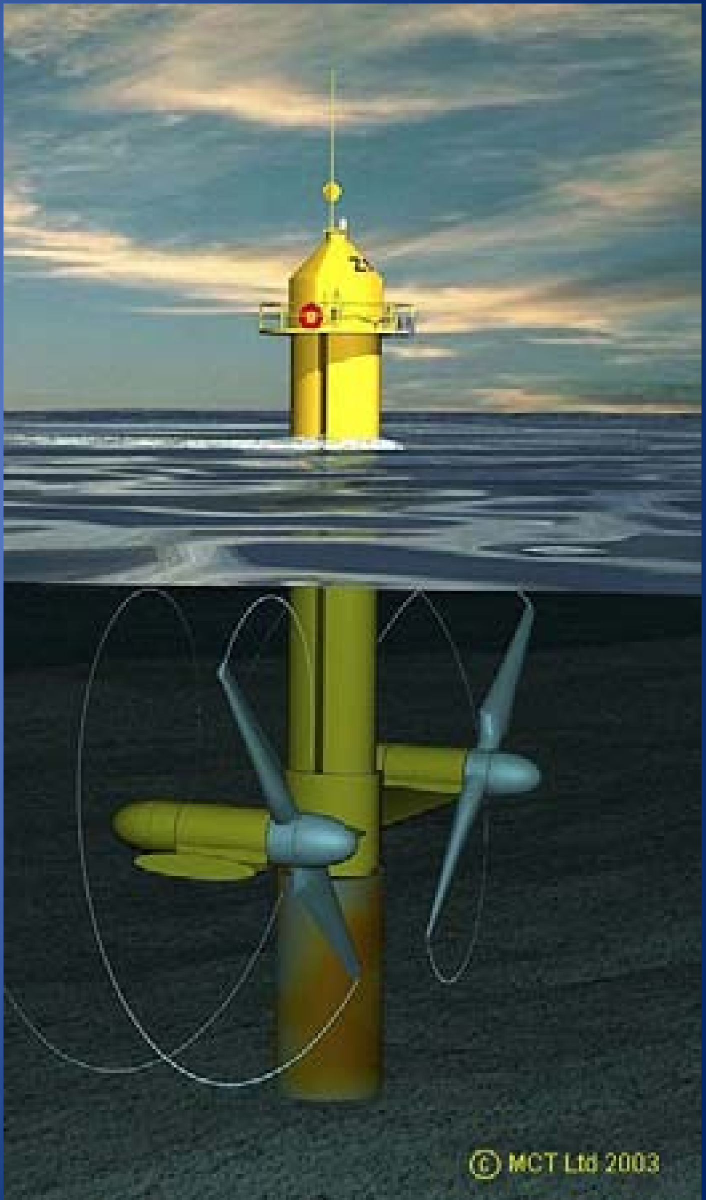
Transportation; housing, factories and offices

The other environmental issues are easy (sort of) to remediate

REDUCING OUR CARBON FOOTPRINT = RENEWABLE ENERGY

24 MW
"run-of-river"
Hydroelectric
plant

TIDAL ENERGY IS POTENTIALLY A HUGE RESOURCE



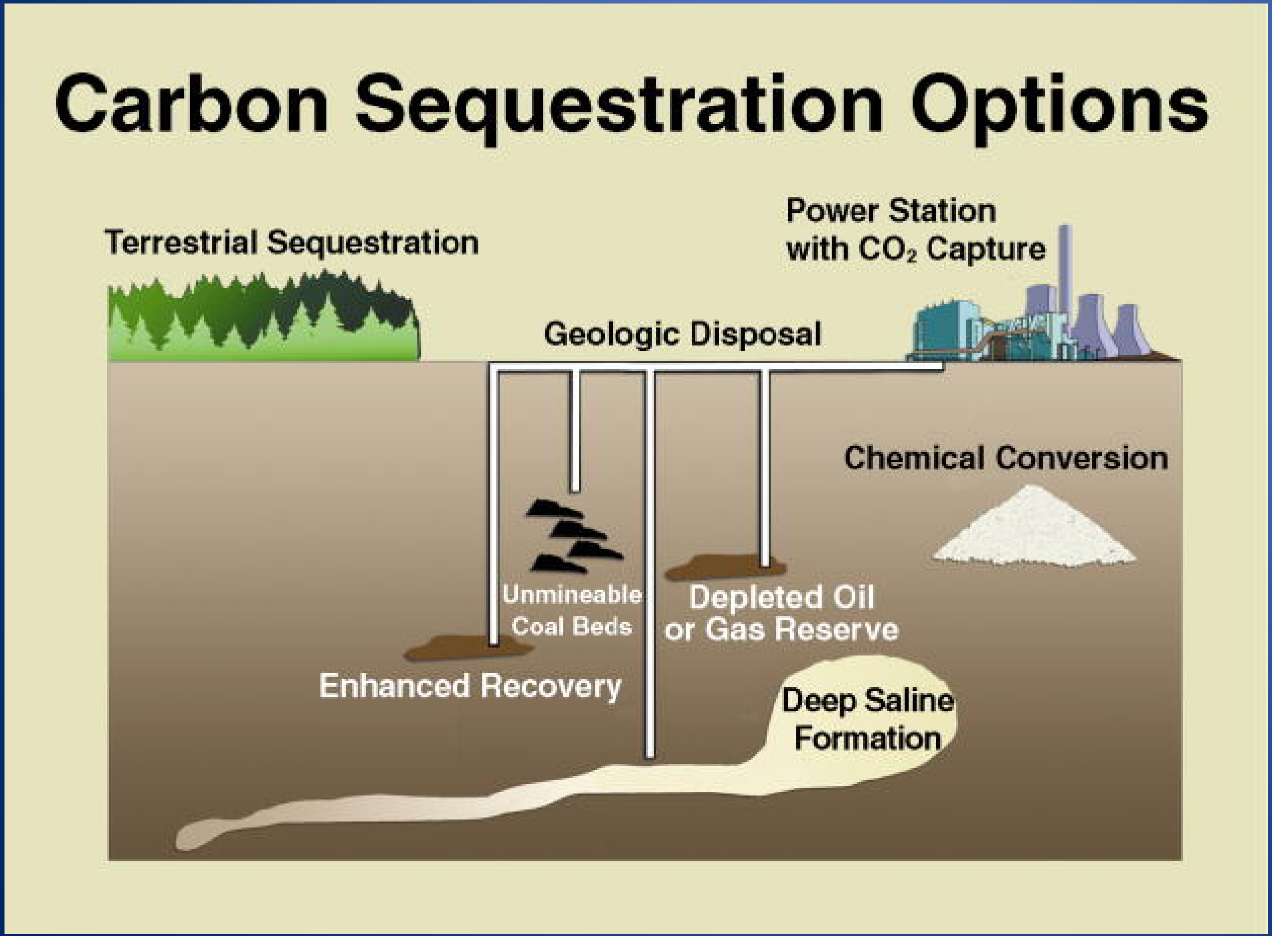
Nuclear is a good solution if not in earthquake zones, flood plains, or near Sea level!

..And a waste fuel site is Finally sanctioned.

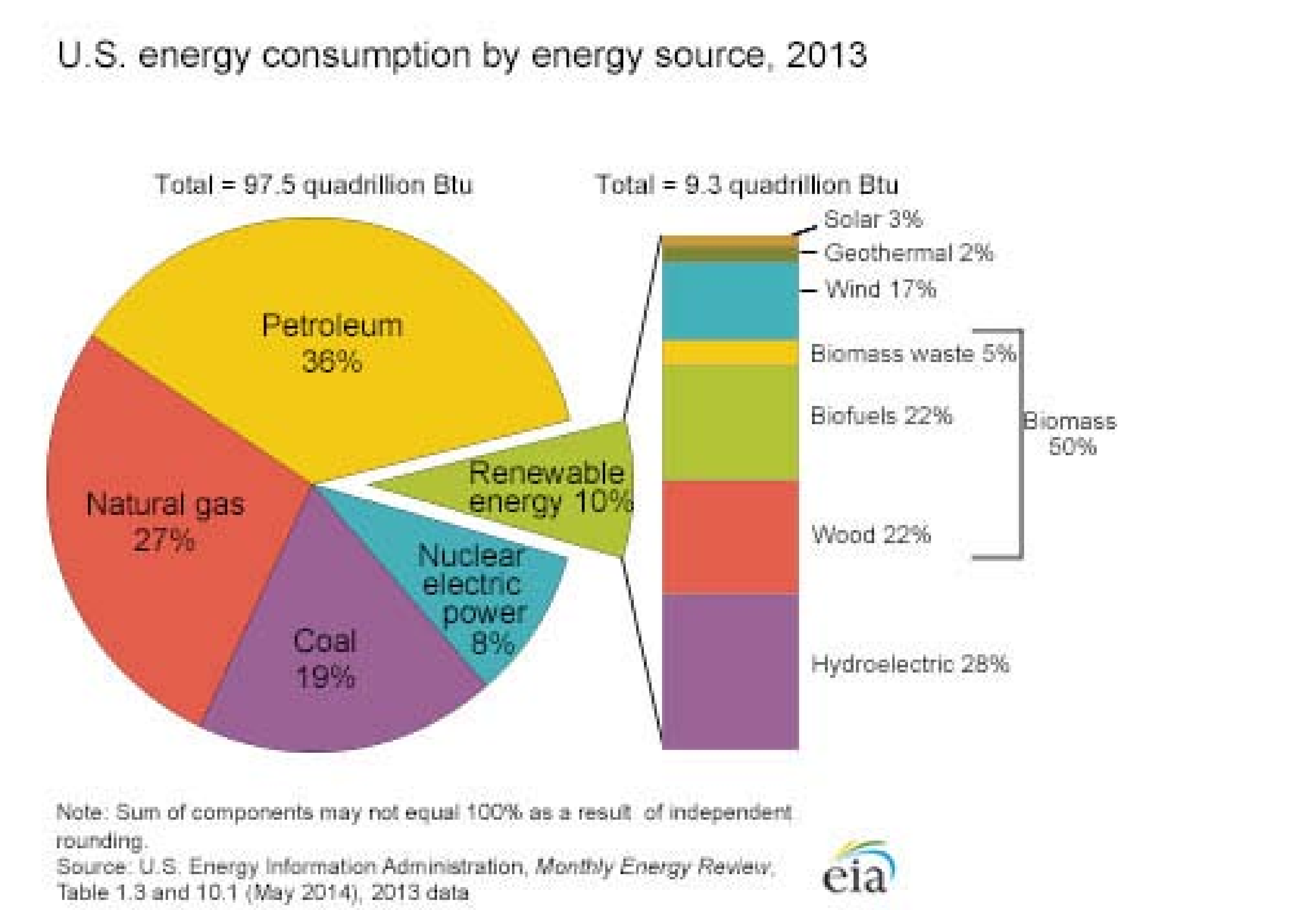
(*Spent fuel can be recycled and/or stored safely*)

COAL IS AN ABUNDANT AND CHEAP RESOURCE

But its use requires…..
Clean coal technologies
Carbon capture and sequestration



This is expensive !



Note: Wind + Solar = 2% Total

It will take time to transition to a smaller carbon footprint.

THE FUTURE

Climate change due to anthropogenic
Greenhouse gases will take centuries to remediate.
Humans will suffer, but will survive.

Man's other physical impacts on
Planet earth are relatively easy
To remediate, if there is a public
Will to do so.

FOOD IS NOT A PROBLEM

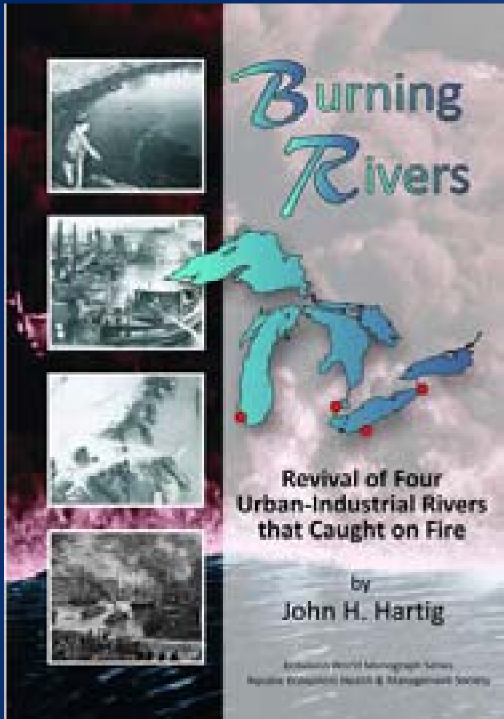
(Fertilizers, water and pesticides are, but manageable!

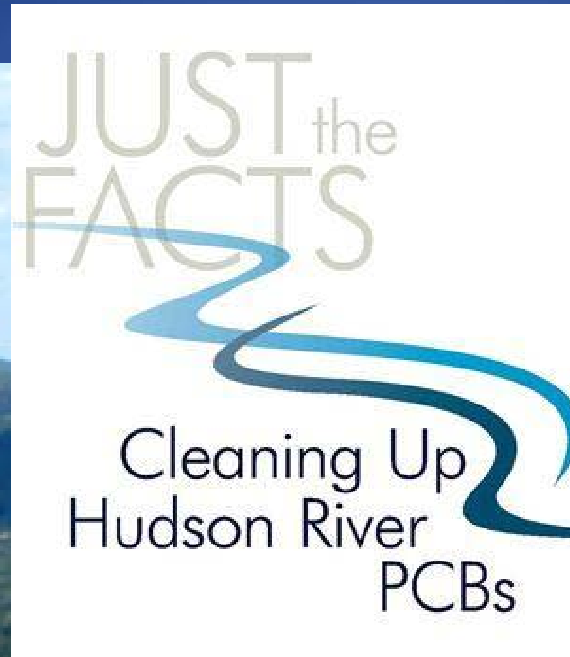
Water Use can be Regulated and Desalination is an Option for Supply

Desalination plants supply 70%
Of Saudi Arabia's water supply
And 28 Million MW electric power

Desalinization plant in Australia

When there is a will to do so, we can Clean up the environment!

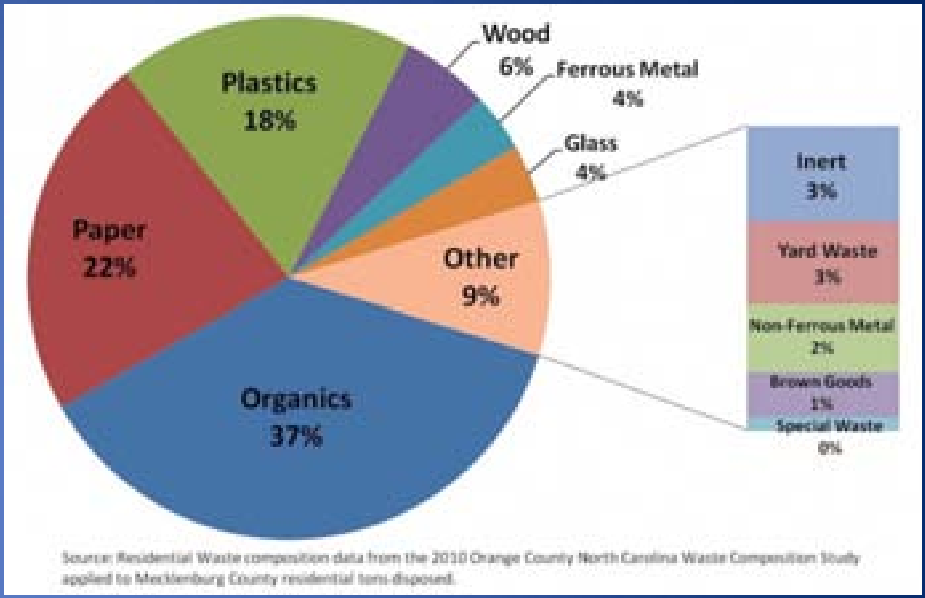


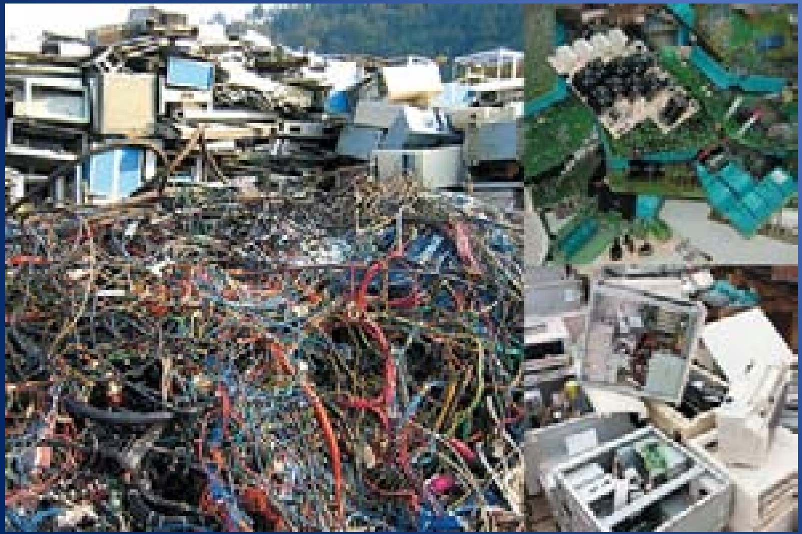


Forests can be replanted


Mining Scars can be restored

MANAGING GLOBAL WASTE
Recycling Makes a Difference!
...and saves energy.





MANAGING GLOBAL WASTE
Waste to Energy Makes a Difference!


FISHERIES SUSTAINABILITY
= Strict Quotas on wild fish
= conservation areas
= fish farming

EFFICIENT AND AFFORDABLE PUBLIC TRANSPORTATION WILL HAPPEN – It simply has to!

WHAT CAN WE DO IN NEW CANAAN ?

Some Possible Garden Club initiatives to
Reduce Carbon Footprints & Promote Conservation

- **Promote institutional and business re-cycling.**
- **Upgrade home insulation (get an energy audit!).**
- **Use energy efficient electric appliances and LED lightbulbs.**
- **Operate fuel efficient cars.**
- **Support community conversion to natural gas.**
- **Support the Solarize New Canaan program.**
- **Plant More Trees - community parks and roadsides.**
- **Reduce Pesticide use.**
- **Conserve Water by reducing lawn areas and replacing with wild greenscapes.**
- **Buy organically grown food.**
- **ban plastic bags in stores.**

COLLECTIVELY, SMALL STEPS MAKE A BIG DIFFERENCE!


A CRITICAL INITIATIVE………..
PROMOTE
INTERNATIONAL PLANNED PARENTHOOD
AND
ENVIRONMENTAL AWARENESS
IN
THE DEVELOPING WORLD!

Some Closing Thoughts

Planet Earth is changing, at an accelerating rate, and with a potentially devastating impact on humanity.

There is a significant anthropogenic factor in the change.

In the face of surging global population growth, current global practices in natural resource extraction, energy, water, land, forest and ocean exploitation, and waste disposal are simply unsustainable.

There is a growing chasm between the “haves” and “have nots”.

What is our duty as the global “privileged” class, to mitigate the impact of global change on planet earth, and on those less fortunate?


We the people, the media and opinion moguls, and our elected leaders can no longer ignore the human factor in global change. The consequences of doing so will be catastrophic to life as we know it.
Reduction of our carbon footprint, energy conservation, and natural resource sustainability matter – a lot!
Making a difference starts in your own home and community. Then let your voice be heard in the state house, corporate board room, and in Washington.
MAY ALL OF US BECOME BETTER STEWARDS OF THIS WONDERFUL PLANET.

ABOUT THE AUTHOR

G. Warfield "Skip" Hobbs is a geologist and Founder and Managing Partner of Ammonite Resources, a firm of international petroleum and mining geotechnical and business consultants which has been headquartered in New Canaan, Connecticut since 1982. Hobbs holds a B.Sc. Degree in Geology from Yale College and a M.Sc. Degree in Petroleum Geology from the Royal School of Mines, Imperial College, London. He has served as an elected officer of the American Association of Petroleum Geologists, and from 2004-2012 served on the Executive Committee of the American Geological Institute, a federation of 50 geoscience professional societies representing over 250,000 members in every earth science discipline. He was AGI President in 2010-2011. Hobbs was a member of the Council of Scientific Society Presidents in Washington, D.C., from 2009-2012, where he served as Co-Chair of the Committee on Energy and the Environment. From 2000-2014 Skip was a Trustee of the New Canaan Nature Center and was president of the Nature Center from 2012-2014. He writes and lectures frequently on energy economics and energy policy, and on environmental issues. In his spare time Hobbs manages a family farm in Massachusetts that produces organically grown vegetables, honey, maple syrup, grass-fed beef, and timber .

<skiphobbs@ammoniteresources.com>