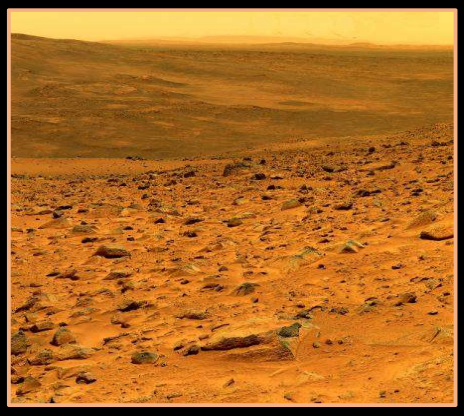
What's Behind Climate Change?

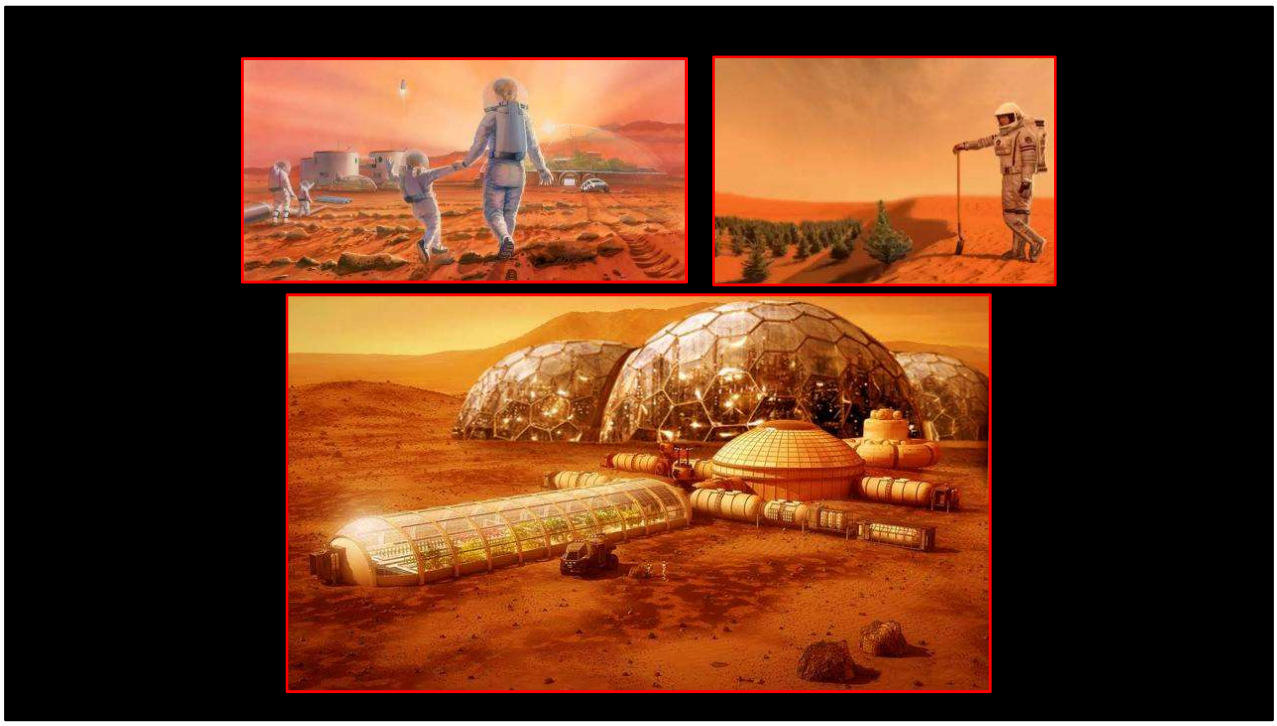
William Becker
Presidential Climate Action Project

Two Paths to Our Future?

or



"We are running out of space on Earth and we need to break through the technical limitations preventing us living elsewhere in the universe."



What's Behind Climate Change?

- Bubbles
- Denial
- Disconnection
- Soft Energy
- Organized Retreat
- Biophilia

Closing

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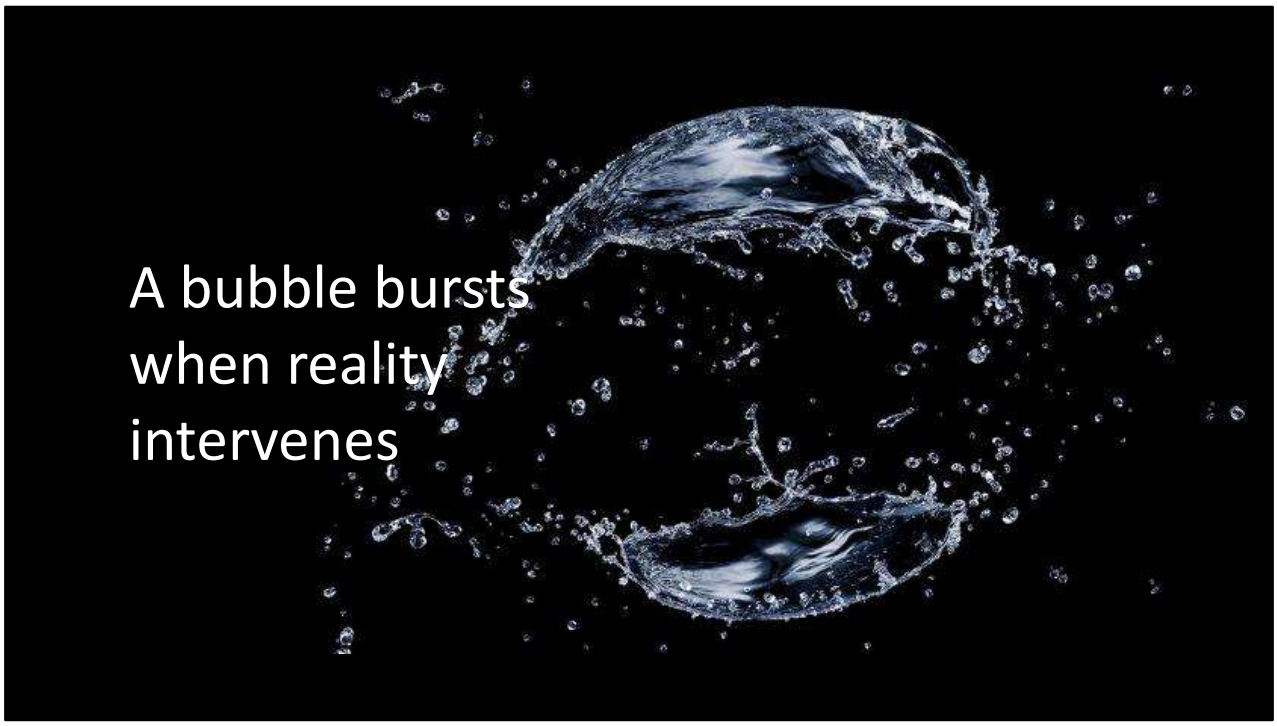
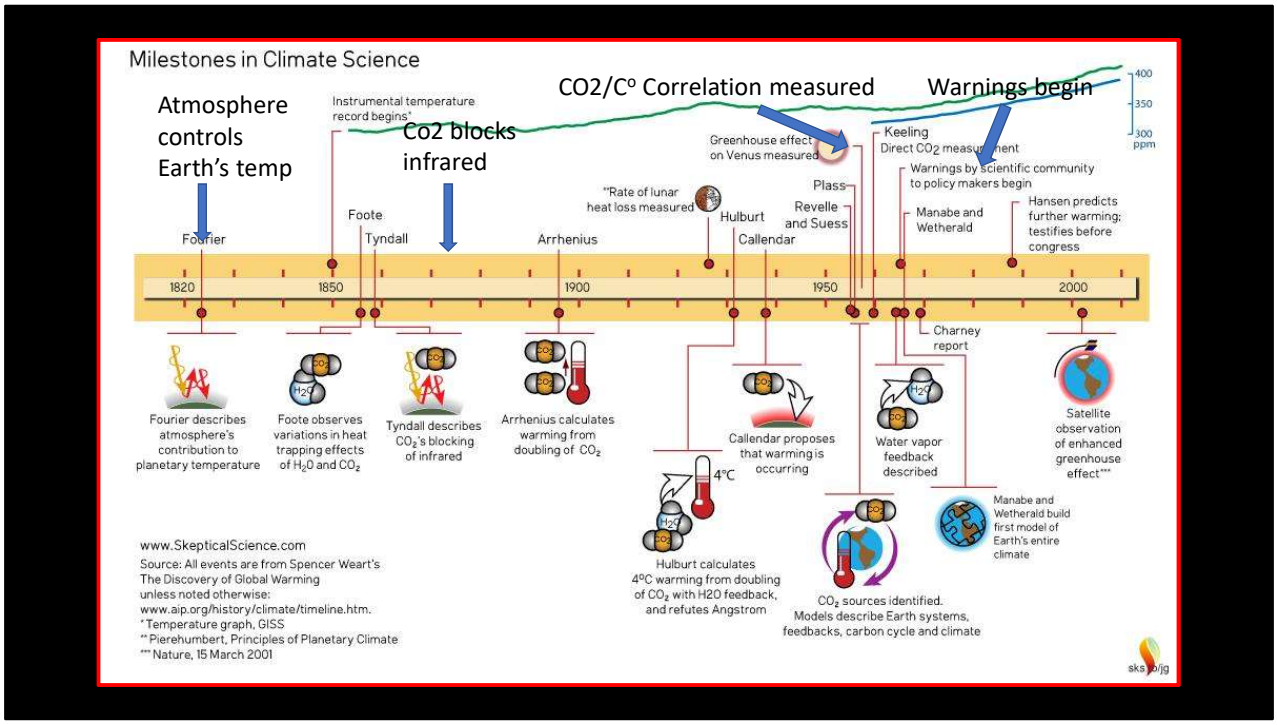
Closing

A “bubble” develops when our actions are based on implausible views about the future

A bubble bursts when reality intervenes



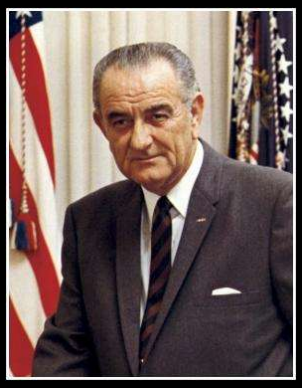

Milestones in Climate Science
Atmosphere controls Earth's temp
Instrumental temperature record begins*
Co2 blocks infrared
CO2/C° Correlation measured
Warnings begin
Greenhouse effect on Venus measured
Keeling
Direct CO2 measurement
Warnings by scientific community to policy makers begin
**Rate of lunar heat loss measured
Plass
Revelle and Suess
Manabe and Wetherald
Hansen predicts further warming; testifies before congress
Hulburt
Callendar
Fourier
Foote
Tyndall
Arrhenius
1820
1850
1900
1950
2000
400
350
300
ppm
Charney report
Fourier describes atmosphere's contribution to planetary temperature
Foote observes variations in heat trapping effects of H2O and CO2
Tyndall describes CO2's blocking of infrared
Arrhenius calculates warming from doubling of CO2
Callendar proposes that warming is occurring
Water vapor feedback described
Satellite observation of enhanced greenhouse effect***
4°C
Manabe and Wetherald build first model of Earth's entire climate
Hulburt calculates 4ºC warming from doubling of CO2 with H2O feedback, and refutes Angstrom
CO2 sources identified. Models describe Earth systems, feedbacks, carbon cycle and climate
www.SkepticalScience.com
Source: All events are from Spencer Weart's The Discovery of Global Warming unless noted otherwise: www.aip.org/history/climate/timeline.htm.
*Temperature graph, GISS
**Pierehumbert, Principles of Planetary Climate
***Nature, 15 March 2001


Positive proof of global warming.
18th Century
1900
1950
1970
1980
1990
2006

Missed Opportunities

President's Science Advisory Panel
November 1965

By the year 2000 there will be about 25% more CO^2 in the atmosphere than at present. This will modify the heat balance of the atmosphere to such an extent that marked changes in climate, not controllable through local or even national efforts, could occur.

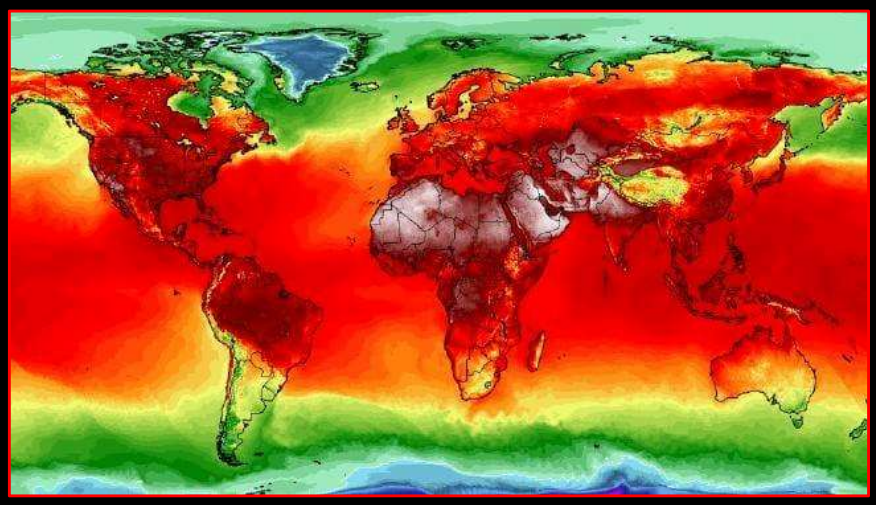


One challenge is our history of avoiding action. As I investigated what past president did about the problem, I found that presidents as far back as Lyndon Johnson were warned by their sciencie advisor that global warming would lead to consequence we could not control. As one observer said about the peace negotiations in the Middle East – We have never missed an opportunity to miss an opportunity.

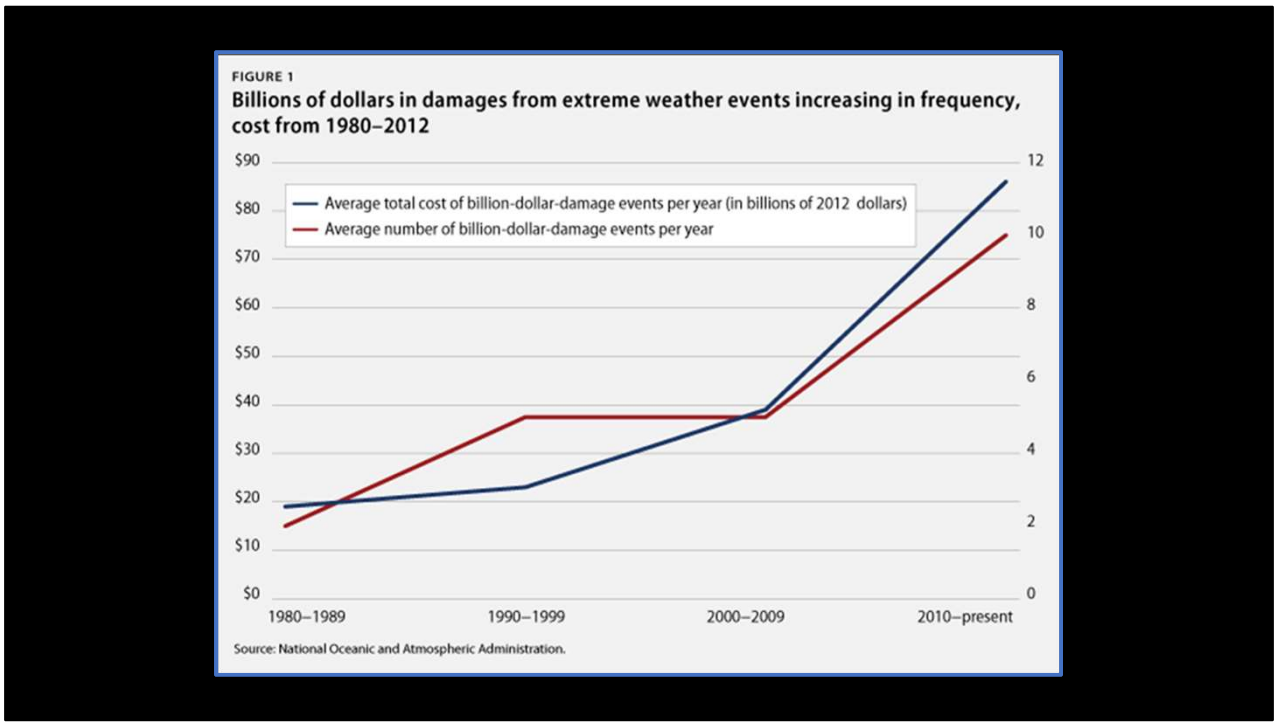

GLOBAL TEMPERATURE & CARBON DIOXIDE
°C
+1.1°
+0.9°
+0.7°
+0.5°
+0.3°
+0.1°
-0.1°
-0.3°
PPM
410
390
370
350
330
310
290
270
TEMPERATURE
CARBON DIOXIDE
1880
2017
CLIMATE CENTRAL

350 ppm “safe”

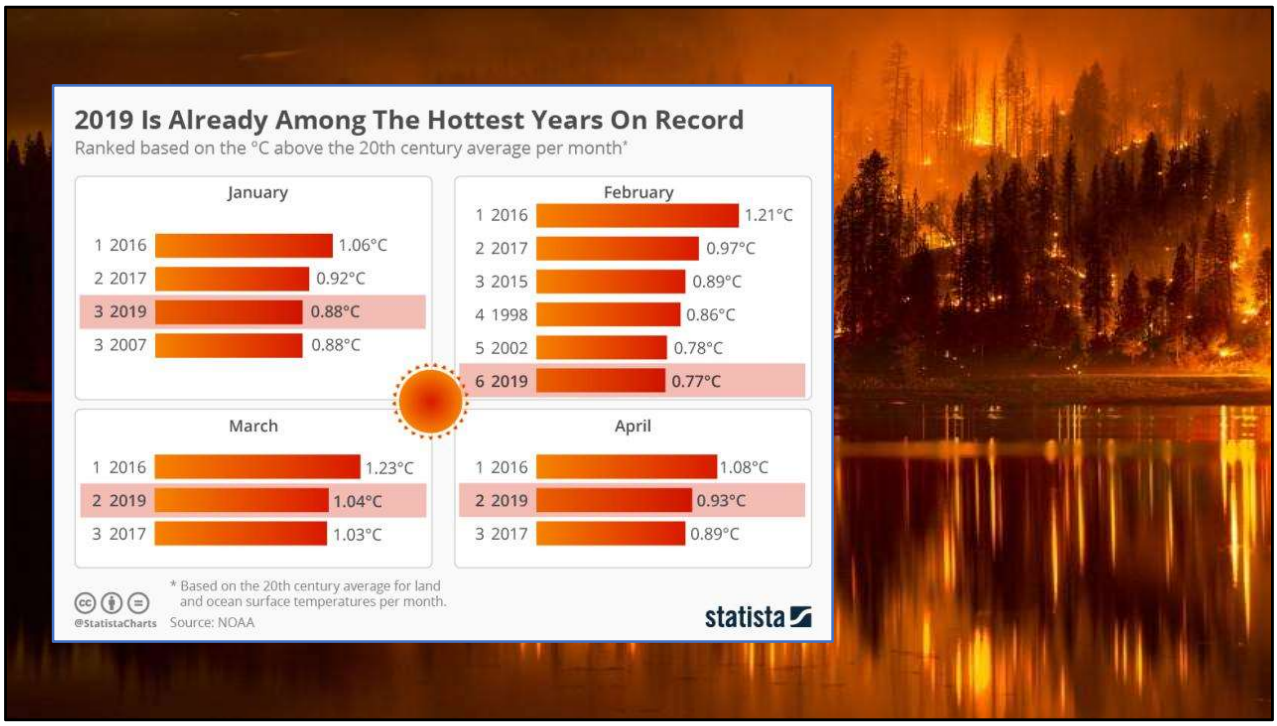
415 ppm today



We are beginning to see substantial pressures on federal disaster spending. In fact, Congress is considering how to push more of those costs on to states. But for a taxpayer, it makes little difference whether he or she is paying to disasters as a federal or a state taxpayer.

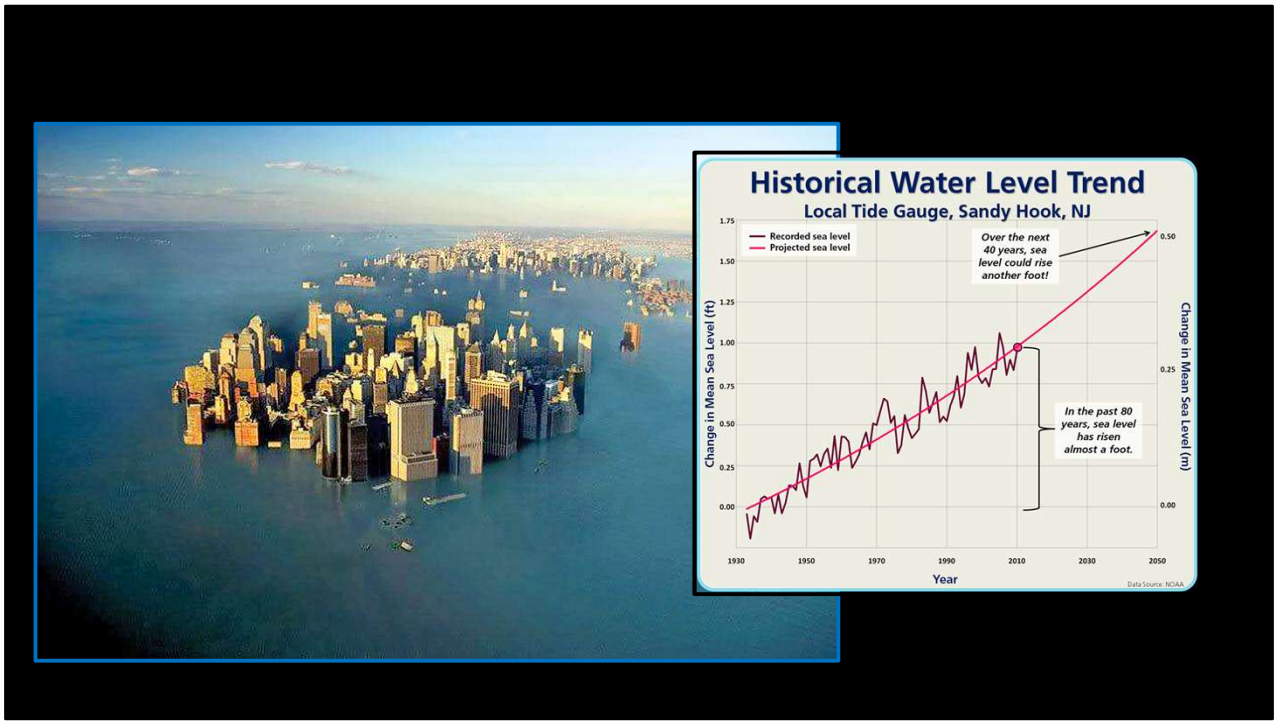


For more information: https://www.ncdc.noaa.gov/billions/events



For more information: https://www.noaa.gov/news/summer-2019-was-hottest-on-record-for-northern-hemisphere

Source: https://www.hunter-ed.com/michigan/studyGuide/Causes-of-Threatened-and-Endangered-Species/201023_700043005/
For more information: https://www.endangeredspeciesinternational.org/overview5.html



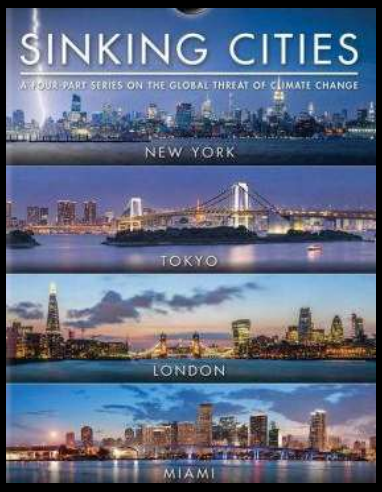
For more information:
https://tidesandcurrents.noaa.gov/est/est_station.shtml?stnid=8531680
To find observed water levels at other specific locations, go to:
https://www.tidesandcurrents.noaa.gov/waterlevels.html?id=8531680

Source: https://the100metreline.blogspot.com/2009/06/80m-sea-rise-maps-for-north-america.html

For more information: https://www.usgs.gov/special-topic/water-science-school/science/sea-level-and-climate?qt-science_center_objects=0#qt-science_center_objects


1955
SAN JOAQUIN VALLEY
CALIFORNIA
BM SS61
SUBSIDENCE 9M
1925-1977
1977

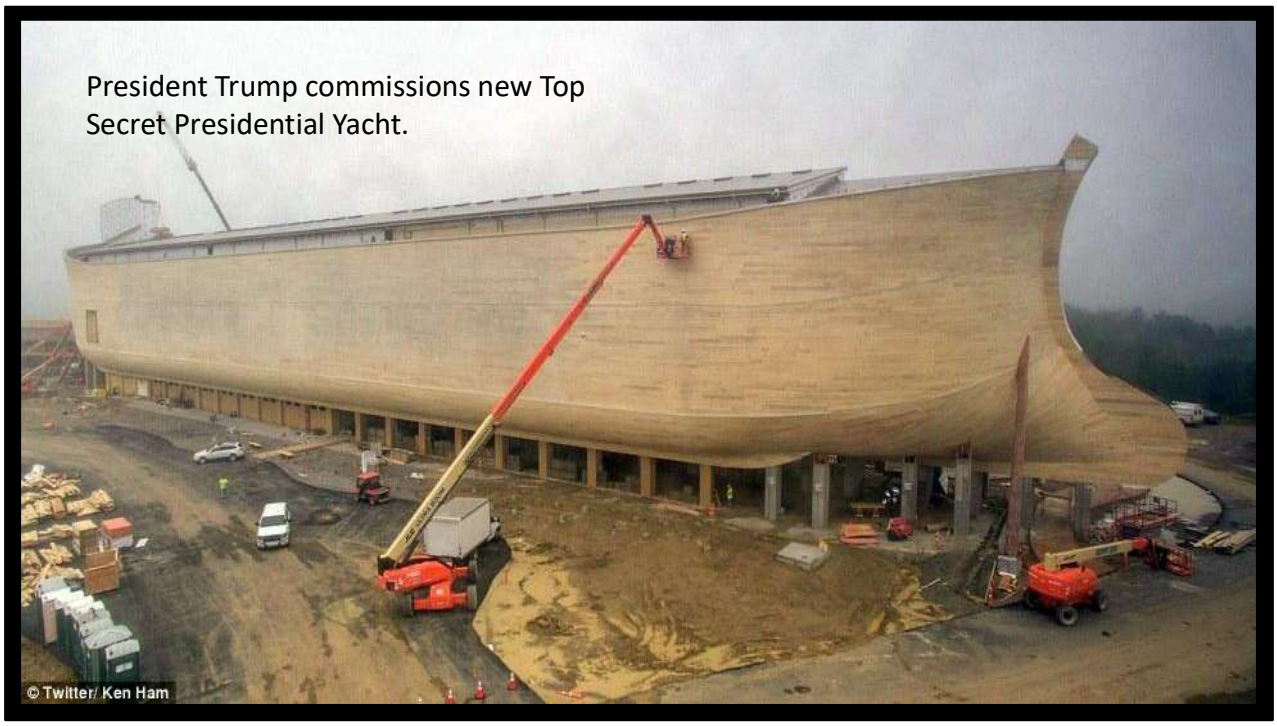

1965
USGS
SUBSIDENCE 8.6 ft
1965-2016
2016


SINKING CITIES
A FOUR-PART SERIES ON THE GLOBAL THREAT OF CLIMATE CHANGE
NEW YORK
TOKYO
LONDON
MIAMI

143 million climate refugees worldwide by 2050

Central America one of three most-affected regions. Drought affecting food production, hurricanes, sea-level rise, poverty, trade policies

For more information on Central America Dry Corridor:
http://www.fao.org/emergencies/crisis/dry-corridor/en/
Source of worldwide refugees information at World Bank:
https://www.worldbank.org/en/news/infographic/2018/03/19/groundswell---preparing-for-internal-climate-migration


President Trump commissions new Top Secret Presidential Yacht.
© Twitter/ Ken Ham

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Closing

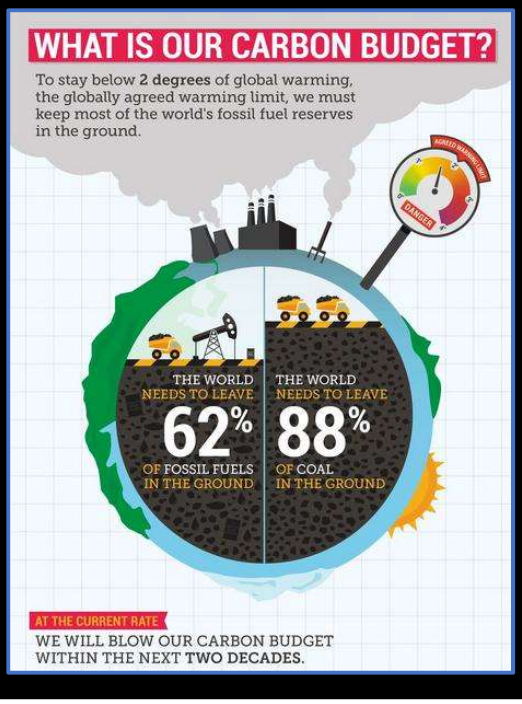
SCIENTIFIC AMERICAN

SUSTAINABILITY

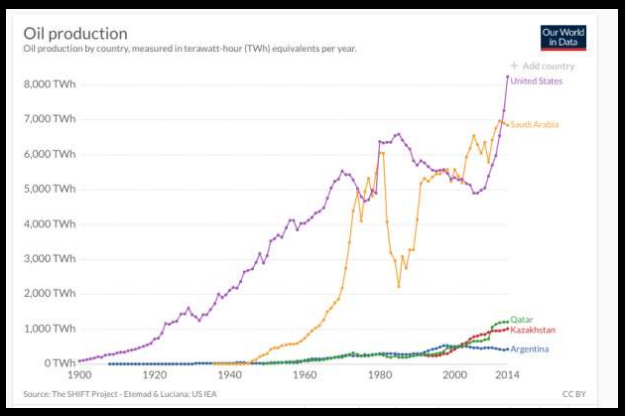
Exxon Knew about Climate Change almost 40 years ago

A new investigation shows the oil company understood the science before it became a public issue and spent millions to promote misinformation

" I believe in clean air. Immaculate air. But I don’t believe in climate change. This very expensive global warming bullshit has got to stop."

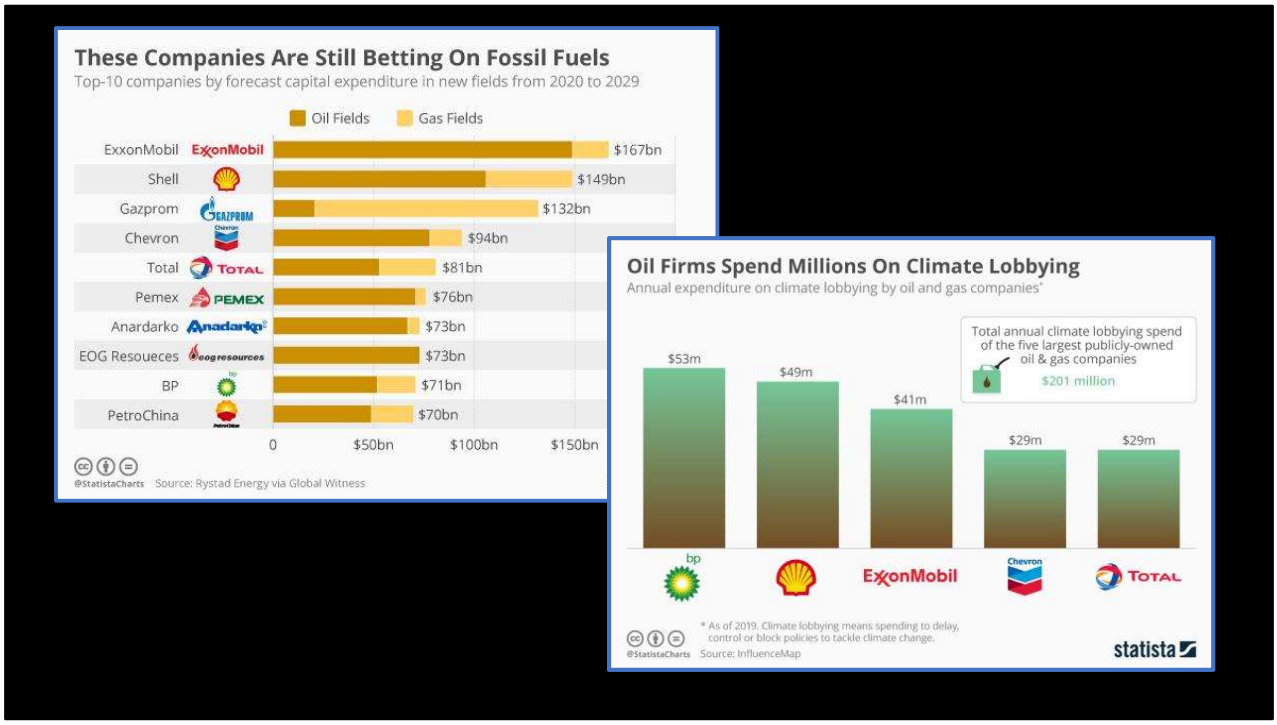


- Scientists: Most fossil fuels must remain in the ground
- But oil/gas production booming



For more information on unburnable fossil fuels:
https://www.nature.com/articles/517150a
Source of graph: Our World In Data: https://ourworldindata.org/fossil-fuels

The graph shows the change in oil production at the country-level from 1900 onwards, where data is available. This can be explored as a time-series or in map form. In 2014, the United States is the world's largest country producer of oil, accounting for just under one-fifth of global production. Saudi Arabia is the world's second largest producer, followed by Russia.
Types of oil production have influenced the shapes of these trends over time. As explored later in this entry, oil production in the United States looked likely to peak and decline in the 1980s before rising again with the extraction of increasing numbers of shale oil resources.



Source of Table on left: Rystad Energy via Global Witness via Statista:
Explanation: Despite the strides made by renewable energy around the world in recent years, oil and gas companies are still planning trillions of dollars worth of fossil fuel exploration and production projects over the coming decade. An analysis published by website global witness claims that the world's ten biggest oil and gas giants will spend $4.9 trillion on new oil and gas fields up to 2029, plans that are "poles apart" from the goals of the Paris climate deal to curb rising temperatures. Future production and capital expenditure (capex) has fallen by more than a third since 2014, primarily due to a slump in oil prices, though it is forecast to rise over 85 percent over the next 10 years. Which companies are still betting the most on fossil fuels? The analysis found that ExxonMobil will be investing some $149 billion into new oil fields during that period, along with $18 billion for gas projects. Shell's capex is expected to be the second-highest at $149 billion while Gazprom's is set to reach $132 billion, the vast majority of which will be spent on gas fields.

Source of chart on right: InfluenceMap via Statista
Explanation: The world's five largest publicly owned oil and gas companies spend approximately $200 million every year on climate lobbying - controlling, delaying or blocking binding climate-motivated policy. In the wake of the Paris Agreement, that has created problems for governments implementing policies that are vital in meeting climate

change targets. Companies are generally reluctant to disclose their lobbying expenditure figures. Using a methodology focusing on the best available record along with intensive research of corporate messaging, InfluenceMap was able to estimate different companies' influence on initiatives to halt climate change. BP spends the most on climate lobbying every year with $53 million, ahead of Shell's $49 million and ExxonMobil's $41 million. Chevron and Total each spend about $29 million annually. According to InfluenceMap, part of the lobby spend goes towards sophisticated efforts to engage politicians and the general public on environmental policies that could impact the usage of fossil fuels. A recent example cited in the report is BP's coordination of messages across its social media channels and advertising platforms that reframe the climate crisis as a "dual energy challenge". The five companies listed support their lobbying expenditure with a spend of $195 million per year on branding activities. This suggests they support action on climate change with the most common tactics drawing attention to low carbon, positioning the company as a climate expert and acknowledging climate concern while ignoring solutions. The report said that the campaigns are misleading the public given that the companies in question are continuing to expand their oil and gas extraction activities. In fact, only 3 percent of spending from the companies is directed to low carbon projects. The report's findings were rejected by Shell and Chevron who both reinforced their commitment to the reduction of greenhouse gases and the fight against climate change.

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Closing

87% indoors

6% vehicles

Smart Phones


HUMMER

This photo is meant to convey that we should expose our children early to direct experiences with nature, as opposed to the previous slides showing kids inside, in cars and on smart phones.

The great ecological issues of our time have to do with our failure to see things in their entirety. We continue to manage complex ecological systems as if they were a collection of isolated parts.

- David Orr

Science & Religion

Science	Religion
Even when you have tons of evidence, doubt what you see	Even without a single piece of evidence, believe in what you can't see

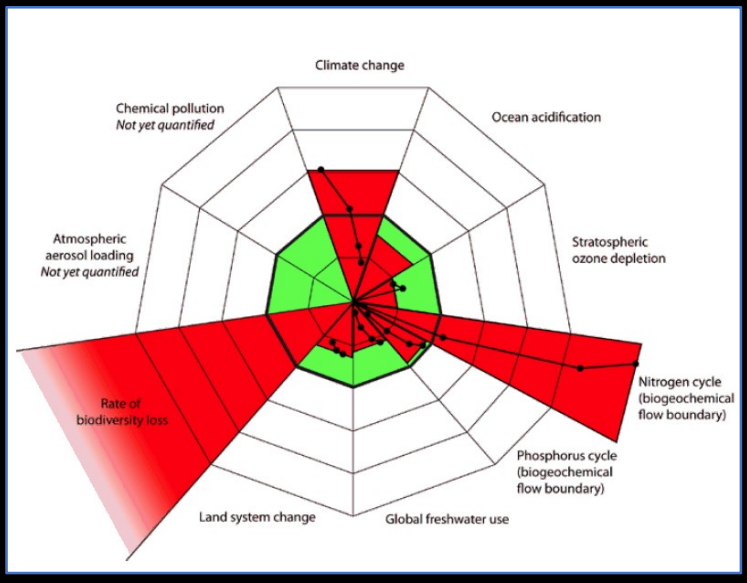
≠

Science is God's way of showing us the genius of his creation.

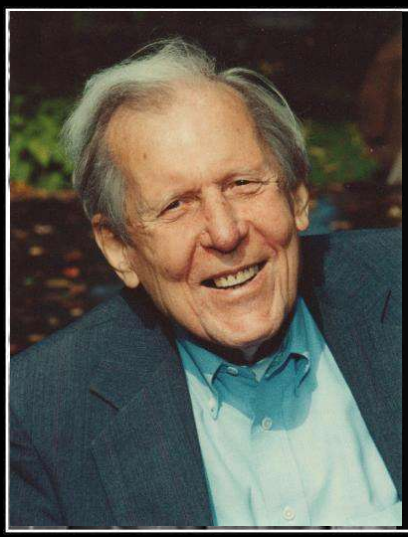
troposphere

Nine Planetary Boundaries:

1. Land use change
2. Phosphorus cycle
3. Nitrogen cycle
4. Ozone depletion
5. Ocean acidification
6. Chemical pollution
7. Aerosol loading
8. Biodiversity loss
9. Climate change



Source and explanation: Stockholm Resilience Centre: https://www.stockholmresilience.org/research/planetary-boundaries/planetary-boundaries/about-the-research/the-nine-planetary-boundaries.html



The natural world is the larger sacred community to which we belong. To be alienated from this community is to become destitute in all that makes us human. To damage this community is to diminish our own existence.

— Thomas Berry —

AZ QUOTES

Anthropocene

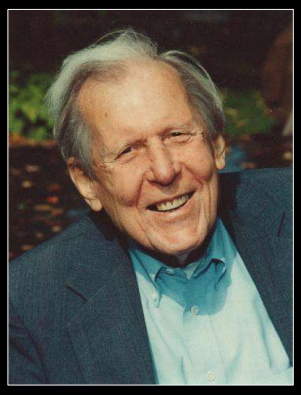
Period during which human activity has been the dominant influence on climate & environment

Anthropocentrism

Human beings central & most significant entities in the world

Wholocene

Humans are part of social, economic & natural worlds. We are members of this dynamic system with strong responsibilities to protect natural world for all species, including ours



"Reconnecting the human species with the rest of the world is the great work of the 21st century."

Catholic priest & eco-theologian Thomas Berry

For more information and excellent background, see:
https://www.sierraclub.org/sierra/2019-3-may-june/feature/outdoors-for-all-nature-is-a-human-right

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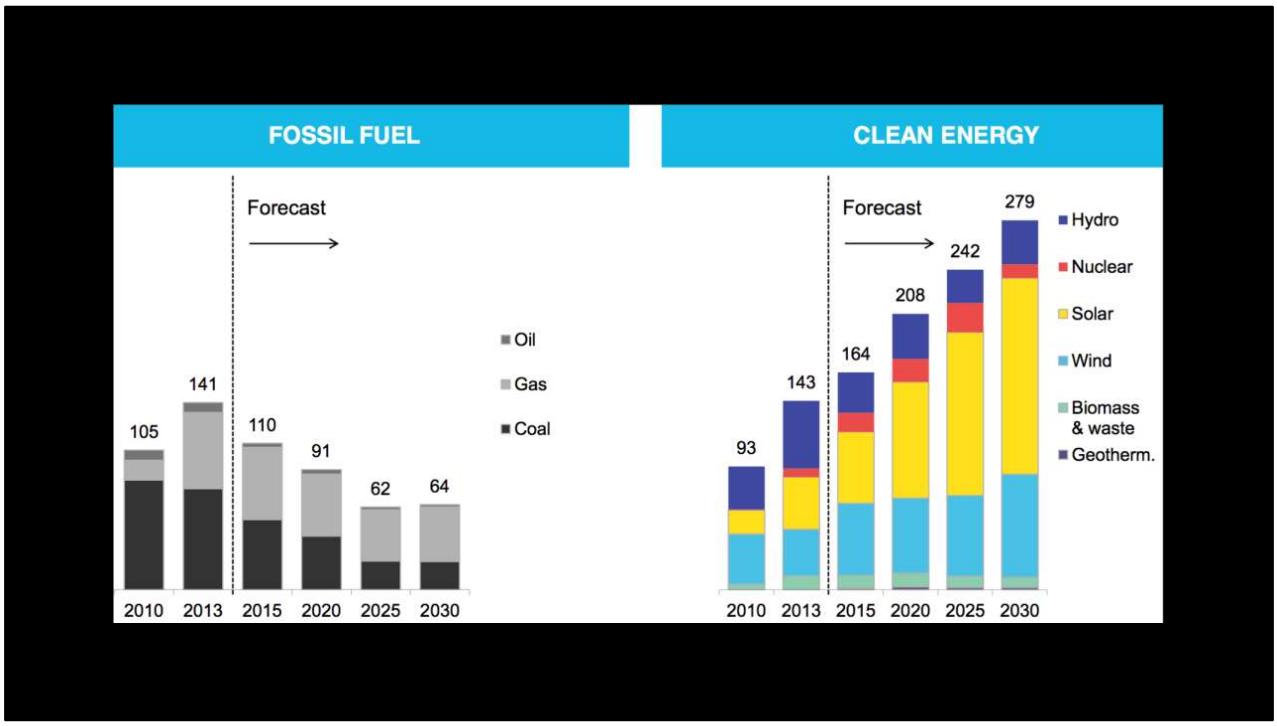
Closing


Transition

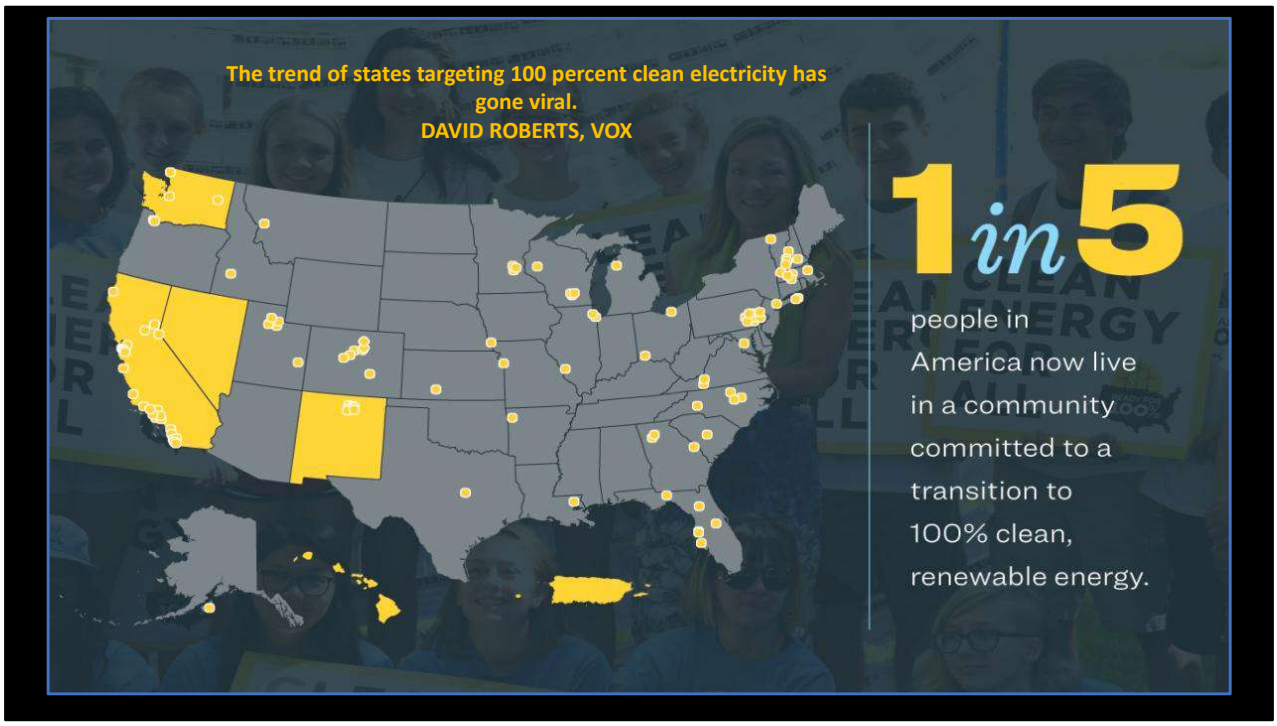


Source: Bloomberg New Energy Finance via ZME Science: https://www.zmescience.com/ecology/climate/how-much-renewable-energy/

According to the Renewables Global Status Report (GSR) from REN21, roughly a fifth of the world's electrical power production now comes from renewable sources. To be more precise, in 2013 renewable energy accounted for 22% of the global energy mix, up from 21% in 2012 and 18% in 2007. The International Energy Agency says renewable energy could make up over a quarter of global electricity generation by 2020 thanks to the rapid deployment of wind and solar energy, as well as new hydro. A report by Frankfurt School UNEP Centre and Bloomberg New Energy Finance says carbon-free renewable power plants in 2014 surpassed 100,000 megawatts of capacity for the first time. A year before, in 2013, it seems like interest in renewable energy surpassed conventional energy sources for the first time as 143 gigawatts of renewable electricity capacity were added, compared with 141 gigawatts in new plants that burn fossil fuels.

Aggressive/Taking

Passive/Receiving



https://www.sierraclub.org/articles/2019/05/100-percent-clean-energy-new-normal
For itemized commitments, see: https://www.sierraclub.org/ready-for-100/commitments

Sierra Club explains: Across the U.S. over 90 cities, more than ten counties and two states, have already adopted ambitious 100% clean energy goals. Six cities in the U.S.--Aspen, Burlington, Georgetown, Greensburg, Rock port, and Kodiak Island--have already hit their targets. These six cities now generate 100% of the energy used community-wide from clean, non-polluting and renewable sources. A city commitment to 100% renewable energy is a mandate for action.
Numerous U.S. cities have made public commitments to cut carbon and address climate change through initiatives like the Compact of Mayors, We Are Still In, or by establishing their own Climate Action Plans.

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Closing

People have an "urge to affiliate with other forms of life".

Edward O. Wilson

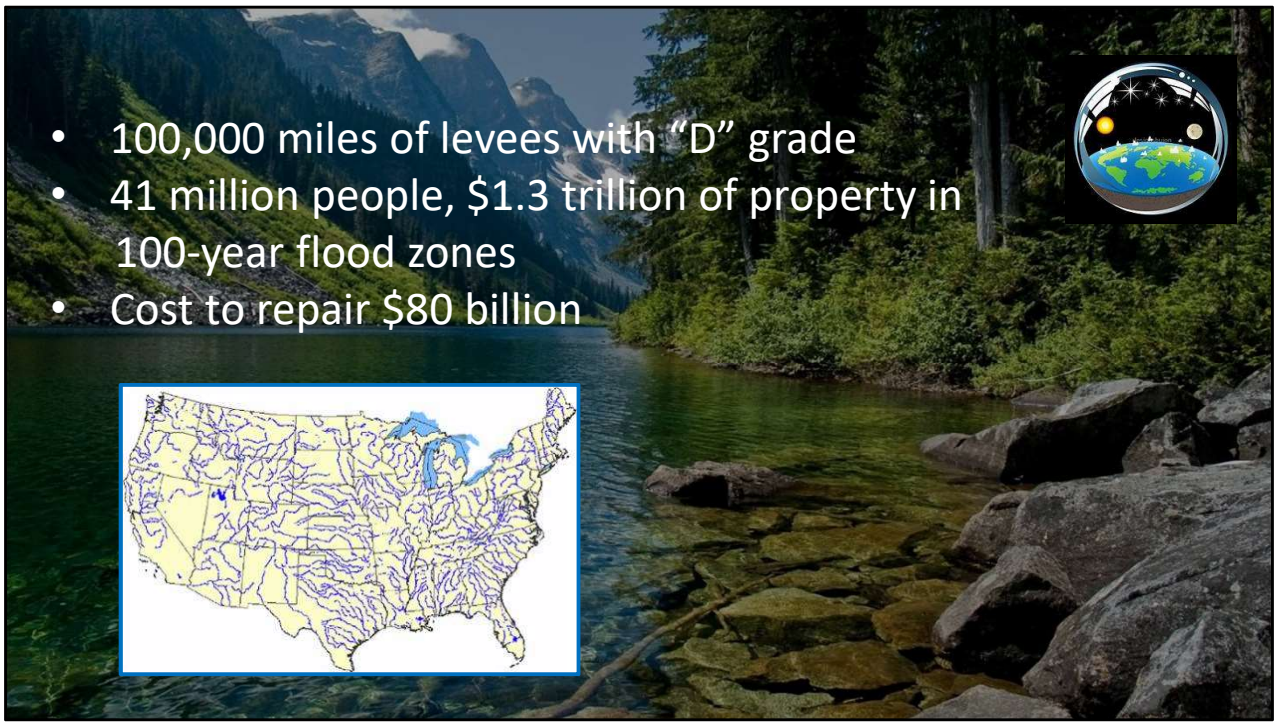
52% of Americans live in coastal counties

40% (123.3 million) live on shoreline counties

8% increase expected by 2020

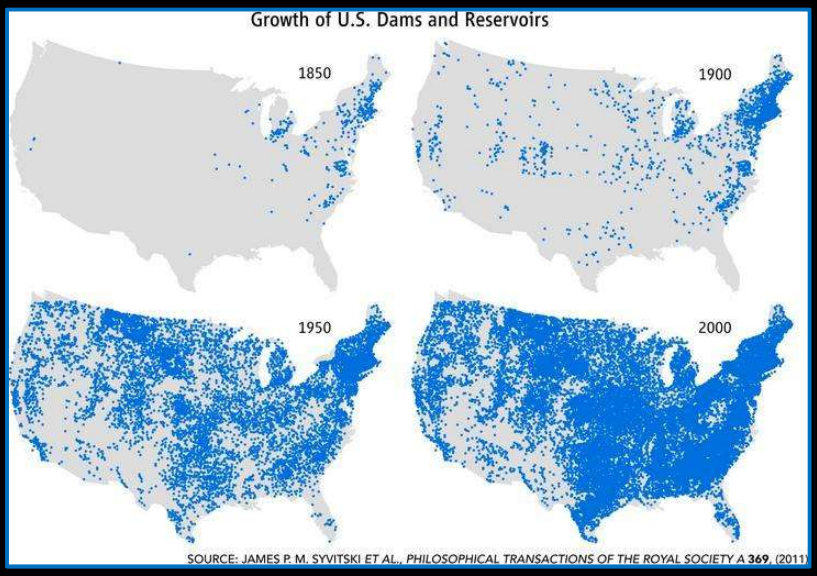
For more information: http://worldpopulationreview.com/countries/united-states-population/
Data on shoreline counties from National Ocean Service: https://oceanservice.noaa.gov/facts/population.html
Source of Map and 52% estimate from NOAA via FEMA: https://www.fema.gov/media-library-data/20130726-1608-20490-8610/coastalzones_fnl_low.pdf

Coastal counties (as opposed to shoreline counties) are important because of the increasing strength and inland penetration of storm surges as well as hurricane exposure affects these counties.



Source: American Society of Civil Engineers 2017 report card on U.S. infrastructure: https://www.infrastructurereportcard.org/

Katrina breached 50 Corps of Engineers' levees



84,000 Dams

1,500 failures since 1850

4,000 dead

SOURCE: JAMES P. M. SYVITSKI ET AL., PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY A 369, (2011) From the Science article "A global perspective on the anthropocene"
DOI: 10.1126/science.334.6052.34
http://www.sciencemag.org/content/334/6052/34.full?sid=a0874eff-d1dc-4de3-86e8-873f17204b6b

Average life more than 50 years

Design capacity 100-year Flood

Cost: $45 billion critical dams

Source: American Society of Civil Engineers 2017 report card on U.S. infrastructure: https://www.infrastructurereportcard.org/

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Closing

Restoration Economy

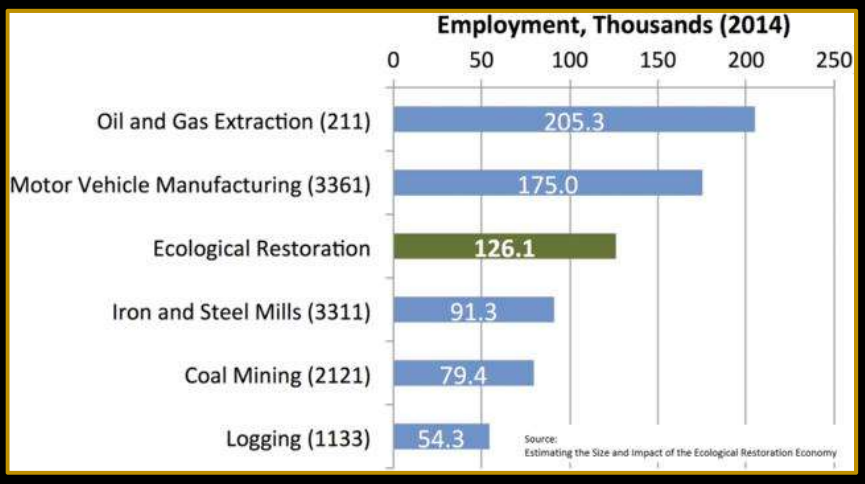
Assisting recovery of degraded, destroyed or damaged ecosystems to make them resilient & self-sustaining.

- Society for Ecological Restoration

Study from Univearsity of North Carolina at Chapel Hill
9.3 billion in direct employment

Restoration Economy

- $25 billion economy
- 126,000 direct jobs
- 95,000 indirect jobs



Source and more information: https://www.greenbiz.com/article/10-things-you-need-know-about-restoration-economy
Formal research in 2015 at University of North Carolina—Chapel Hill. Paper at https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0128339

Restoring wetlands on Louisiana’s Gulf Coast

Restoring meander on Kissimmee River, Fla

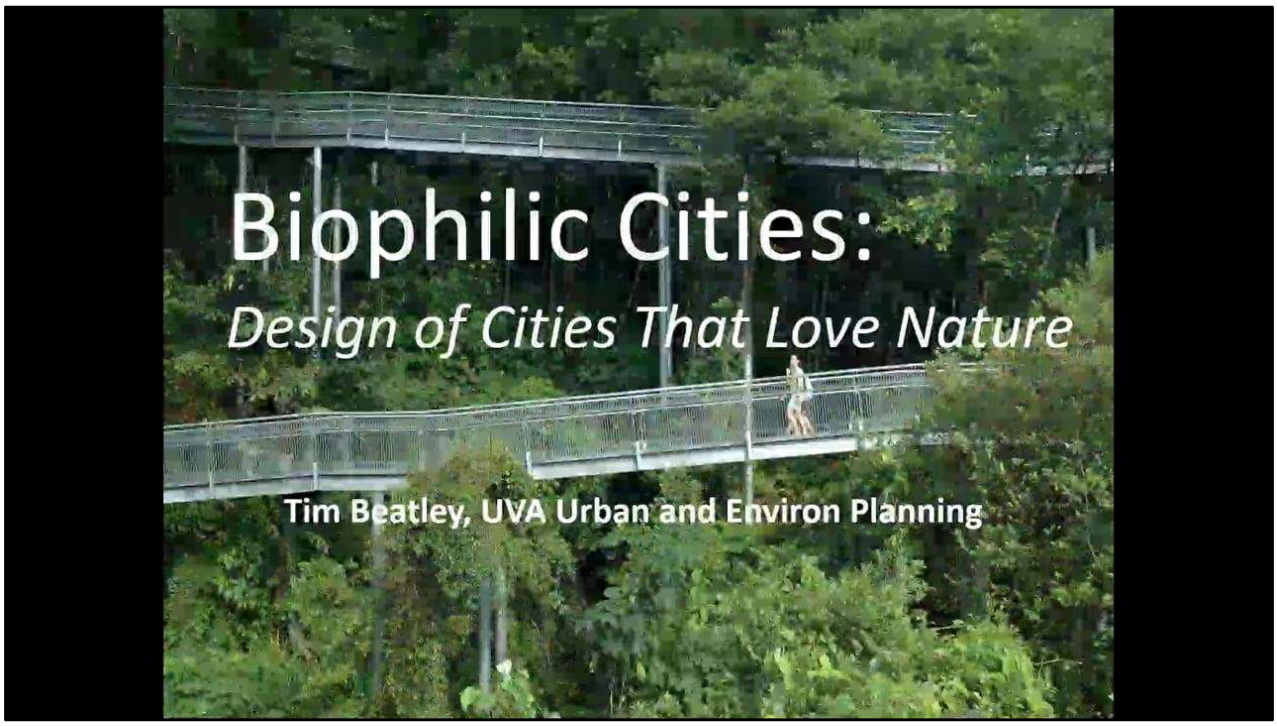
Kissimme river restorationOnce completed, the Kissimmee River Restoration will be the largest river restoration

The project area covers 3,000 square miles, stretching from the southern Orlando area south to Lake Okeechobee. The Kissimmee River Restoration project is intended to restore over 40 square miles of river and floodplain ecosystem including 43 miles of meandering river channel and 27,000 acres of wetlands. Restoration efforts will re-establish an environment conducive to the fauna and flora that existed there prior to the channeling efforts in the 1960s. The following are the Corps's goals and objectives to restore the ecological integrity of the damaged ecosystem: re-establish historic hydrologic conditions; recreate the historical river/floodplain connectivity; recreate the historic mosaic of wetland plant communities; and, restore the historic biological diversity and functionality.

Restoring floodplain to let water spread out

Kissimii river restoring floodplain other projects in Napa River Valley, CA;
Yakima River Basin in Yakima County WA
Yuba River Canyon Restoration in Smartsville, CA


"Managed Retreat"



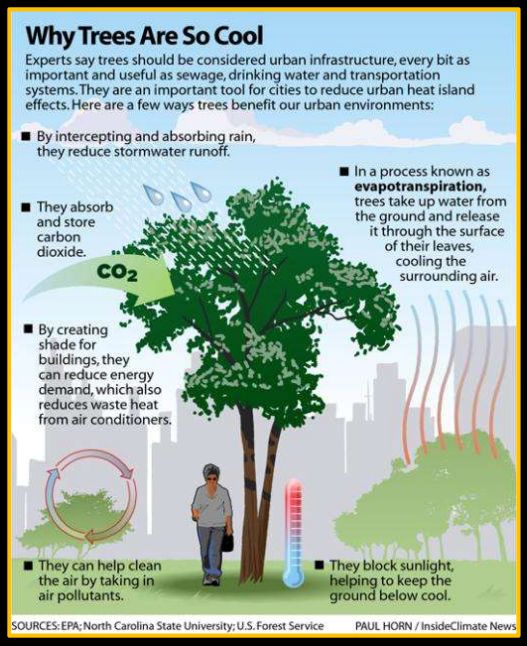
More information: https://www.biophiliccities.org/

Greening city to reduce stormwater runoff, cool city & improve air quality

Permeable surfaces.
& green alleys

Green ally in chicao

Urban forestry for heat island mitigation



Source of Urban Heat Island Graph: Lawrence Berkeley National Lab at https://heatisland.lbl.gov/coolscience n
Source of tree graphic: EPA, US Forest Service and North Carolina State University

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Closing

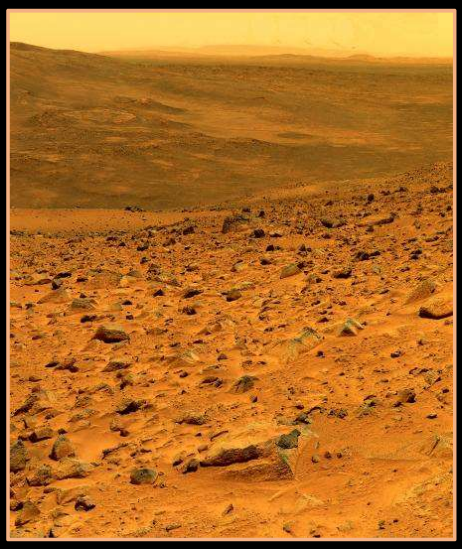
We know how to walk on the moon.

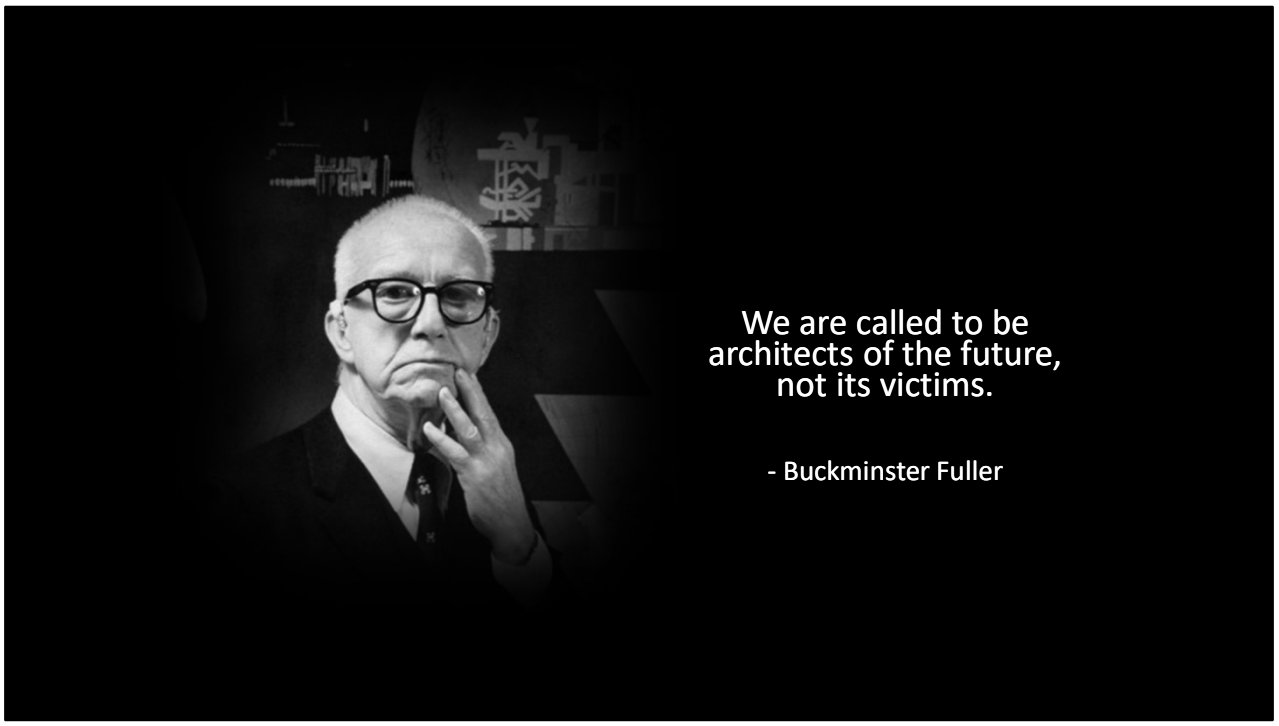
We have yet to learn how to walk on the Earth.

If we insist on ruining the planet,
we have to stop calling ourselves
the most intelligent species.

The Choice

or




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

What's behind climate change?

- Fractured rather than holistic thinking
- Lack of Wholocene awareness
- Denial, inertia, greed, fear delay action

What can save us?

- Net zero carbon by 2050
- Holistic awareness
- Rapid mitigation of emissions
- Rapid climate adaptation
- Stewardship of critical resources
- Thinking of our children & theirs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William Becker
Presidential Climate Action Project