Some thoughts about Global Warming and Global Climate Change

James Flaten
NASA's MN Space Grant Consortium
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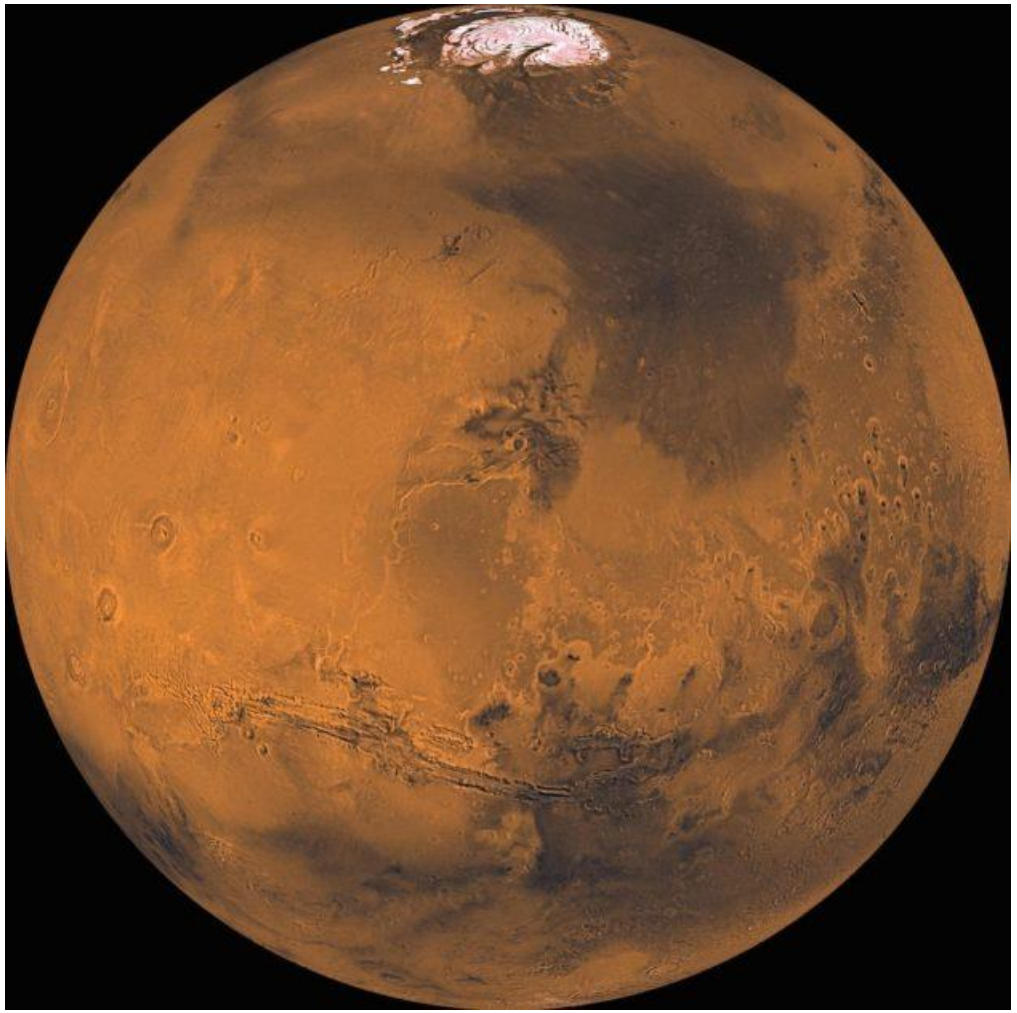
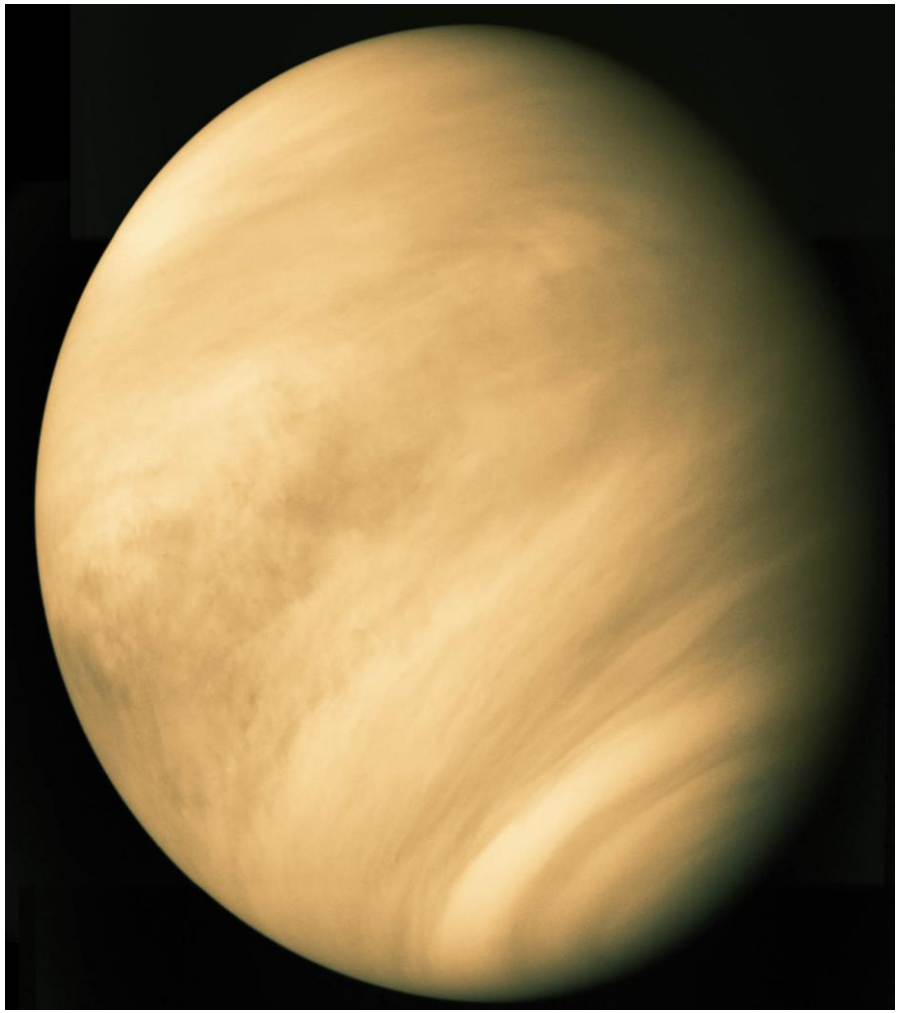
Cautionary Tales

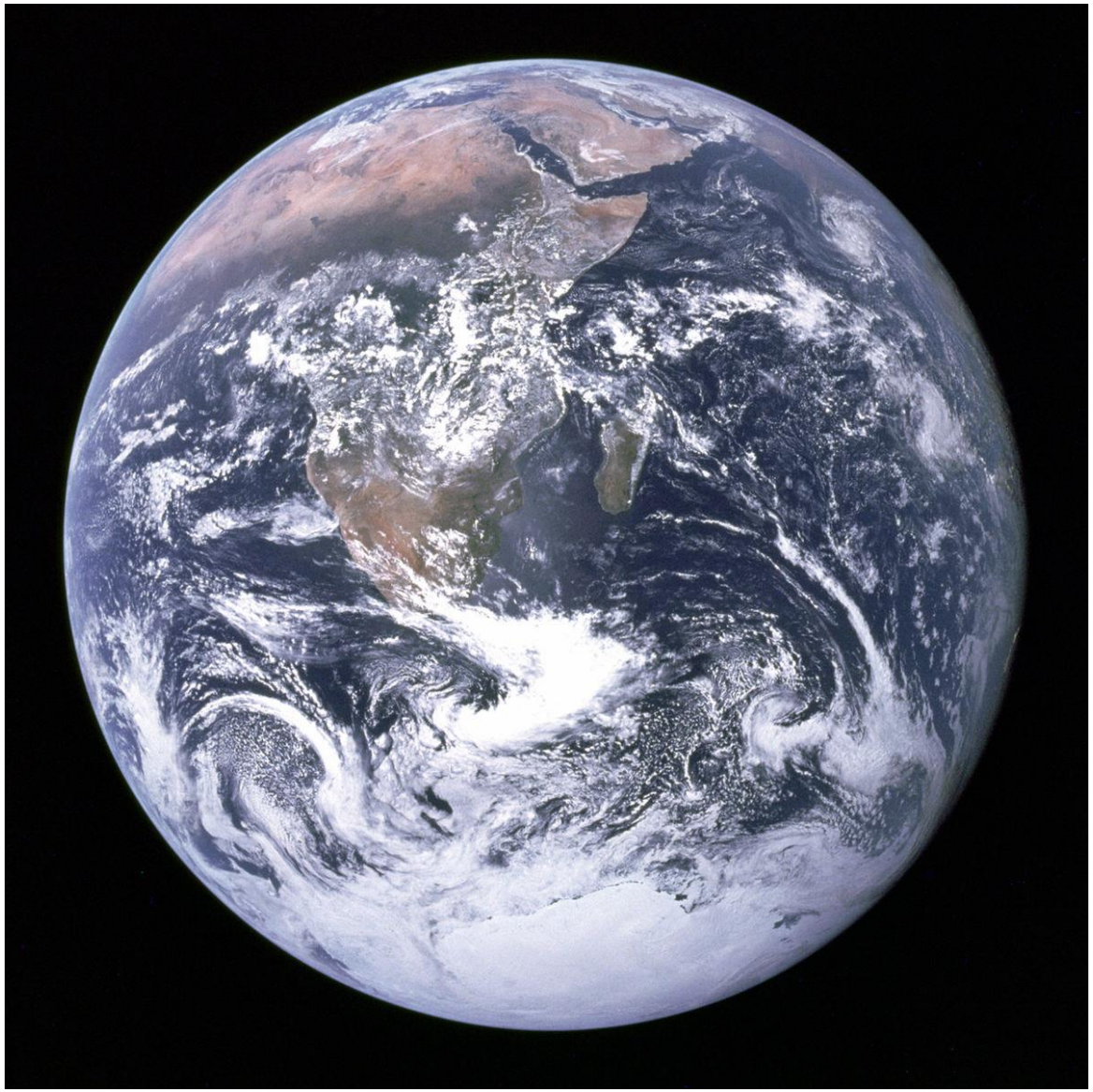


Mars

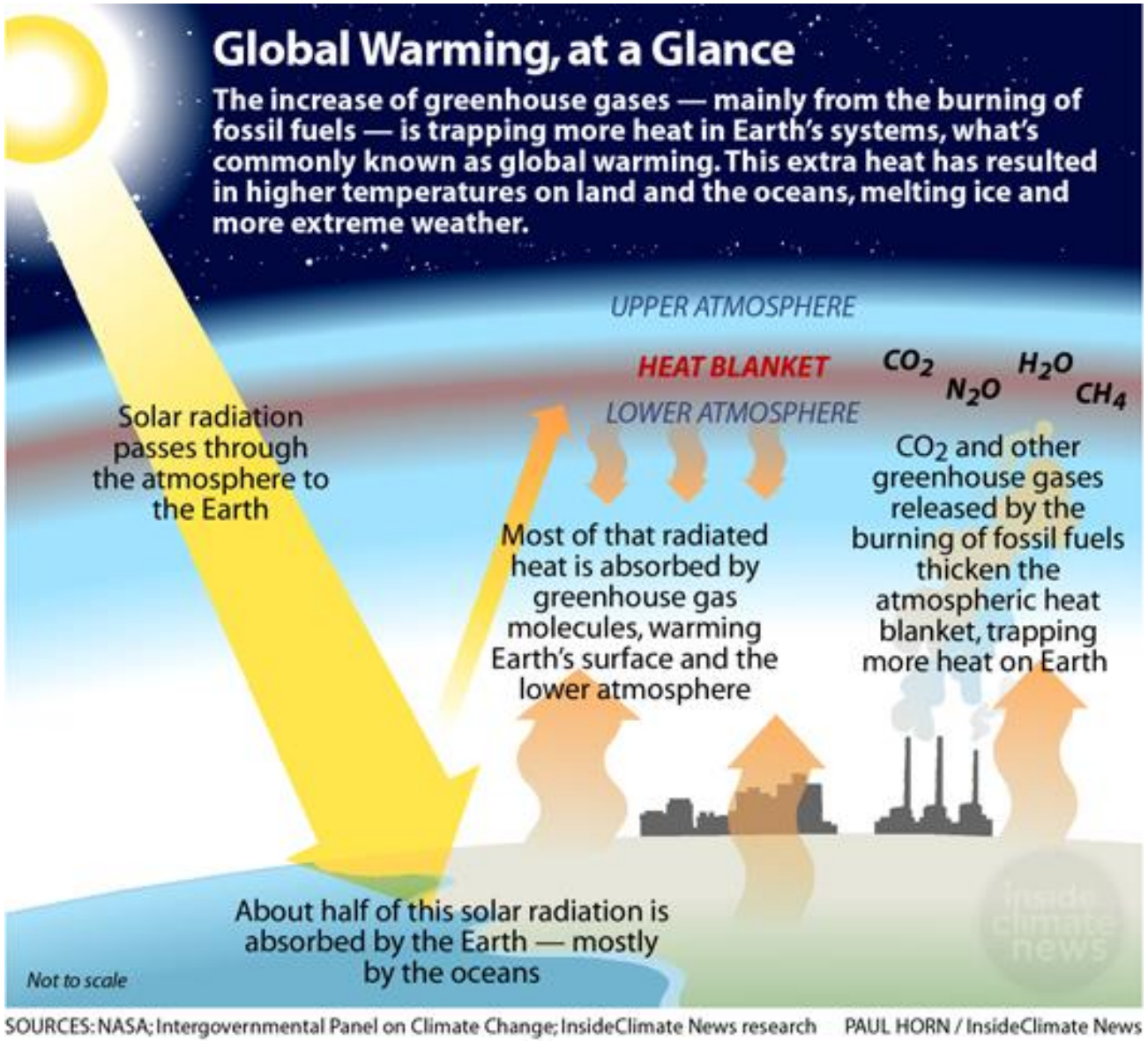


Venus

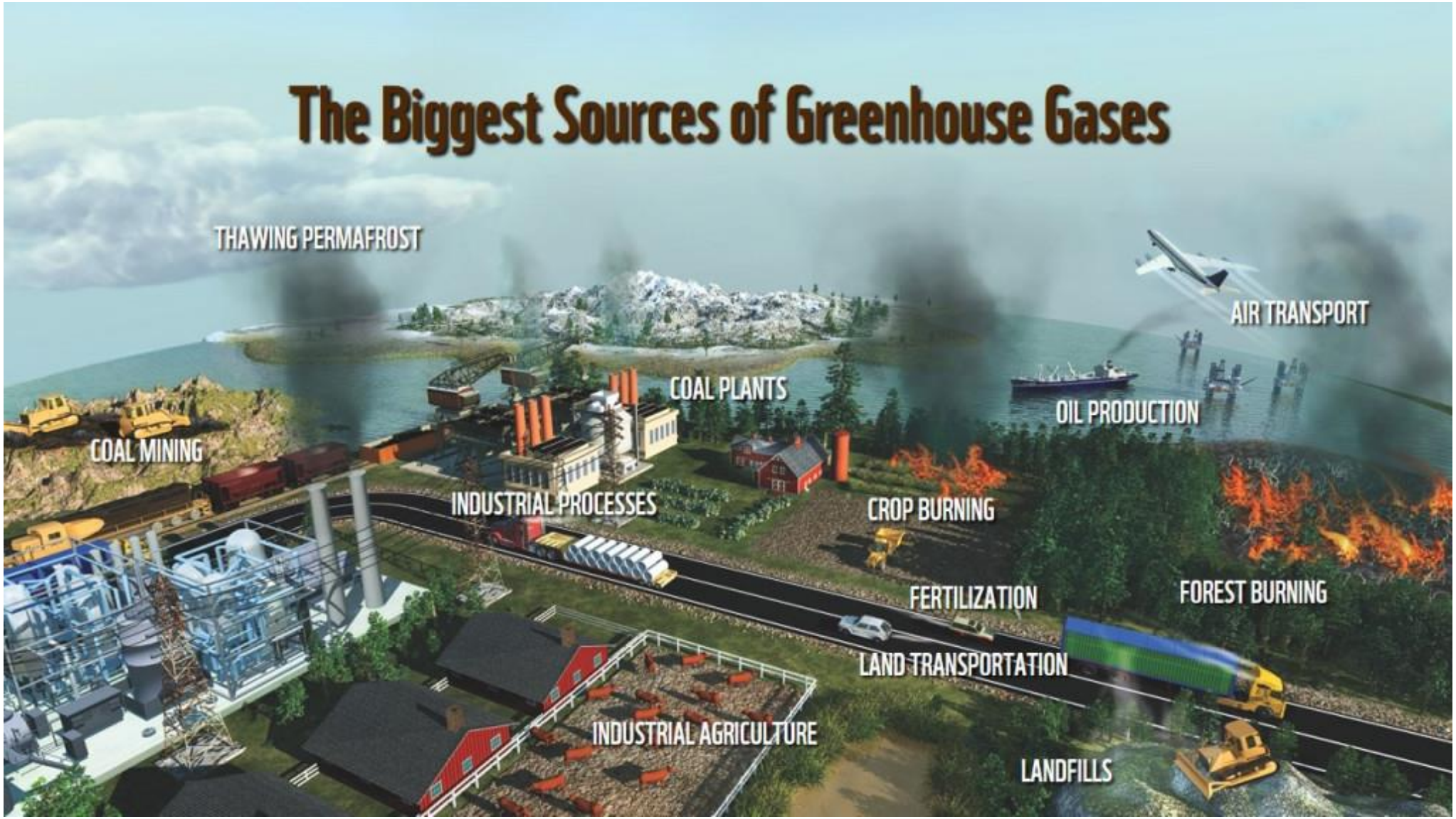
So what is in store for the Earth?



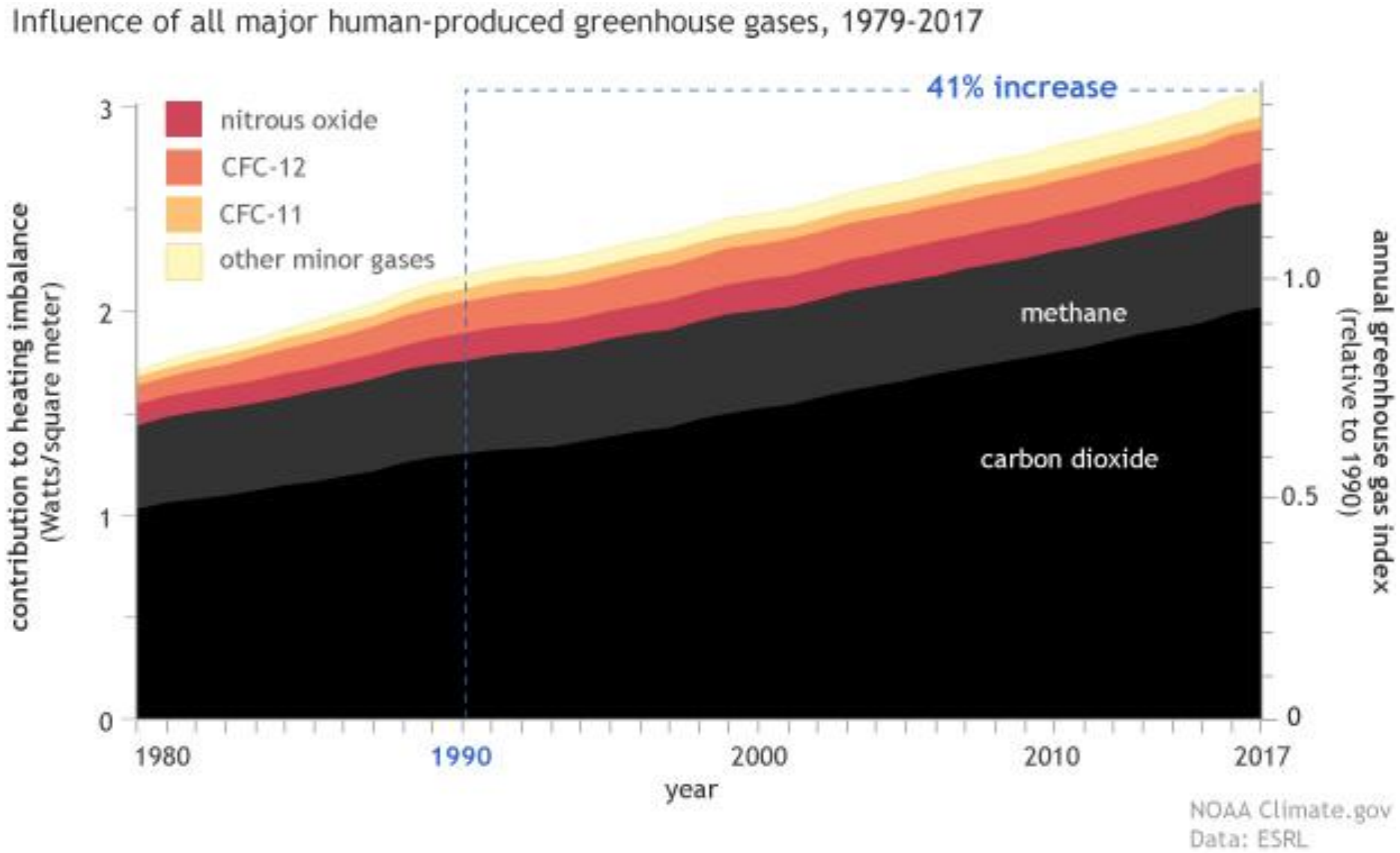
Global Warming: Upsetting the balance



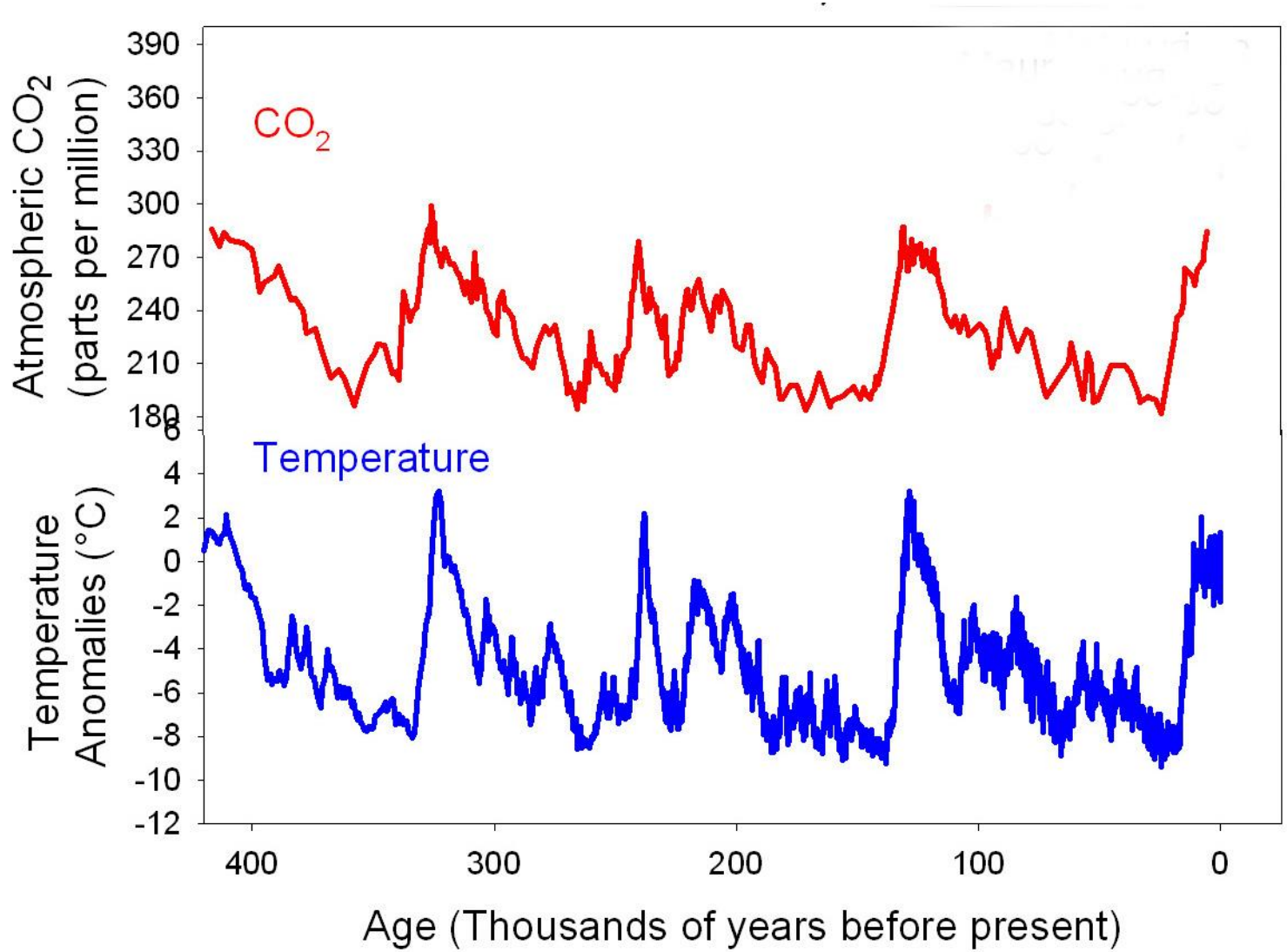
Humans and greenhouse gases



Greenhouse gas levels in the last 40 years

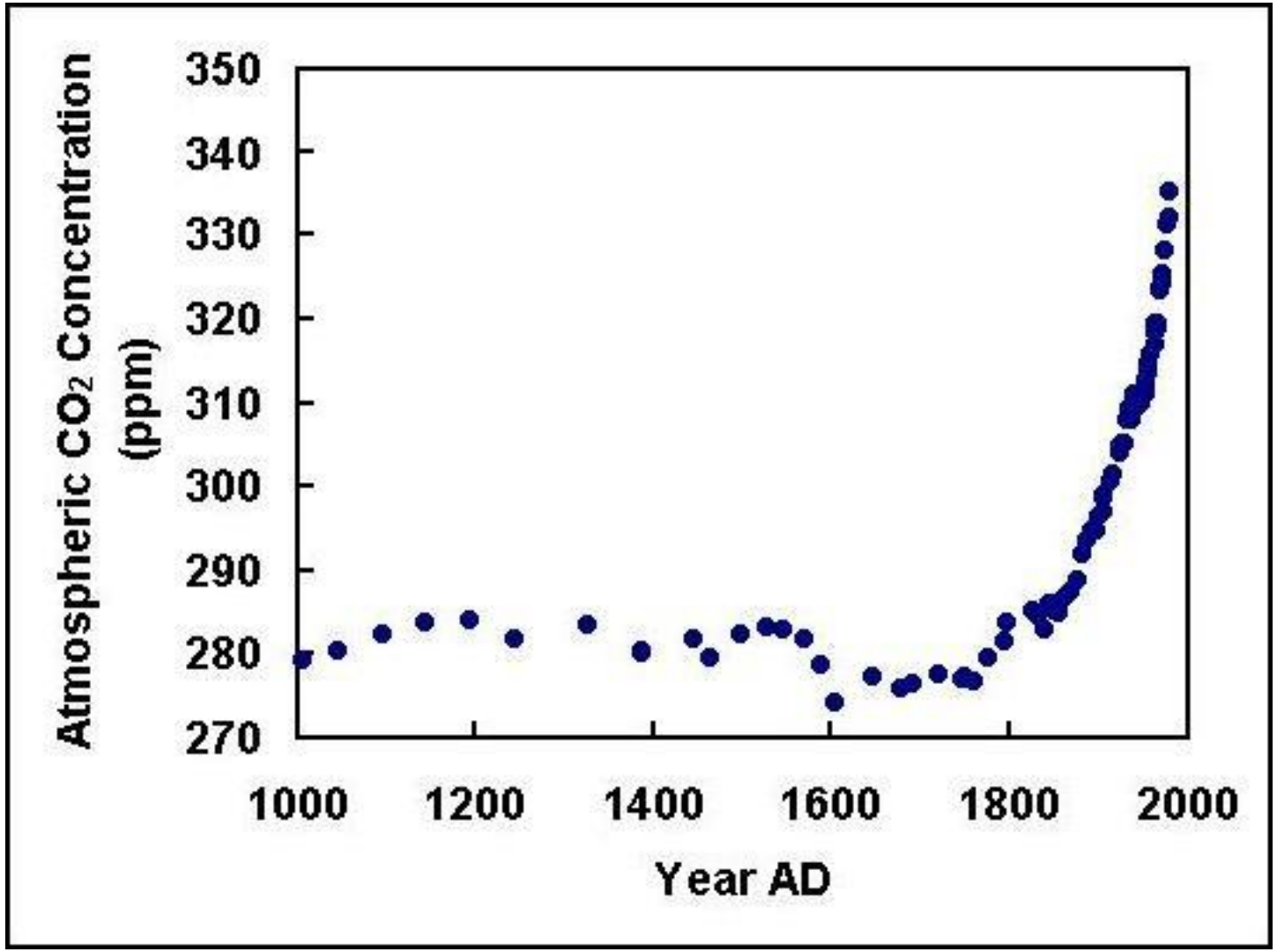


Temperature and CO_2 correlation

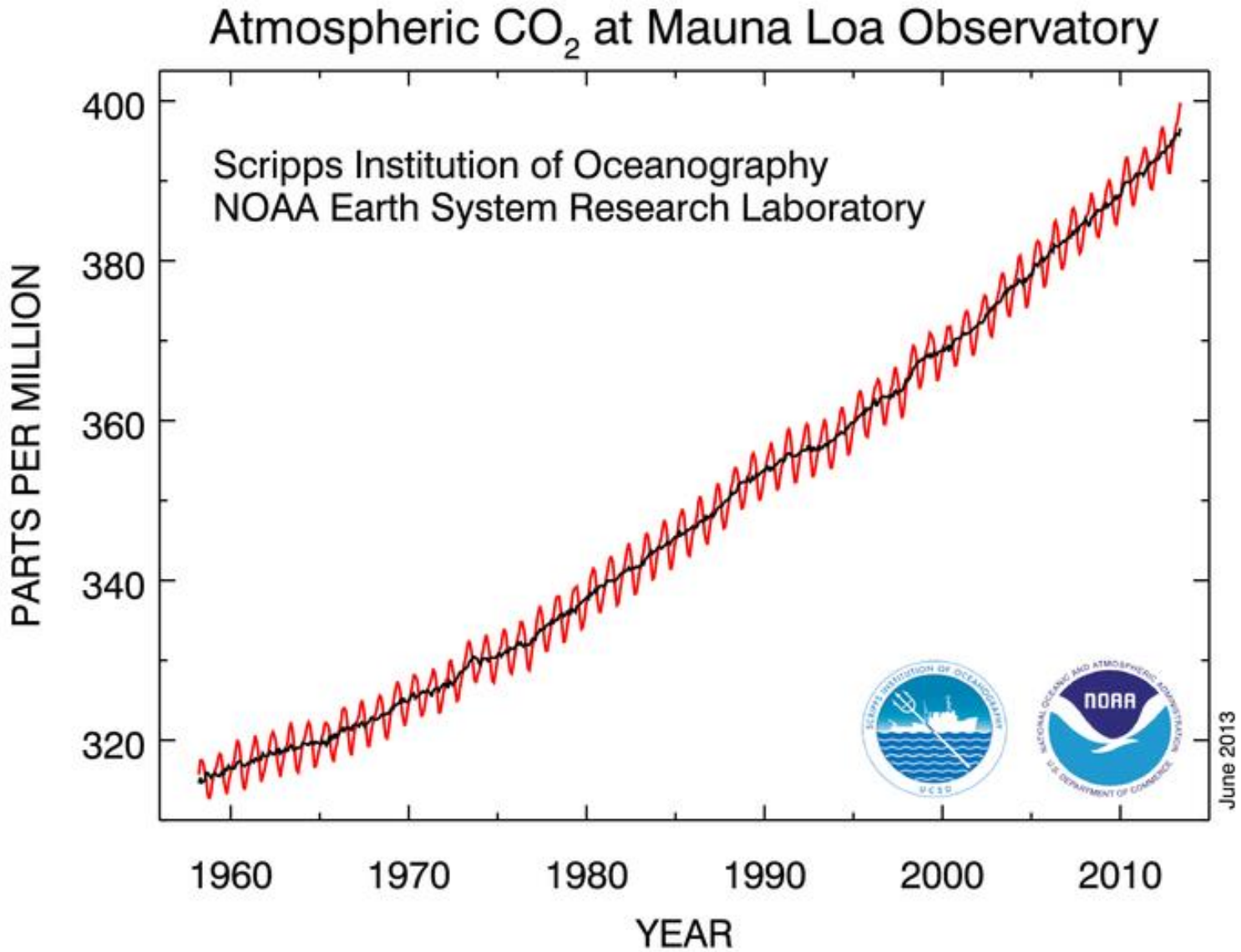


Petit et al. 1999 Nature

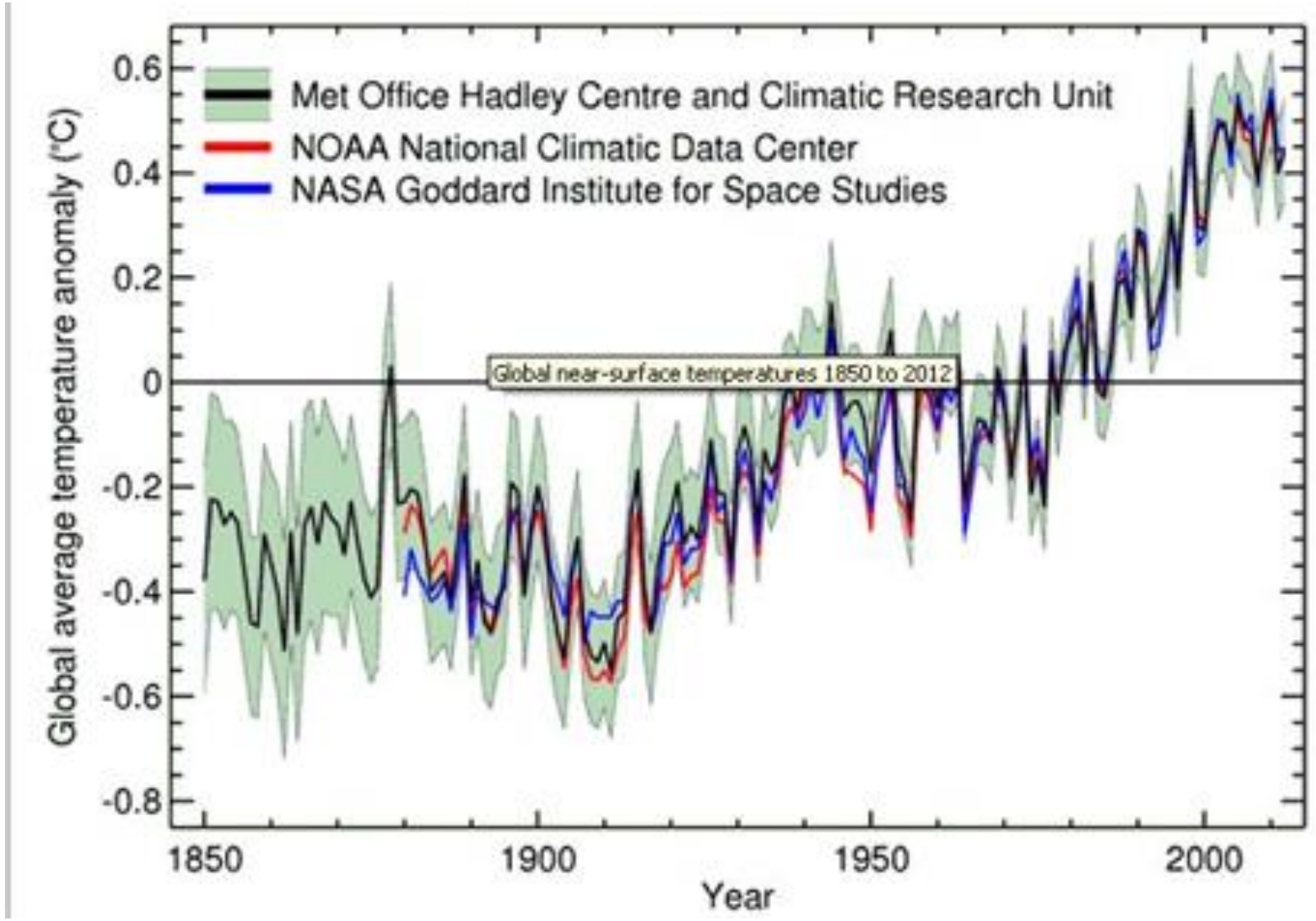
CO_2 levels for the last 1000 years



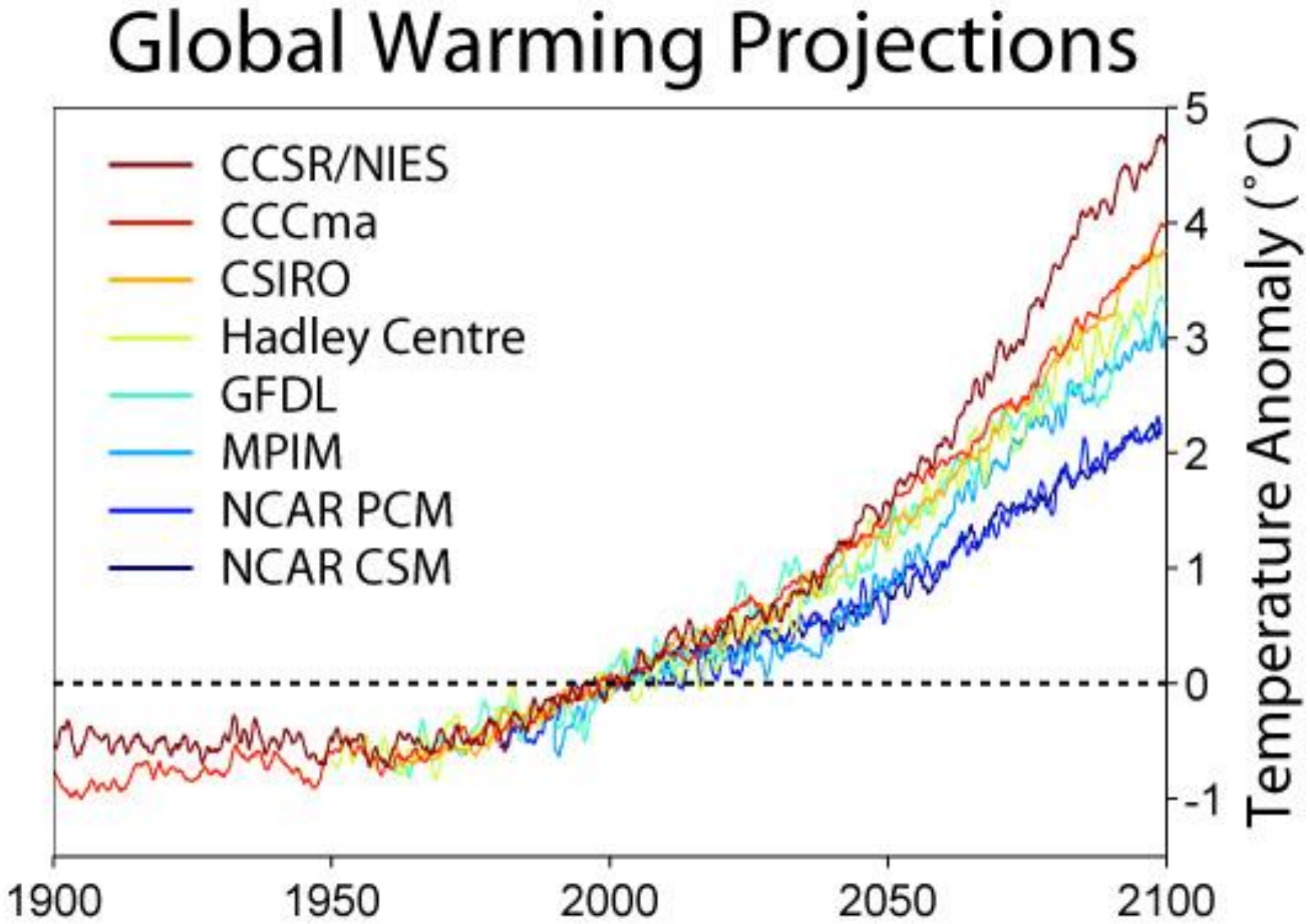
CO_2 levels for the last 60 years



Average global T increase since 1850



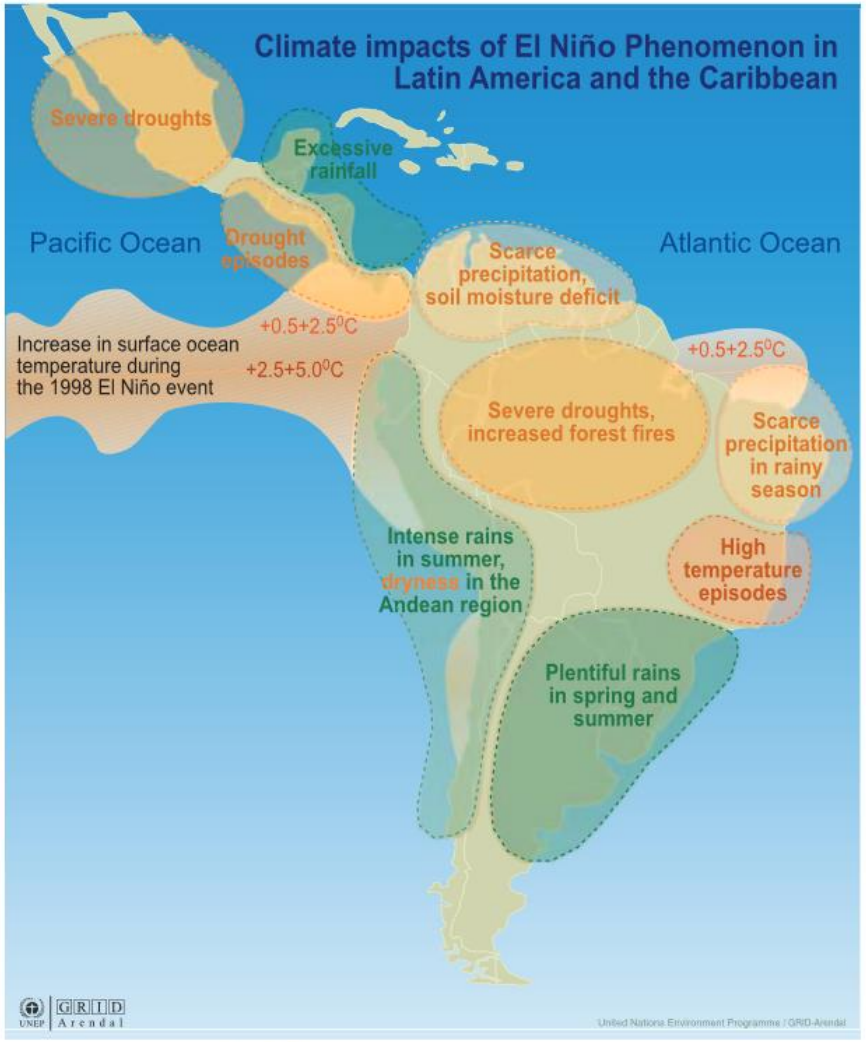
Predicted T increase through 2100



Some consequences of Global Warming

Global Climate Change

FIGURE A.8 Climate Impacts of El Niño in the LCR Region



Source: Modified from UNEP GRID Arendal.

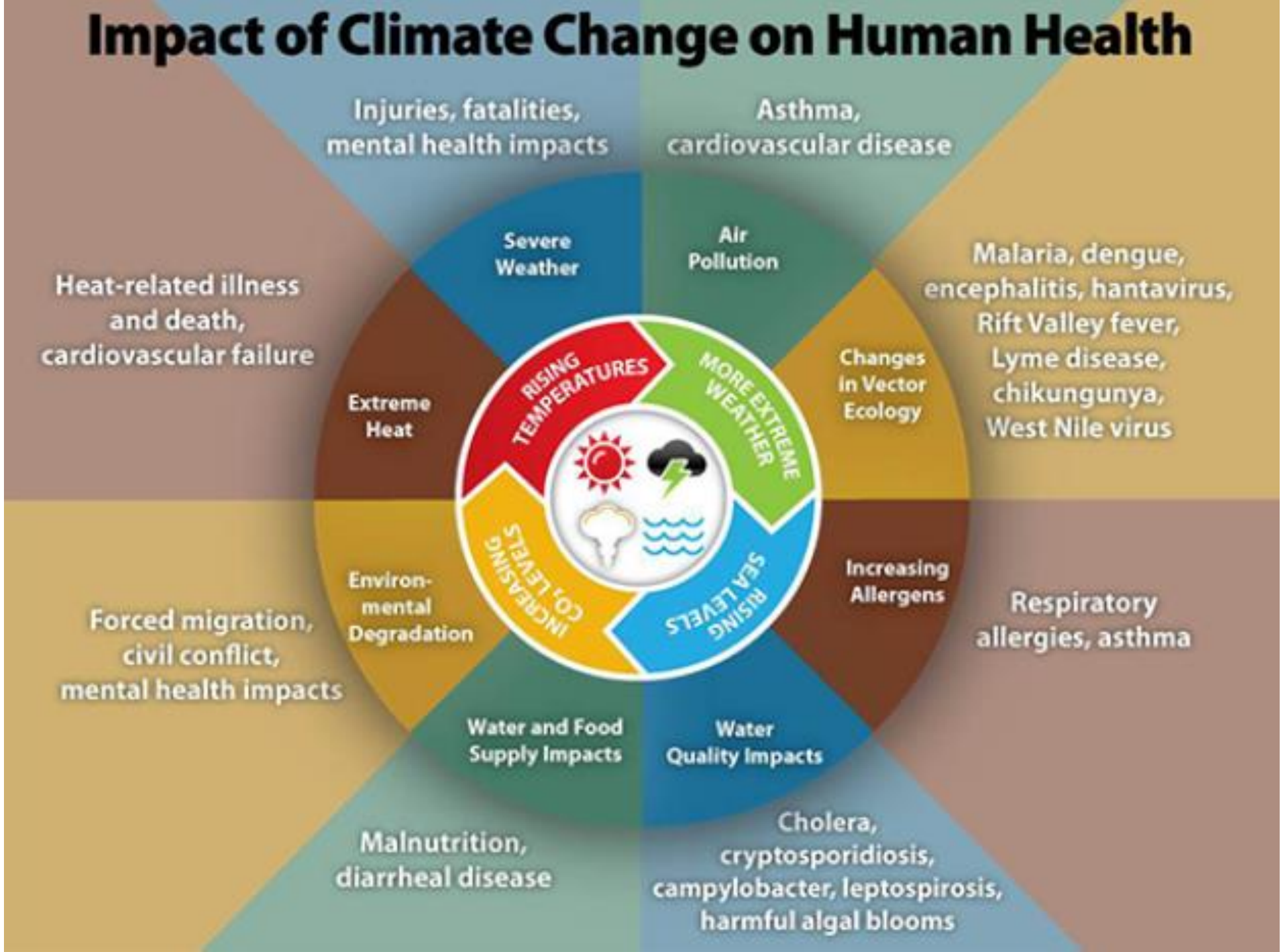
Note: The figure shows the climate impacts of the El Niño–Southern Oscillation phenomenon. LCR = Latin America and Caribbean region.

- Polar ice melting
- Sea level rise
- Extreme weather (more strong storms, wild fires, floods, and severe droughts)
- Agricultural issues
- Spread of diseases
- Loss of biodiversity

More consequences – “threat multiplier”

- Access to clean water reduced
- Ability to reliably grow food reduced
- Increasing numbers of climate migrants
- Economic impacts, especially to the poor
- Increasing rates of poverty
- Induced social/political instability
- Negative impacts on human health
- Wide disparities in vulnerability & culpability

Impact of Climate Change on Human Health

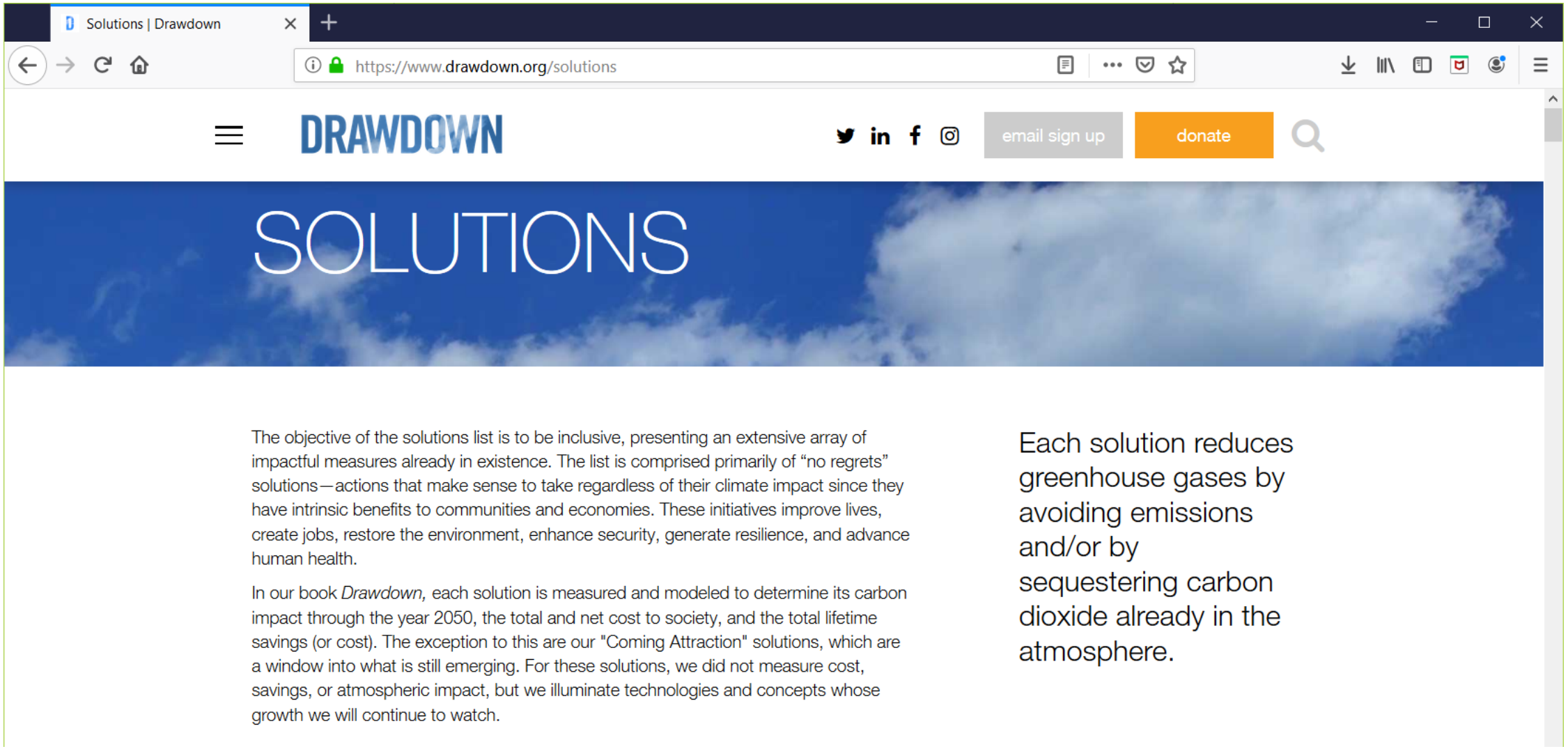


All are impacted; vulnerability varies

What can be done (globally)?

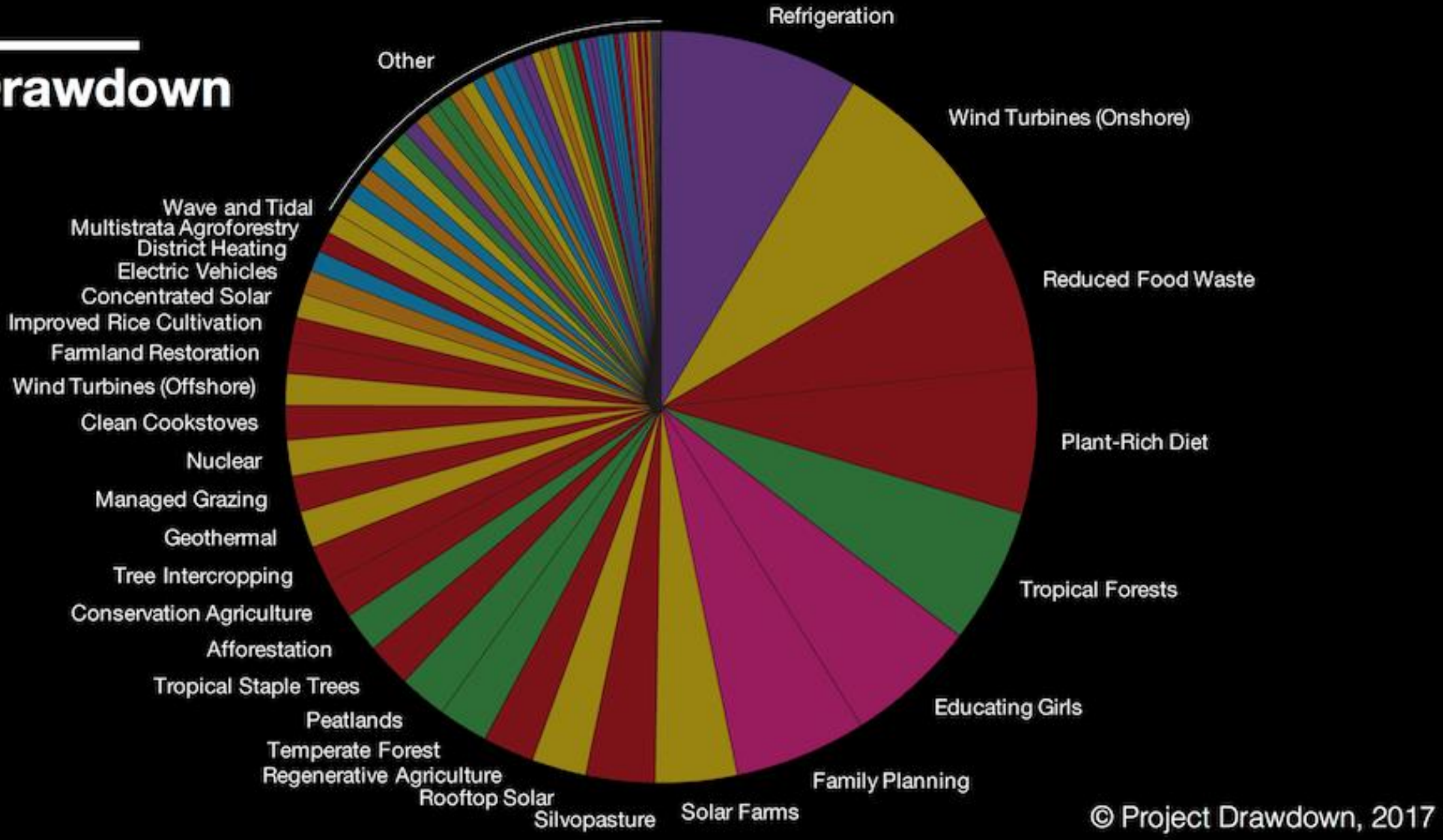
- Reduce emissions of greenhouse gases
  - Use less energy; increase energy efficiency
  - Renewable energy sources (wind, solar, waves)
  - Reduce burning of fossil fuels (esp. coal & oil)
- Carbon capture & sequestration
- Educate people (especially women/girls)
  - Family planning, better farming practices, etc.
- Changes to land management & the food system
  - Eat local & lower on the food chain; waste less

Project Drawdown



www.drawdown.org

Drawdown

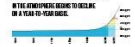


100 SOLUTIONS TO REVERSE GLOBAL WARMING

RANKED BY IMPACT

drawdown.org

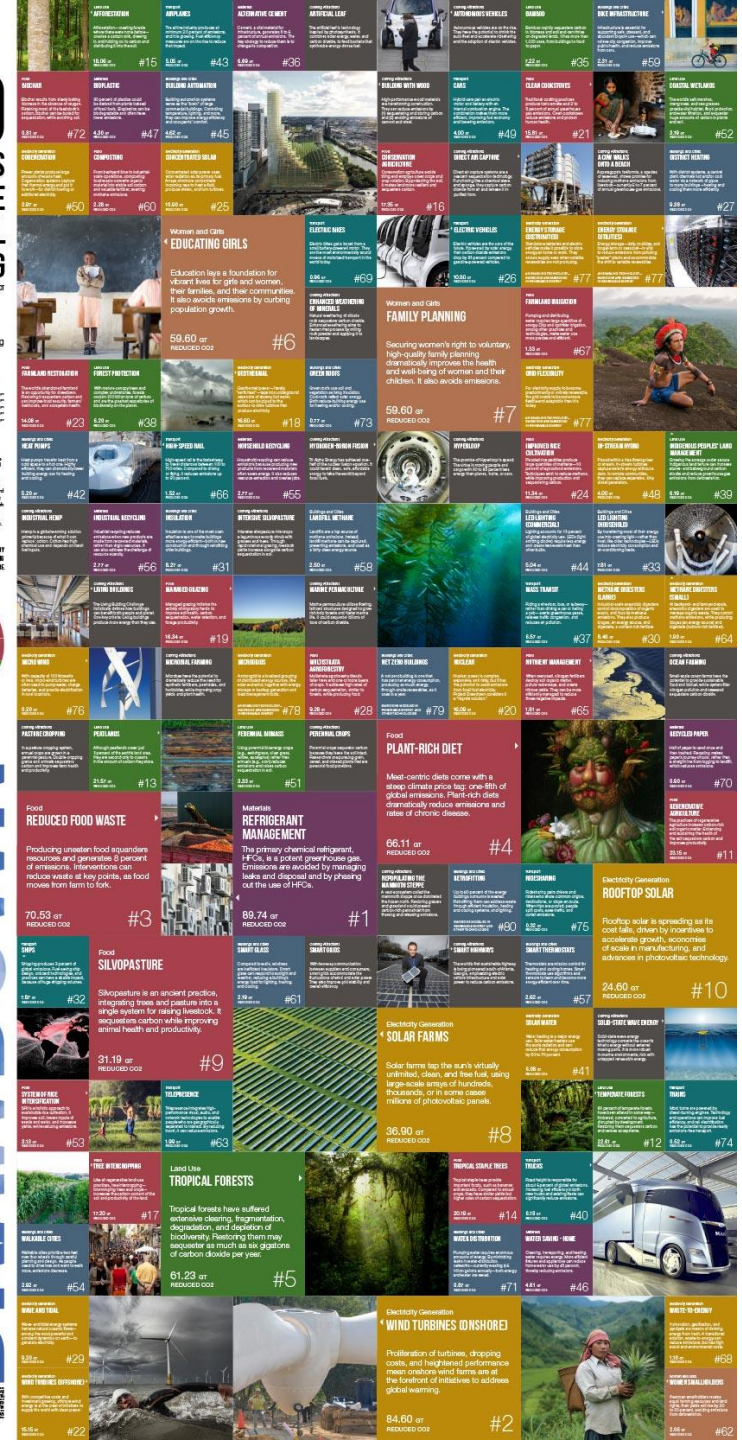
DRAWDOWN IS THAT POINT IN TIME WHEN THE CONCENTRATION OF GREENHOUSE GASES IN THE ATMOSPHERE BEGINS TO DECLINE ON A YEAR-TO-YEAR BASIS.



Project Drawdown is the most comprehensive plan ever proposed to reverse global warming. Our organization did not make or devise the plan—we found the plan because it already exists. We gathered a qualified and diverse group of researchers from around the world to identify, research, and model the 100 most substantive, existing solutions to address climate change. What was uncovered is a path forward that can roll back global warming within thirty years. It shows that humanity has the means at hand. Our work is to accelerate the knowledge and growth of what it possible. We chose the name Drawdown because if we do not name the goal, we are unlikely to achieve it.

EACH SOLUTION REDUCES GREENHOUSE GASES BY AVOIDING EMISSIONS AHEAD OF SEQUESTERING CARBON DIOXIDE ALREADY IN THE ATMOSPHERE.

DRAWDOWN



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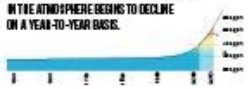

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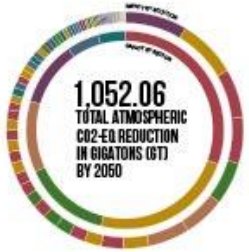

LAND USE
AFFORESTATION
Afforestation—planting forests where there were none before—creates a carbon sink, drawing in and holding on to carbon and distributing it into the soil.
16.06 GT REDUCED CO2 #15

TRANSPORT
AIRPLANES
The airline industry produces at minimum 2.5 percent of emissions, and it is growing. Fuel-efficiency measures are on the rise to reduce that impact.
5.05 GT REDUCED CO2 #43

MATERIALS
ALTERNATIVE CEMENT
Cement, a vital material for infrastructure, generates 5 to 6 percent of annual emissions. The key strategy to reduce them is to change its composition.
6.69 GT REDUCED CO2 #36

CARBON ATTRACTORS
ARTIFICIAL LEAF
The artificial leaf's technology is inspired by photosynthesis. It combines solar energy, water, and carbon dioxide, to feed bacteria that synthesize energy-dense fuel.

CARBON ATTRACTORS
AUTONOMOUS VEHICLES
Autonomous vehicles are on the rise. They have the potential to shrink the auto fleet and accelerate ridesharing and the adoption of electric vehicles.

LAND USE
BAMBOO
Bamboo rapidly sequesters carbon in biomass and soil and can thrive on degraded lands. It has more than 1,000 uses, from buildings to food to paper.
7.22 GT REDUCED CO2 #35

BUILDINGS AND CITIES
BIKE INFRASTRUCTURE
Infrastructure is essential for supporting safe, pleasant, and abundant bicycle use—which can relieve city congestion, improve public health, and reduce emissions from cars.
2.31 GT REDUCED CO2 #59

FOOD
BIOCHAR
Biochar results from slowly baking biomass in the absence of oxygen. Retaining most of the feedstock's carbon, biochar can be locked for sequestration, while enriching soil.
0.81 GT REDUCED CO2 #72

MATERIALS
BIOPLASTIC
50 percent of plastics could be derived from plants instead of fossil fuels. Bioplastics can be biodegradable and often have lower emissions.
4.30 GT REDUCED CO2 #47

BUILDINGS AND CITIES
BUILDING AUTOMATION
Building automation systems serve as the brains of large commercial buildings. Controlling temperature, lighting, and more, they can improve energy efficiency and occupants' comfort.
4.62 GT REDUCED CO2 #45

CARBON ATTRACTORS
BUILDING WITH WOOD
High-performance wood materials are a hallmark of modern construction. They can reduce emissions by (1) sequestering and storing carbon and (2) avoiding emissions of cement and steel.

TRANSPORT
CARS
Hybrid cars pair an electric motor and battery with an internal combustion engine. The combination makes them more efficient, improving fuel economy and lowering emissions.
4.00 GT REDUCED CO2 #49

FOOD
CLEAN COOKSTOVES
Traditional cooking practices produce harmful smoke and 2 to 5 percent of annual greenhouse gas emissions. Clean cookstoves reduce emissions and protect human health.
15.81 GT REDUCED CO2 #21

LAND USE
COASTAL WETLANDS
The world's salt marshes, mangroves, and sea grasses provide vital habitat, flood protection, sediment filtration, and sequester huge amounts of carbon in plants and soil.
3.19 GT REDUCED CO2 #52

ENERGY GENERATION
COGENERATION
Power plants produce large amounts of waste heat. Cogeneration systems capture that thermal energy and put it to work—for district heating or additional electricity.
3.97 GT REDUCED CO2 #50

FOOD
COMPOSTING
From backyard bins to industrial-scale operations, composting food waste converts organic material into stable soil carbon and valuable fertilizer, averting methane emissions.
2.28 GT REDUCED CO2 #60

ENERGY GENERATION
CONCENTRATED SOLAR
Concentrated solar power uses solar radiation as its primary fuel. Mirrors or lenses concentrate incoming rays to heat a fluid, produce steam, and turn turbines.
10.90 GT REDUCED CO2 #25

FOOD
CONSERVATION AGRICULTURE
Conservation agriculture avoids tilling and employs cover crops and crop rotation. By protecting the soil, it makes land more resilient and sequesters carbon.
17.35 GT REDUCED CO2 #16

CARBON ATTRACTORS
DIRECT AIR CAPTURE
Direct air capture systems are a nascent sequestration technology. Fans move air into a chemical slurry and sponge, they capture carbon dioxide from air and release it in purified form.

CARBON ATTRACTORS
A COW WALKS ONTO A BEACH
Asparagopsis taxiformis, a species of seaweed, shows promise for reducing methane emissions from livestock—currently to 7 percent of annual greenhouse gas emissions.

BUILDINGS AND CITIES
DISTRICT HEATING
With district systems, a central plant chernals hot and/or cool water via a network of pipes to many buildings—heating and cooling them more efficiently.
0.38 GT REDUCED CO2 #27

Women and Girls
EDUCATING GIRLS
Education lays a foundation for vibrant lives for girls and women, their families, and their communities. It also avoids emissions by curbing population growth.
59.60 GT REDUCED CO2 #6

TRANSPORT
ELECTRIC BIKES
Electric bikes gain a boost from a small battery-powered motor. They are the most environmentally sound piece of motorized transport in the world today.
0.96 GT REDUCED CO2 #69

TRANSPORT
ELECTRIC VEHICLES
Electric vehicles are the cars of the future. Powered by solar energy their carbon dioxide emissions are cut by 50 percent compared to gasoline-powered vehicles.
10.80 GT REDUCED CO2 #26

ENERGY GENERATION
ENERGY STORAGE DISTRIBUTED
Stationary batteries and electric vehicles make it possible to store energy at home or work. They can help supply even when variable renewables are not producing.
#77

ENERGY GENERATION
ENERGY STORAGE UTILITIES
Energy storage—daily, multiday, and longer-term or seasonal—is vital to reduce emissions from polluting "peaker" plants and accommodate the shift to variable renewables.
#77

Women and Girls
FAMILY PLANNING
Securing women's right to voluntary, high-quality family planning dramatically improves the health and well-being of women and their children. It also avoids emissions.
59.60 GT REDUCED CO2 #7

FOOD
FARMLAND IRRIGATION
Pumping and distributing water requires large quantities of energy. Drip and sprinkler irrigation, among other practices and technologies, make water use more precise and efficient.
1.33 GT REDUCED CO2 #67

ENERGY GENERATION
GRID FLEXIBILITY
For electricity supply to become predominantly or entirely renewable, the grid needs to be more responsive, flexible, and adaptable than it is today.
#77

FOOD
FARMLAND RESTORATION
The worlds abandoned farmland is an opportunity for drawdown. Restorative practices sequester carbon and can improve food security, farmers' livelihoods, and ecosystem health.
14.08 GT REDUCED CO2 #23

LAND USE
FOREST PROTECTION
With mature canopy trees and complex ecosystems, forests contain 100 billion tons of carbon and are the greatest repositories of biodiversity on the planet.
6.20 GT REDUCED CO2 #38

ENERGY GENERATION
GEOTHERMAL
Geothermal power—literally "earth heat"—taps into underground reservoirs of steamy hot water, which can be piped to the surface to drive turbines that produce electricity.
16.60 GT REDUCED CO2 #18

BUILDINGS AND CITIES
GREEN ROOFS
Green roofs use soil and vegetation as living insulation. Cool roofs reflect solar energy. Both reduce building energy use for heating and/or cooling.
0.77 GT REDUCED CO2 #73

BUILDINGS AND CITIES
HEAT PUMPS
Heat pumps transfer heat from a cold space to a hot one. Highly efficient, they can dramatically lower building energy use for heating and cooling.
5.20 GT REDUCED CO2 #42

TRANSPORT
HIGH-SPEED RAIL
High-speed rail is the fastest way to travel distances between 100 to 700 miles. Compared to driving it can cut emissions up to 90 percent.
1.52 GT REDUCED CO2 #66

MATERIALS
HOUSEHOLD RECYCLING
Household recycling can reduce emissions because producing new products from recovered materials often uses energy. It also reduces resource extraction and creates jobs.
2.77 GT REDUCED CO2 #55

CARBON ATTRACTORS
HYDROGEN-BORON FUSION
TI Alpha Energy has achieved one-half of the nuclear fusion equation. It could have shut down, with affordable energy to take the world beyond fossil fuels.

CARBON ATTRACTORS
HYPERLOOP
The promise of hyperloop is speed. The virtue is moving people and cargo with 90 to 95 percent less energy than planes, trains, or cars.

FOOD
IMPROVED RICE CULTIVATION
Flooded rice paddies produce large quantities of methane—10 percent of agricultural emissions. Techniques exist to reduce methane, while improving production and sequestering carbon.
11.34 GT REDUCED CO2 #24

ENERGY GENERATION
IN-STREAM HYDRO
Flood with a free-flowing river or stream, in-stream turbines capture waterly energy without a dam. In remote communities, they can replace expensive, dirty diesel generators.
4.00 GT REDUCED CO2 #48

LAND USE
INDIGENOUS PEOPLES' LAND MANAGEMENT
Growing the acreage under secure Indigenous land tenure can increase stores—and safeguard—carbon stocks and reduce greenhouse gas emissions from deforestation.
6.19 GT REDUCED CO2 #39

CARBON ATTRACTORS
INDUSTRIAL HEMP
Hemp is a globe-warming solution primarily because of what it can replace: cotton. Cotton has high chemical use and depends on fossil fuel inputs.

MATERIALS
INDUSTRIAL RECYCLING
Industrial recycling reduces emissions when new products are made from recovered materials, rather than virgin resources. It can also address the challenge of resource scarcity.
2.77 GT REDUCED CO2 #56

BUILDINGS AND CITIES
INSULATION
Insulation is one of the most cost-effective ways to make buildings more energy efficient—both in new construction and through retrofitting older buildings.
6.27 GT REDUCED CO2 #31

CARBON ATTRACTORS
INTENSIVE SILVOPASTURE
Intensive silvopasture intercrops a leguminous woody shrub with grasses and trees. Through rotational grazing, it can both yields increase and sequester carbon dioxide in soil.

BUILDINGS AND CITIES
LANDFILL METHANE
Landfills are a top source of methane emissions. Instead, landfill methane can be captured, converting emissions into fuel as a fairly clean energy source.
2.50 GT REDUCED CO2 #58

BUILDINGS AND CITIES
LED LIGHTING (COMMERCIAL)
Lighting accounts for 15 percent of global electricity use. LEDs (light emitting diodes) require less energy and create less waste heat than other bulbs.
5.04 GT REDUCED CO2 #44

BUILDINGS AND CITIES
LED LIGHTING (HOUSEHOLD)
By transferring most of their energy use into creating light—rather than heat, like older technologies—LEDs reduce electricity consumption and air-conditioning costs.
7.81 GT REDUCED CO2 #33

CARBON ATTRACTORS
LIVING BUILDINGS
The Living Building Challenge holistically defines how buildings can benefit both people and planet. One key criteria: Living buildings produce more energy than they use.

FOOD
MANAGED GRAZING
Managed grazing imitates the wild herds of the past by hard to improve soil health, carbon sequestration, water retention, and forage productivity.
10.34 GT REDUCED CO2 #19

CARBON ATTRACTORS
MARINE PERMACULTURE
Marine permaculture utilizes floating, offshore structures designed to grow rich kelp forests and higher marine life. It could sequester billions of tons of carbon dioxide.

TRANSPORT
MASS TRANSIT
Riding a streetcar, bus, or subway—rather than driving a car or taking a cab—avoids greenhouse gases, relieves traffic congestion, and reduces air pollution.
6.57 GT REDUCED CO2 #37

ENERGY GENERATION
METHANE DIGESTERS (LARGE)
Industrial-scale anaerobic digesters control decomposition of organic waste, and thus its methane emissions. They also produce biogas, an energy source, and digestate, a nutrient-rich fertilizer.
8.40 GT REDUCED CO2 #30

ENERGY GENERATION
METHANE DIGESTERS (SMALL)
At backyard- and farm-scale, anaerobic digesters are used to manage organic waste. They control methane emissions, while producing biogas for energy source and digestate (nutrient-rich fertilizer).
1.90 GT REDUCED CO2 #64

ENERGY GENERATION
MICRO WIND
With capacity of 100 kilowatts or less, micro wind turbines are often used to pump water, charge batteries, and provide electrification in rural locations.
0.20 GT REDUCED CO2 #76

CARBON ATTRACTORS
MICROBIAL FARMING
Microbes have the potential to dramatically reduce the need for synthetic fertilizers, pesticides, and herbicides, while improving crop yields and plant health.

ENERGY GENERATION
MICROGRIDS
Anchored to a localized grouping of distributed energy sources, like solar and wind, together with energy storage or backup generators and load management tools.
#78

FOOD
MULTISTRATA AGROFORESTRY
Multistrata agroforestry blends taller trees and one or more layers of crops. It addresses high rates of carbon sequestration, similar to forests, while producing food.
9.28 GT REDUCED CO2 #28

BUILDINGS AND CITIES
NET ZERO BUILDINGS
A net zero building is one that has zero net energy consumption, producing as much energy through on-site renewables, as it uses in a year.
#79

ENERGY GENERATION
NUCLEAR
Nuclear power is complex, expensive, and risky, but it has the potential to avoid emissions from fossil fuel electricity. Project Drawdown considers it a "regret solution."
16.09 GT REDUCED CO2 #20

FOOD
NUTRIENT MANAGEMENT
When overused, nitrogen fertilizers destroy soil organic matter, pollute waterways, and create nitrous oxide. They can be more efficiently managed to reduce these negative impacts.
1.81 GT REDUCED CO2 #65

CARBON ATTRACTORS
OCEAN FARMING
Small-scale ocean farms have the potential to provide sustainable food and biofuel, while oysters filter nitrogen pollution and seaweed sequesters carbon dioxide.

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Coming Attraction
PASTURE CROPPING

In a pasture-cropping system, annual crops are grown in a perennial pasture. Double-cropping grains and animals separates carbon and improves farm health and productivity.

21.57 GT REDUCED CO2

#13

Land Use
PEATLANDS

Although peatlands cover just 3 percent of the earth's land area, they are second only to oceans in the amount of carbon they store.

Land Use
PERENNIAL BIOMASS

Using perennial bioenergy crops (e.g., switchgrass, silver grass, willow, eucalyptus) rather than annuals (e.g., corn) reduces emissions and raises carbon sequestration in soil.

3.33 GT REDUCED CO2

#51

Coming Attraction
PERENNIAL CROPS

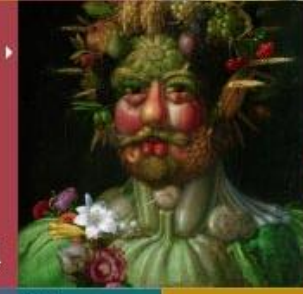
Perennial crops sequester carbon because they have the soil intact. Researchers are pursuing grain-, cereal-, and oilseed plants that are perennial food predictors.

Food
PLANT-RICH DIET

Meat-centric diets come with a steep climate price tag: one-fifth of global emissions. Plant-rich diets dramatically reduce emissions and rates of chronic disease.

66.11 GT REDUCED CO2

#4



Material
RECYCLED PAPER

Half of paper is used once and then trashed. Recycling makes paper's journey circular, rather than a straight line from logging to landfill, which reduces emissions.

0.90 GT REDUCED CO2

#70

Food
REDUCED FOOD WASTE

Producing uneaten food squanders resources and generates 8 percent of emissions. Interventions can reduce waste at key points, as food moves from farm to fork.

70.53 GT REDUCED CO2

#3

Materials
REFRIGERANT MANAGEMENT

The primary chemical refrigerant, HFCs, is a potent greenhouse gas. Emissions are avoided by managing leaks and disposal and by phasing out the use of HFCs.

89.74 GT REDUCED CO2

#1

Coming Attraction
REPOPULATING THE MAMMOTH STEPPE

A vast ecosystem called the mammoth steppe once dominated the Arctic north. Restoring grasses and grassland could prevent carbon-rich permafrost from thawing and releasing emissions.

Buildings and Cities
RETROFITTING

Up to 80 percent of the energy buildings consume is wasted. Retrofitting them can address waste through efficient insulation, heating and cooling systems, and lighting.

#80

Transport
RIDESHARING

Ridesharing pairs drivers and riders who share common origins, destinations, or stops en route. When trips are pooled, people split costs, save traffic, and curtail emissions.

0.32 GT REDUCED CO2

#75

Electricity Generation
ROOFTOP SOLAR

Rooftop solar is spreading as its cost falls, driven by incentives to accelerate growth, economies of scale in manufacturing, and advances in photovoltaic technology.

24.60 GT REDUCED CO2

#10

Transport
SHIPS

Shipping produces 3 percent of global emissions. Fuel-saving ship design, onboard technologies, and practices can have a sizable impact because of huge shipping volumes.

7.87 GT REDUCED CO2

#32

Food
SILVOPASTURE

Silvopasture is an ancient practice, integrating trees and pasture into a single system for raising livestock. It sequesters carbon while improving animal health and productivity.

31.19 GT REDUCED CO2

#9

Buildings and Cities
SMART GLASS

Compared to walls, windows are inefficient insulators. Smart glass can respond to sunlight and weather, reducing a building's energy load for lighting, heating, and cooling.

2.19 GT REDUCED CO2

#61

Coming Attraction
SMART GRIDS

With two-way communication between suppliers and consumers, smart grids accommodate the fluctuations of wind and solar power. They also improve grid stability and overall efficiency.

Coming Attraction
SMART HIGHWAYS

The world's first solar-stable highway is being proved each of Atlanta, Georgia, emphasizing electric vehicle infrastructure and solar power to reduce carbon emissions.

Buildings and Cities
SMART THERMOSTATS

Thermostats are motion control for heating and cooling homes. Smart thermostats use algorithms and sensors to learn and become more energy efficient over time.

2.62 GT REDUCED CO2

#57

Electricity Generation
SOLAR FARMS

Solar farms tap the sun's virtually unlimited, clean, and free fuel, using large-scale arrays of hundreds, thousands, or in some cases millions of photovoltaic panels.

36.90 GT REDUCED CO2

#8

Electricity Generation
SOLAR WATER

Water heating is a major energy use. Solar water heaters use the sun's radiation and can reduce this energy consumption by 50 to 70 percent.

6.06 GT REDUCED CO2

#41

Coming Attraction
SOLID-STATE WAVE ENERGY

Solid-state wave energy technology converts the ocean's kinetic energy without external moving parts. It is more robust in extreme environments, rich with untapped renewable energy.

Food
SYSTEM OF RICE INTENSIFICATION

SRI is a holistic approach to sustainable rice cultivation. It improves soil, lowers inputs of seeds and water, and increases yields, while reducing emissions.

3.13 GT REDUCED CO2

#53

Transport
TELEPRESENCE

Telepresence integrates high-performance visual, audio, and network technologies to enable people who are geographically separated to interact. By reducing travel, it can reduce emissions.

1.99 GT REDUCED CO2

#63

Land Use
TEMPERATE FORESTS

80 percent of temperate forests have been altered in some way—fragmented, converted to agriculture, disrupted by development. Restoring them sequesters carbon and revives ecosystems.

22.61 GT REDUCED CO2

#12

Transport
TRAINS

Most trains are powered by diesel-burning engines. Technology and operations can improve fuel efficiency, and rail electrification has the potential to provide nearly emissions-free transport.

0.52 GT REDUCED CO2

#74

Food
TREE INTERCROPPING

Like all regenerative land use practices, tree intercropping—intermingling trees and crops—increases the carbon content of the soil and productivity of the land.

17.20 GT REDUCED CO2

#17

Land Use
TROPICAL FORESTS

Tropical forests have suffered extensive clearing, fragmentation, degradation, and depletion of biodiversity. Restoring them may sequester as much as six gigatons of carbon dioxide per year.

61.23 GT REDUCED CO2

#5

Food
TROPICAL STAPLE TREES

Tropical staple trees provide important foods, such as bananas and avocado. Compared to annual crops, they have similar yields but higher rates of carbon sequestration.

20.19 GT REDUCED CO2

#14

Transport
TRUCKS

Road freight is responsible for about 6 percent of global emissions. Increasing fuel efficiency in both new trucks and existing fleets can significantly reduce emissions.

6.19 GT REDUCED CO2

#40

Buildings and Cities
WALKABLE CITIES

Walkable cities prioritize two feet over four wheels through careful planning and design. As people need to drive less and want to walk more, emissions decrease.

2.92 GT REDUCED CO2

#54

Buildings and Cities
WATER DISTRIBUTION

Pumping water requires enormous amounts of energy. By minimizing leaks in water distribution networks—currently wasting 6.6 trillion gallons annually—both energy and water are saved.

0.87 GT REDUCED CO2

#71

Buildings
WATER SAVING - HOME

Cleaning, transporting, and heating water requires energy. More efficient fixtures and appliances can reduce home water use by 40 percent, thereby reducing emissions.

4.61 GT REDUCED CO2

#46

Electricity Generation
WAVE AND TIDAL

Wave- and tidal-energy systems harness natural oceanic flows—among the most powerful and constant dynamics on earth—to generate electricity.

9.20 GT REDUCED CO2

#29

Electricity Generation
WIND TURBINES (OFFSHORE)

With competitive costs and investment growing, offshore wind energy is at the crest of initiatives to supply the world with clean power.

15.15 GT REDUCED CO2

#22

Electricity Generation
WIND TURBINES (ONSHORE)

Proliferation of turbines, dropping costs, and heightened performance mean onshore wind farms are at the forefront of initiatives to address global warming.

84.60 GT REDUCED CO2

#2

Electricity Generation
WASTE-TO-ENERGY

Incineration, gasification, and pyrolysis are means of deriving energy from trash. A transitional solution, waste-to-energy can reduce emissions but has high social and environmental costs.

1.10 GT REDUCED CO2

#68

Women and Girls
WOMEN SMALLHOLDERS

Provide smallholders access to equal farming resources and land rights, that yields will rise by 20 to 30 percent, avoiding emissions from deforestation.

2.06 GT REDUCED CO2

#62

What can be done (personally)?

- Learn even more – e.g. watch some TED talks!
- Talk about Global Warming and Climate Change
- Consider both when making personal decisions
  - What to eat, How to get around, How to vote
- Act to enable "global" solutions when you can
  - Energy: efficiency, renewables, etc.
  - Farming and food: less waste, less meat, etc.

NOBEL PEACE CENTER

Search Languages

WHAT'S ON NEWS VISIT PEACE PRIZE

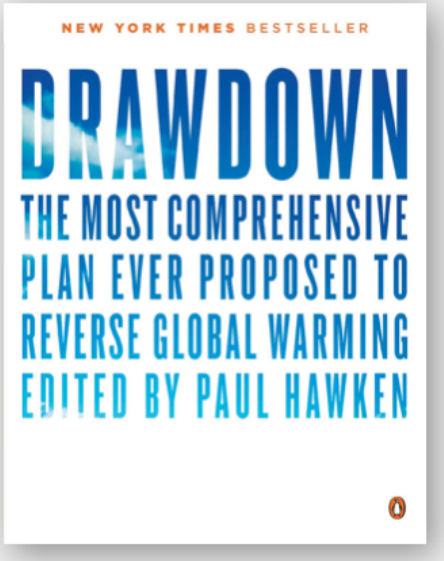
EXHIBITION —— APR 5, 2019-JAN 10, 2020

KLIMALAB

An Exhibition about the Climate, Nature and People.

Photo: Øystein Thorvaldsen

www.nobelpeacecenter.org/en/



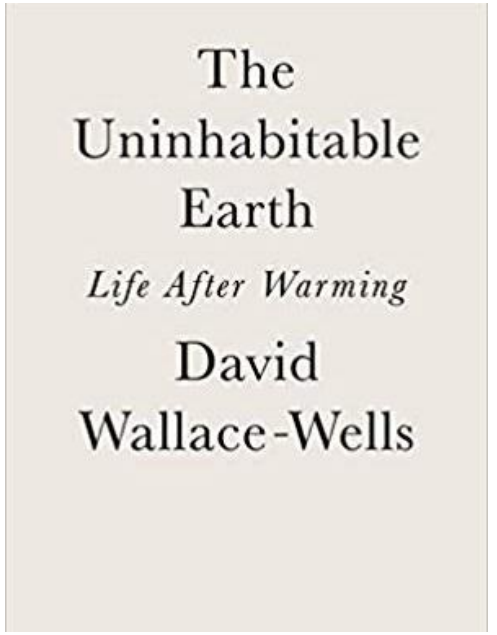
#1 Best-Selling Environmental Book of 2017

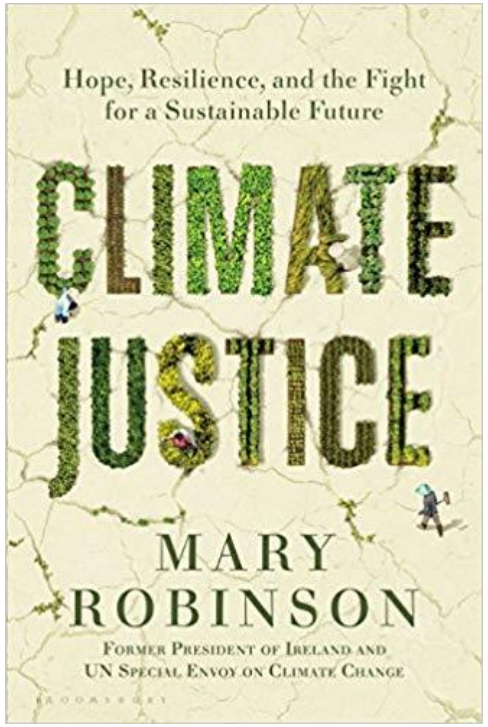
ORDER THE BOOK

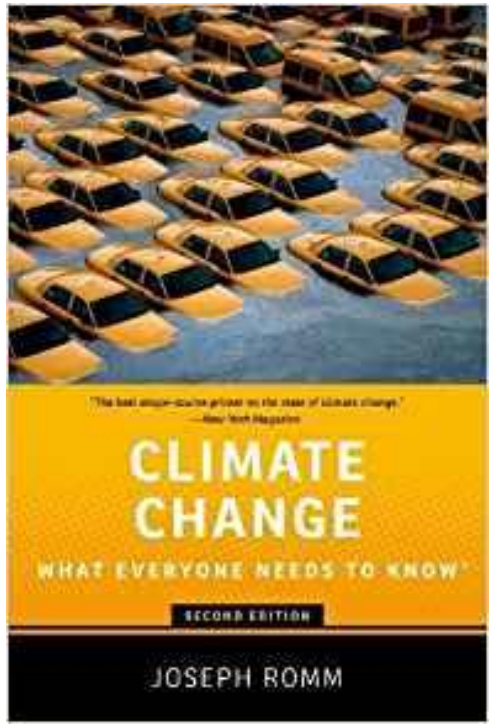
"...read this book — not just as an antidote to fear and despair but as foundation for understanding."

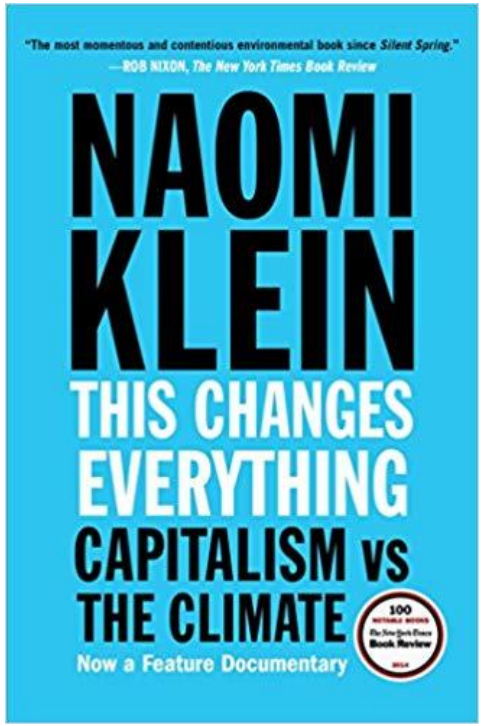
— Ron Meador, MinnPost

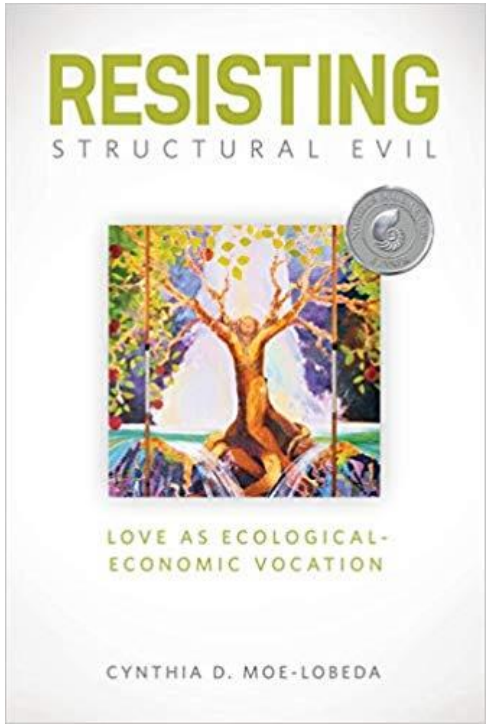
MORE REVIEWS





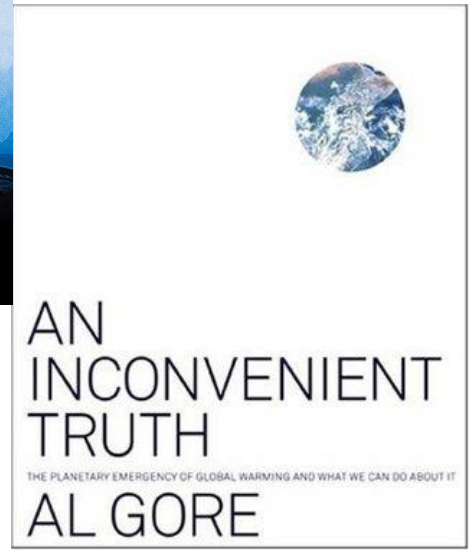


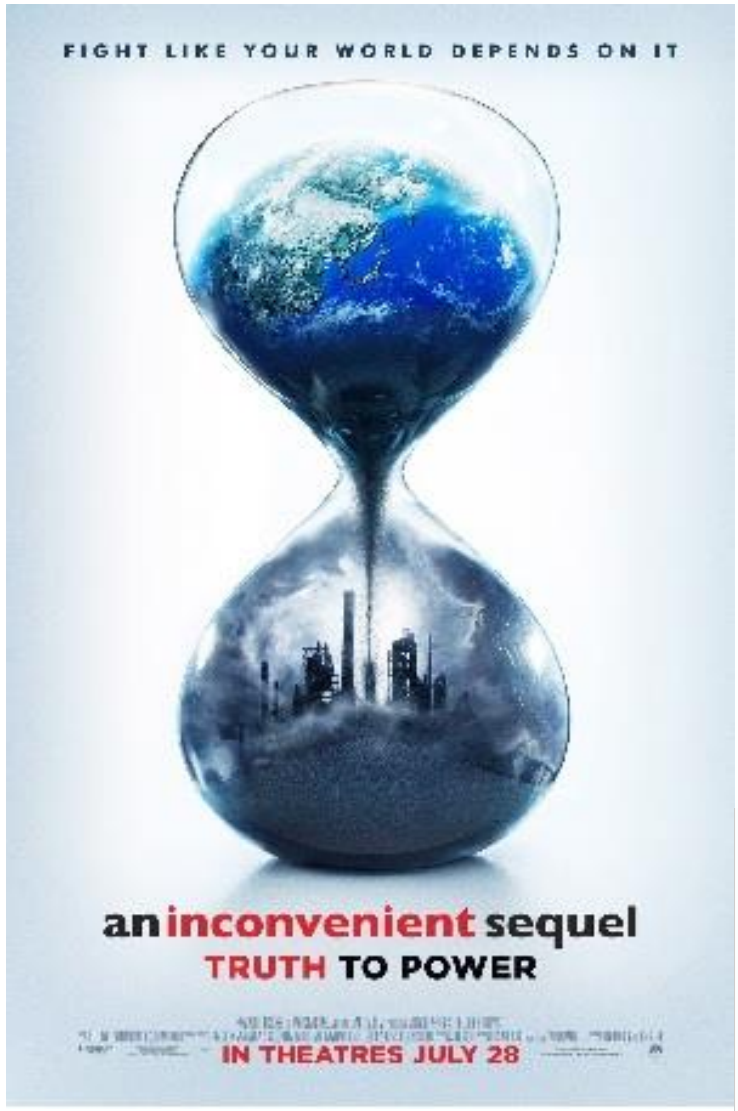




2006

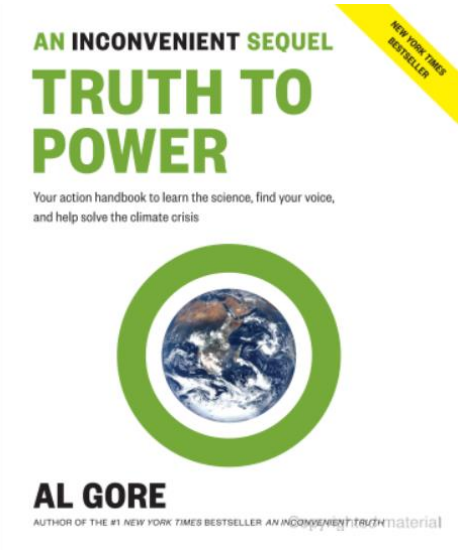
Academy Award for
Best Documentary Feature





2017

Nominated for
Best Documentary
British Academy Films Awards



Don’t get discouraged; be hopeful, but persistent

Do what you can,
when you can,
as often as you can.