

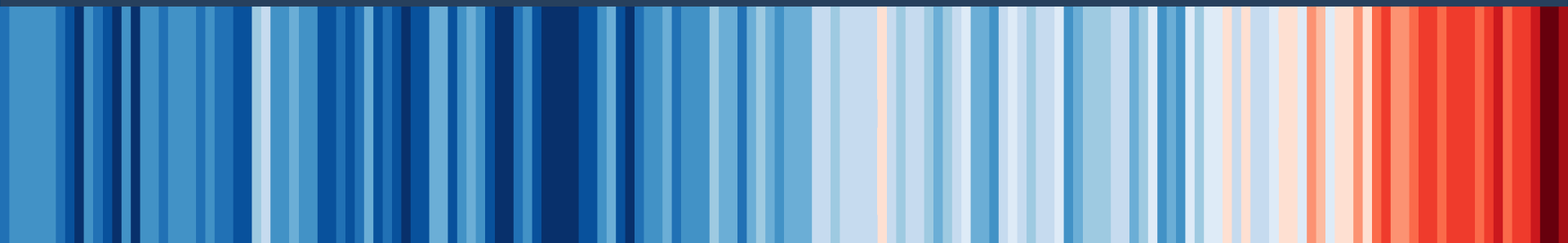


Thinking Global, Educating Local: Educators Creating a Climate for Change

Monday, April 8
3:30 – 4:30 pm

TEACHERS COLLEGE
COLUMBIA UNIVERSITY
A Graduate School of Education, Health & Psychology

EDUCATORS CREATING A CLIMATE FOR CHANGE



Annual Global Temperatures 1850-2017

Ed Hawkins, University of Reading

JASON E. SMERDON

Lamont-Doherty Earth Observatory
COLUMBIA UNIVERSITY | EARTH INSTITUTE

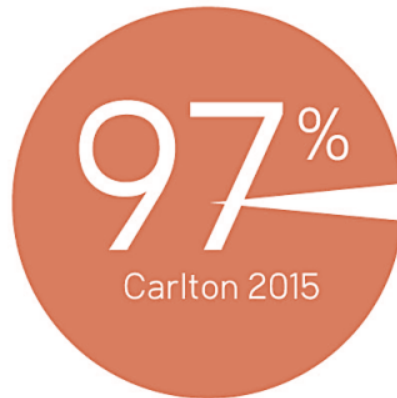
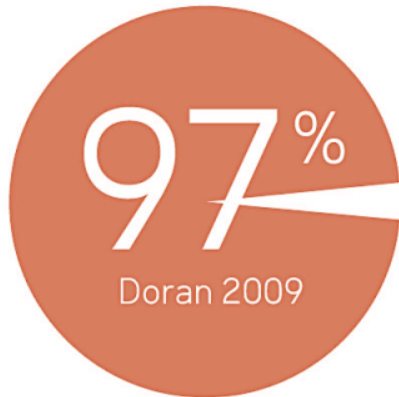


THE EARTH INSTITUTE
COLUMBIA UNIVERSITY

FACT:
THE EARTH IS
WARMING AND WE
ARE CAUSING IT

CONSENSUS ON CONSENSUS:

A SYNTHESIS OF CONSENSUS ESTIMATES ON HUMAN-CAUSED GLOBAL WARMING



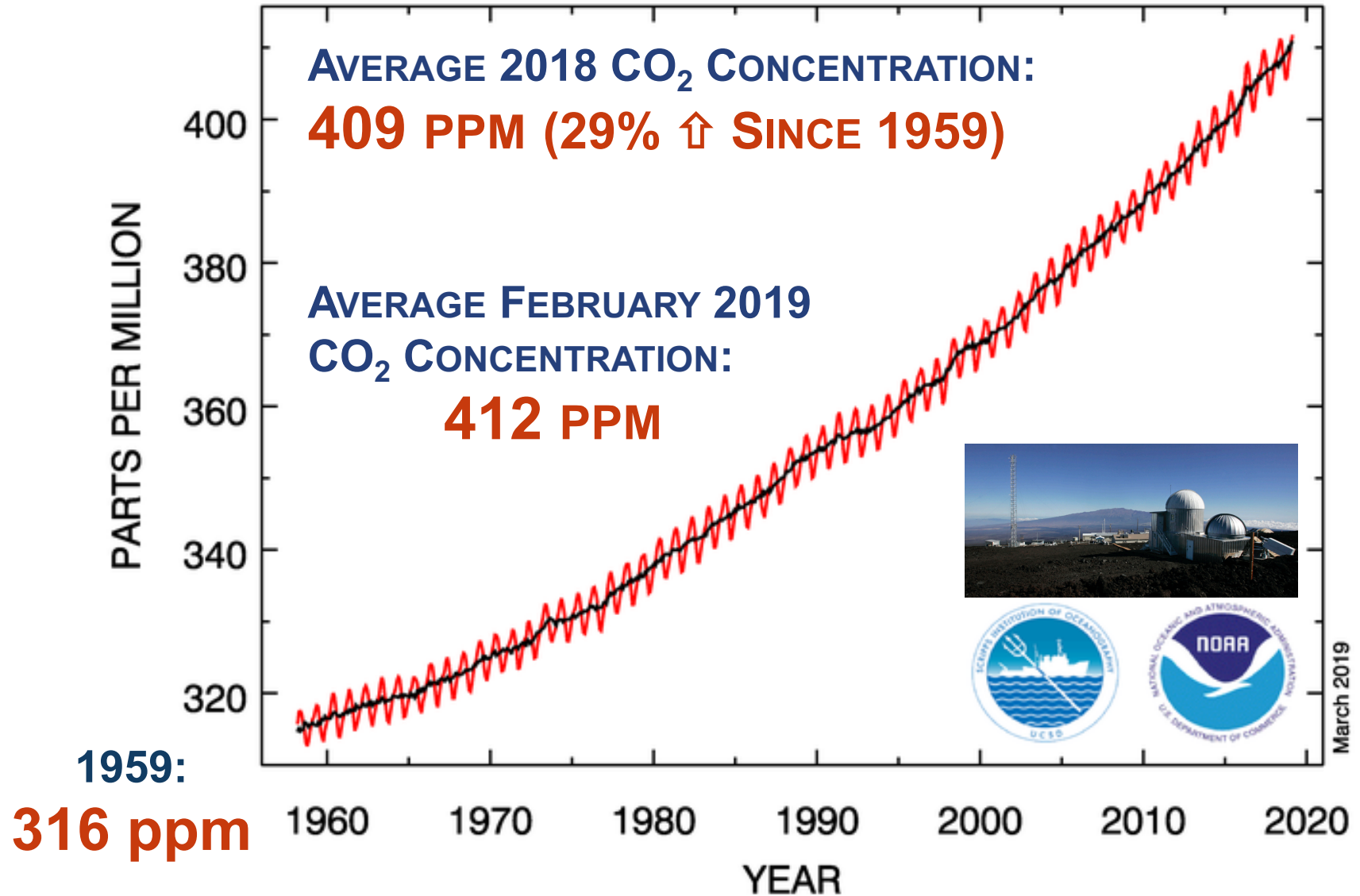
Cook et al., *Environmental Research Letters*, 2016

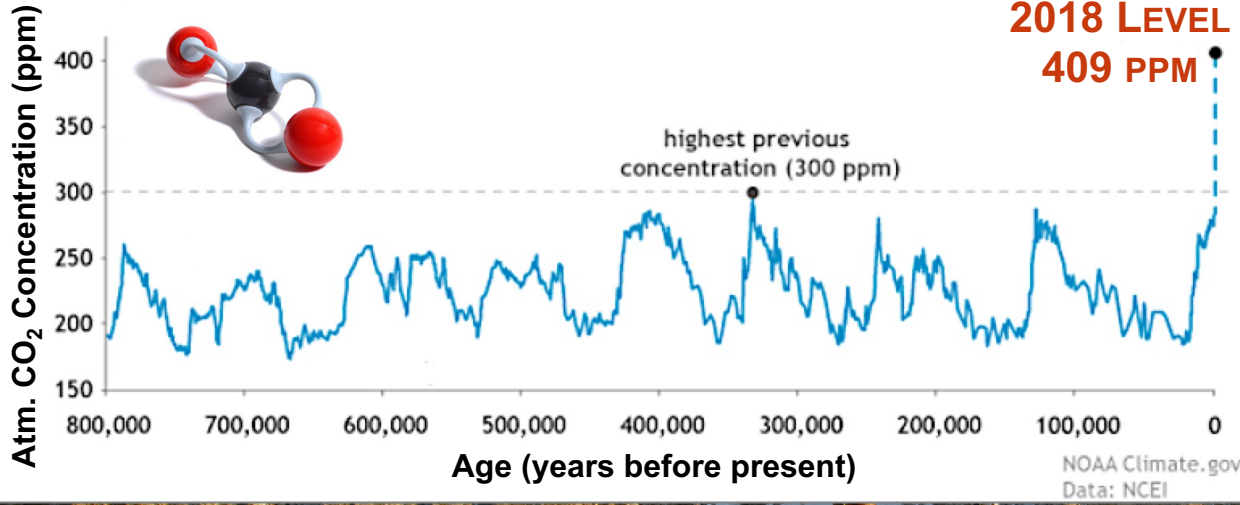
3

**SUPPORTING
FACTS**

FACT 1:
CO₂ IN THE
ATMOSPHERE IS
INCREASING

ATMOSPHERIC CO₂ AT MAUNA LOA OBSERVATORY





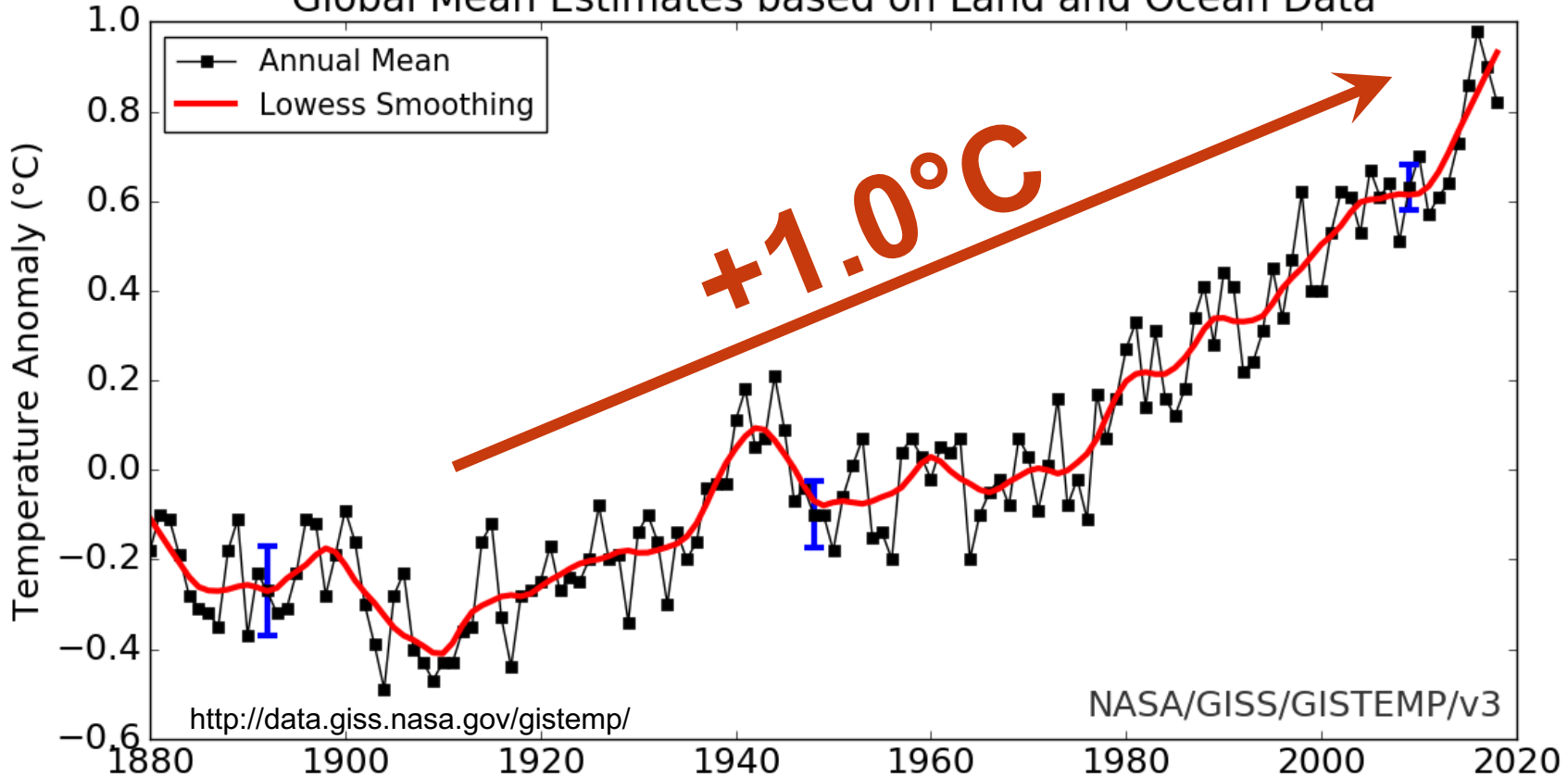
“ ATMOSPHERIC CONCENTRATIONS OF ”
CARBON DIOXIDE, METHANE, AND NITROUS
OXIDE HAVE INCREASED TO LEVELS
UNPRECEDENTED IN AT LEAST
THE LAST 800,000 YEARS.
CO₂ CONCENTRATIONS HAVE INCREASED
BY 40% SINCE PRE-INDUSTRIAL TIMES,
PRIMARILY FROM FOSSIL
FUEL EMISSIONS...

IPCC STATEMENT ON INCREASES IN ATMOSPHERIC GREENHOUSE GASES, SPM, 2013

FACT 2:
THE EARTH IS
WARMING

NASA GISS GLOBAL TEMPERATURE RECORD

Global Mean Estimates based on Land and Ocean Data



1880-1929

0.62°C

1967-2016

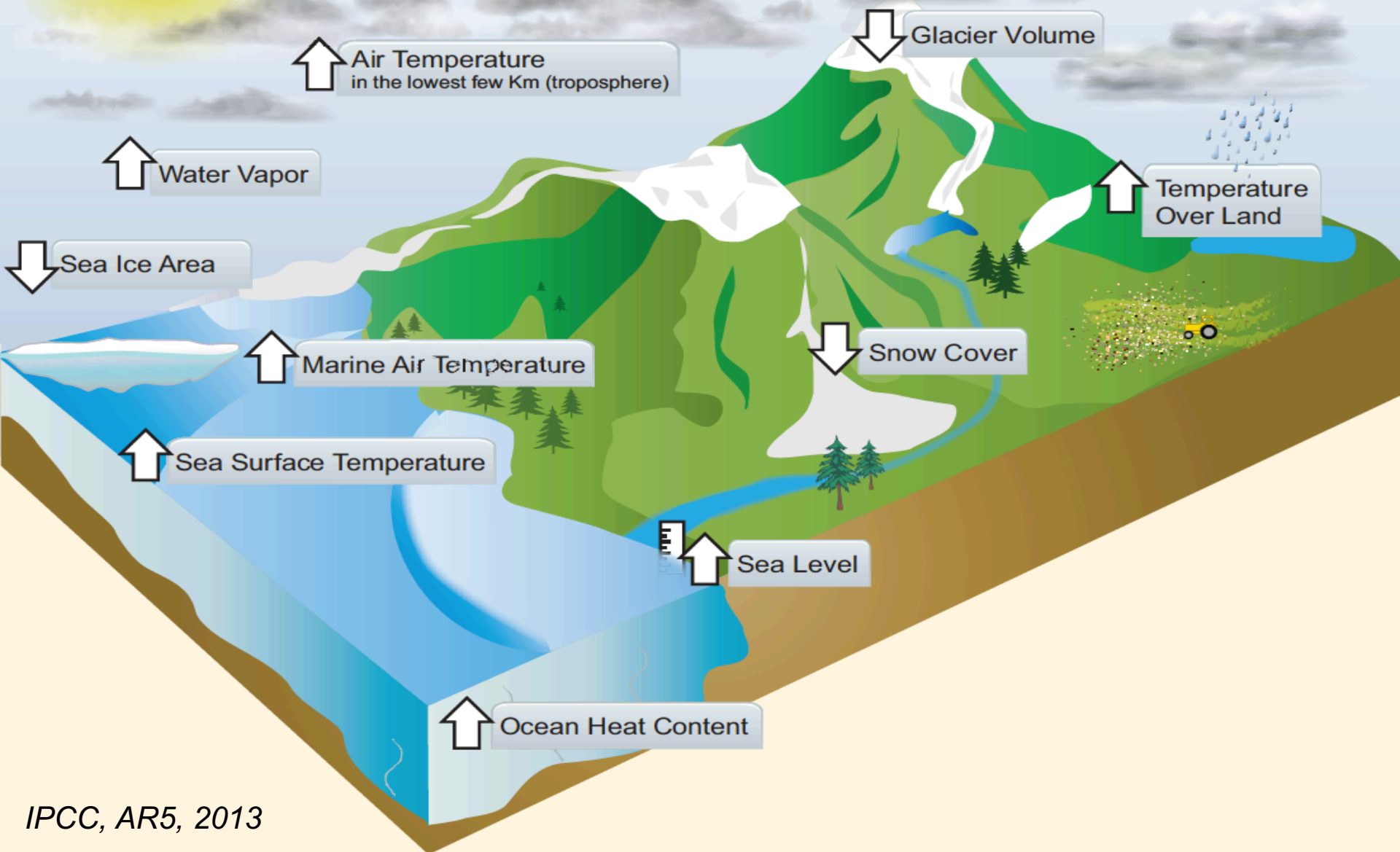


MEAN HUMAN HEIGHT
IN THE UNITED STATES



Mathez, E. A. and J. E. Smerdon, *Climate Change: The Science of Global Warming and our Energy Future*, 2nd Ed., Columbia University Press, October 2018.

MANY DIFFERENT WARMING SIGNALS



IPCC, AR5, 2013

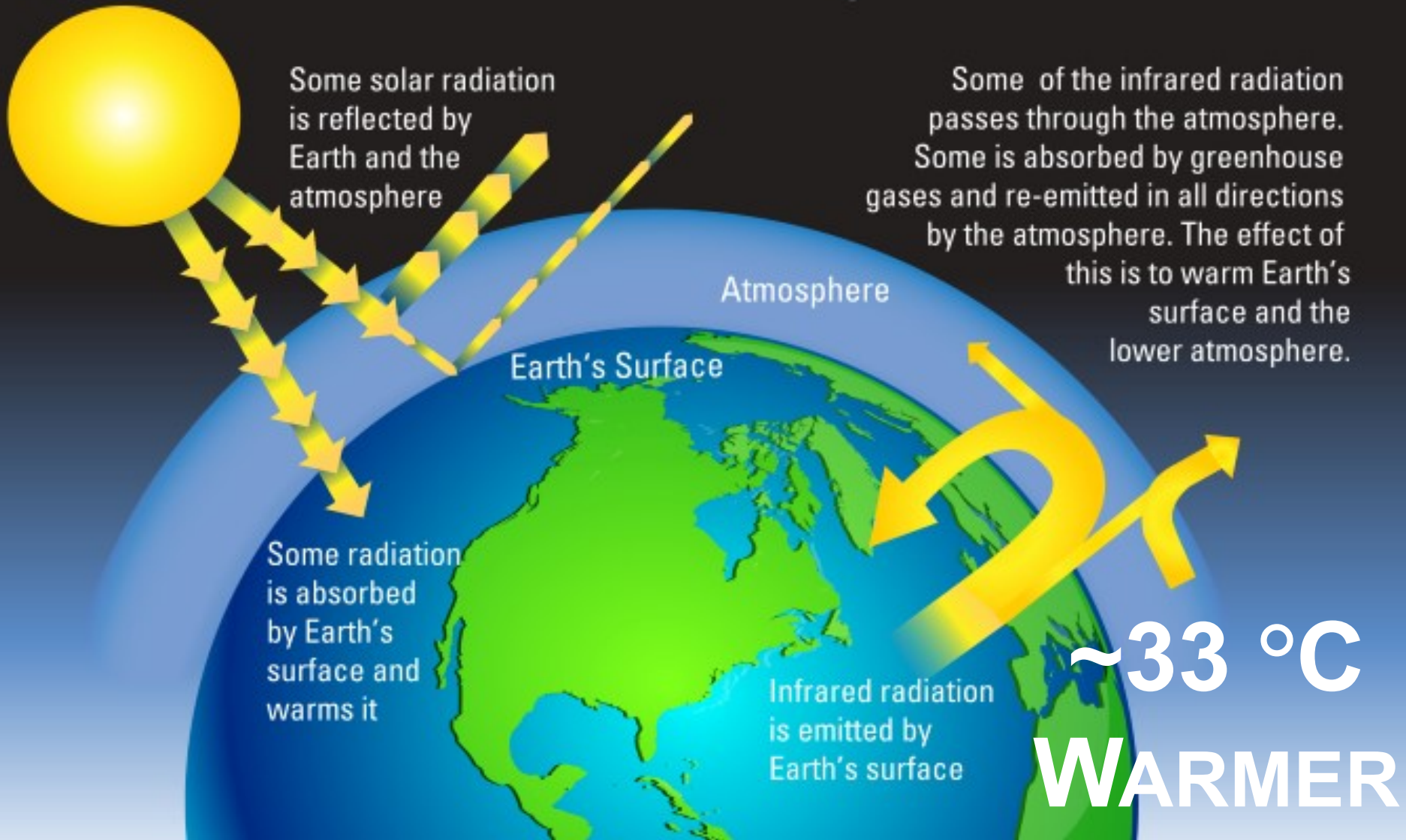
“ WARMING OF THE CLIMATE SYSTEM IS ”
UNEQUIVOCAL,
AND SINCE THE 1950s, MANY OF
THE OBSERVED CHANGES ARE
UNPRECEDENTED
OVER DECADES TO MILLENNIA.

IPCC STATEMENT ON WARMING, SPM, 2013

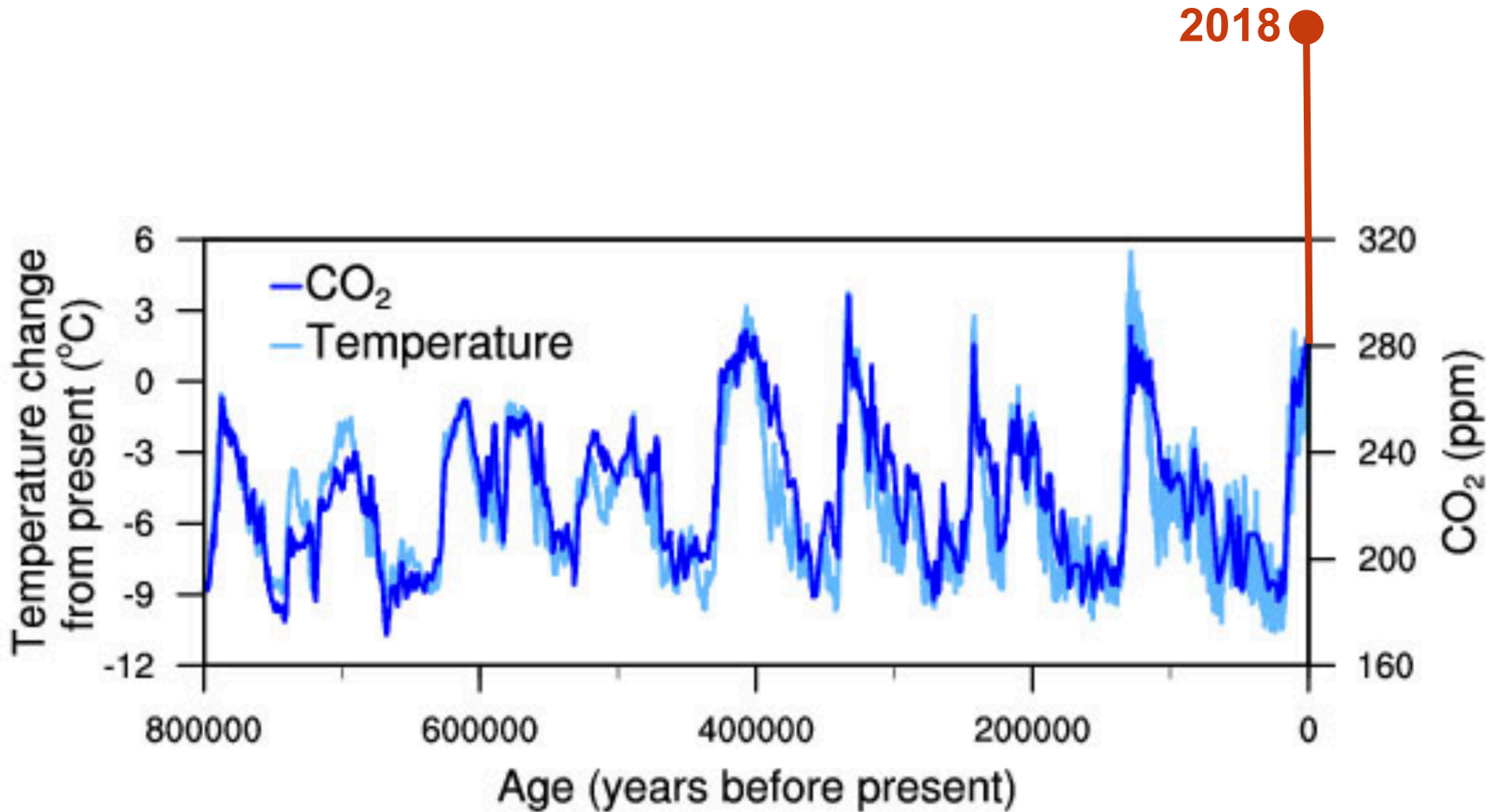
FACT 3:

**CO₂ IS THE CAUSE
OF THE WARMING**

THE GREENHOUSE EFFECT

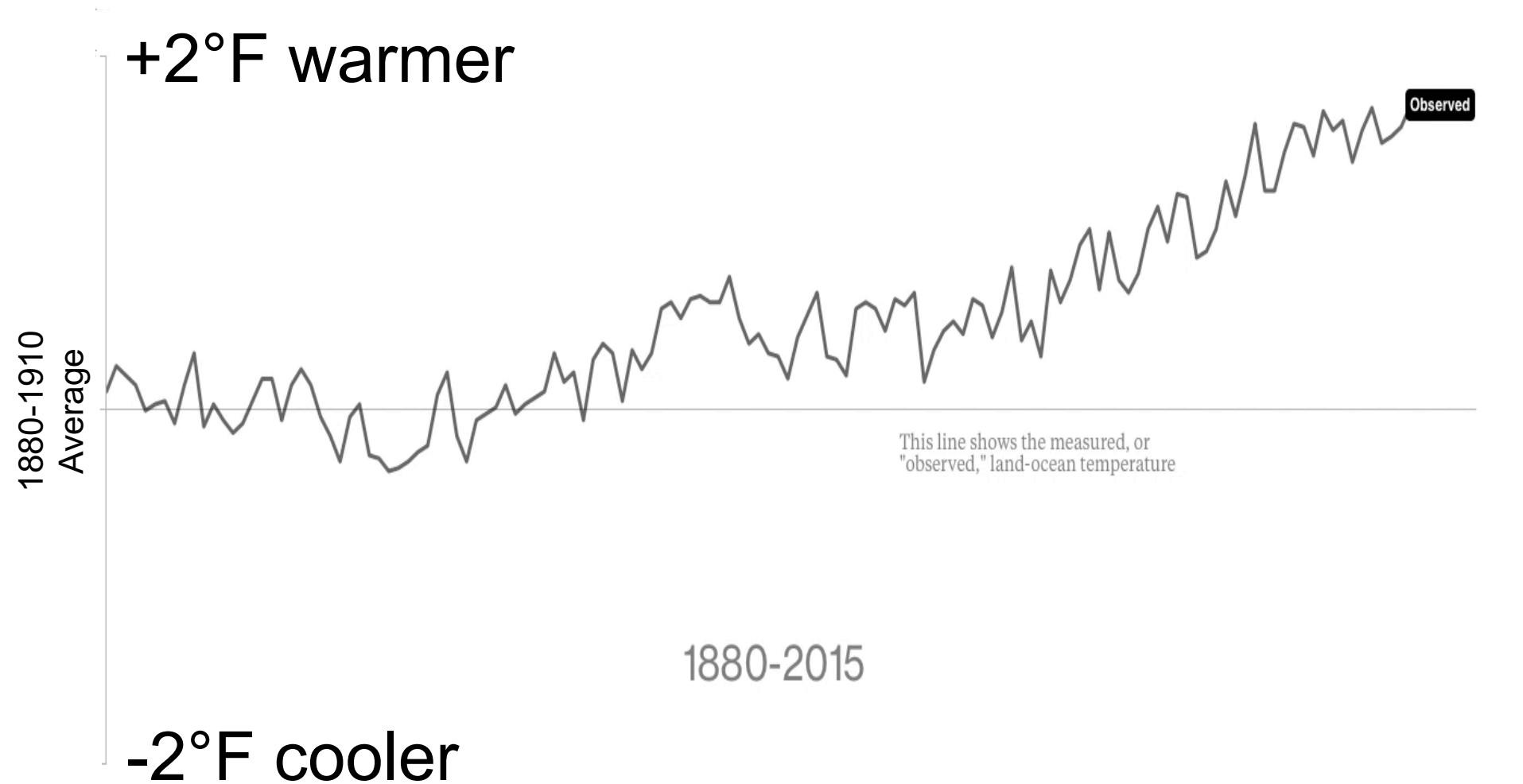


TEMPERATURE AND CO₂ IN THE PAST



<https://www.ncdc.noaa.gov/global-warming/temperature-change>

WHAT IS WARMING THE WORLD?



<http://www.bloomberg.com/graphics/2015-whats-warming-the-world/>

FACT:
THE EARTH IS
WARMING AND WE
ARE CAUSING IT

“

MOST

”

OF THE OBSERVED INCREASE IN
GLOBAL AVERAGE TEMPERATURES
SINCE THE MID-20TH CENTURY IS
VERY LIKELY DUE
TO THE OBSERVED INCREASE IN
ANTHROPOGENIC
GHG CONCENTRATIONS.

IPCC STATEMENT ON GLOBAL WARMING AND HUMAN INFLUENCE, SPM, 2014

THE IMPACTS OF CLIMATE CHANGE ARE HERE



QUESTION:
WHAT DOES THE
FUTURE HOLD?

HOW WILL WE GENERATE ENERGY IN THE FUTURE?



HOW WILL WE USE ENERGY IN THE FUTURE?



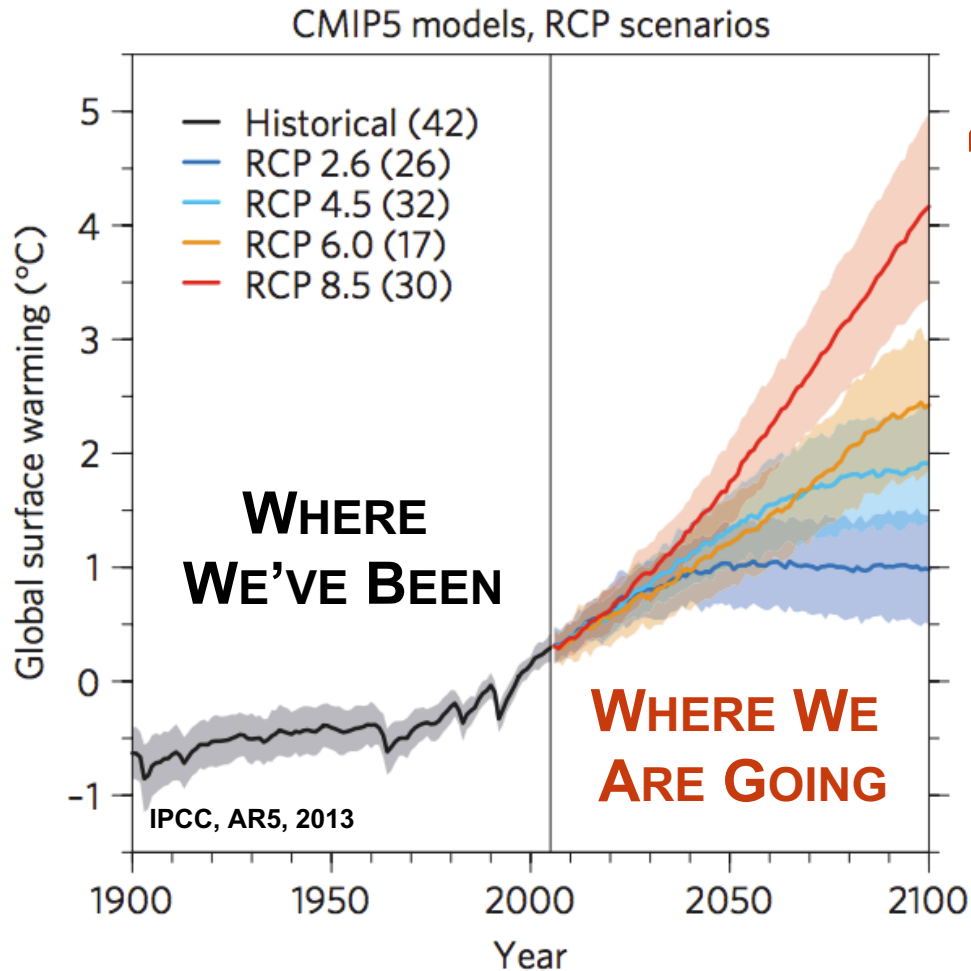
How Will Countries Continue to **MODERNIZE** AND **DEVELOP**?



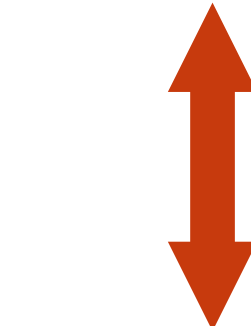
HOW MANY OF **US** WILL THERE BE IN THE FUTURE?



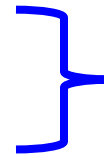
WARMING AND OUR FUTURE



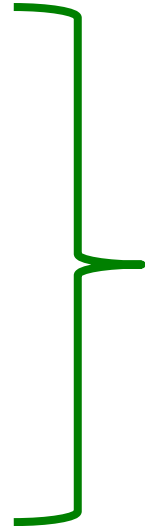
4.8°C



0.3°C



SCIENTIFIC UNCERTAINTY



DECISION UNCERTAINTY

LAST GLACIAL MAXIMUM: ~4-5°C COLDER



https://en.wikipedia.org/wiki/Lower_Manhattan

2100 IS NOT THAT FAR AWAY



2100

GLOBAL MEAN TEMPERATURE RISE

1°C

2°C

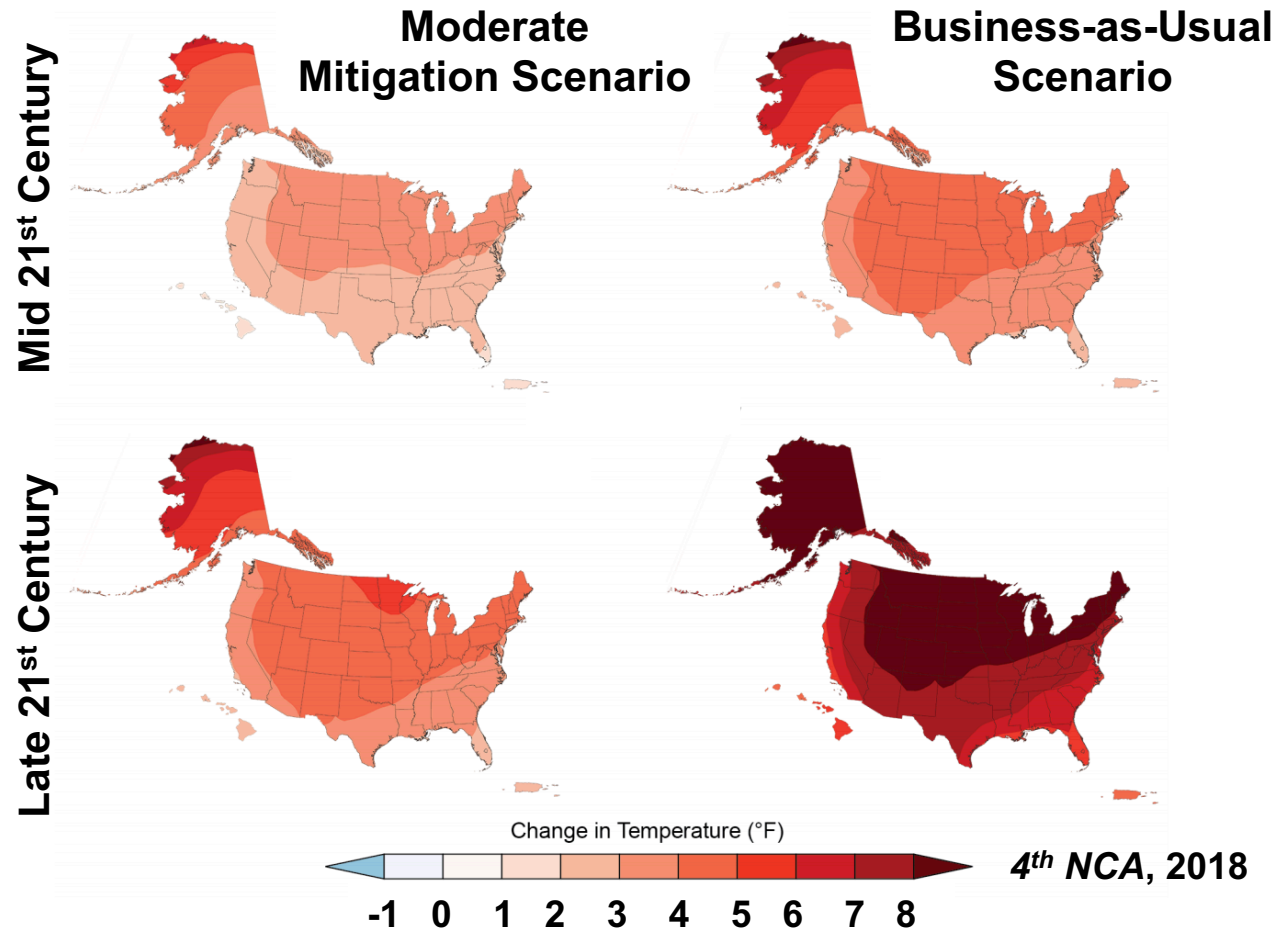
3°C

4°C



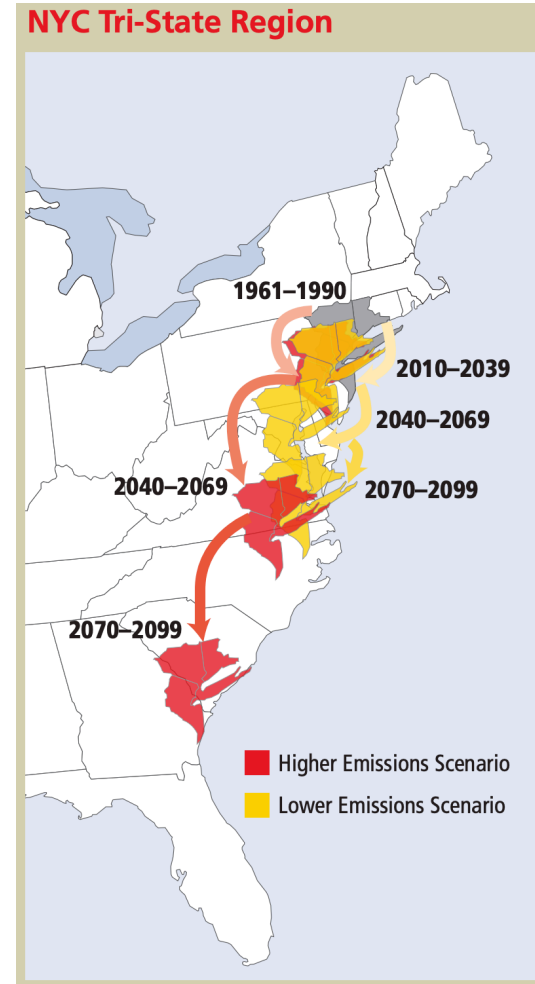
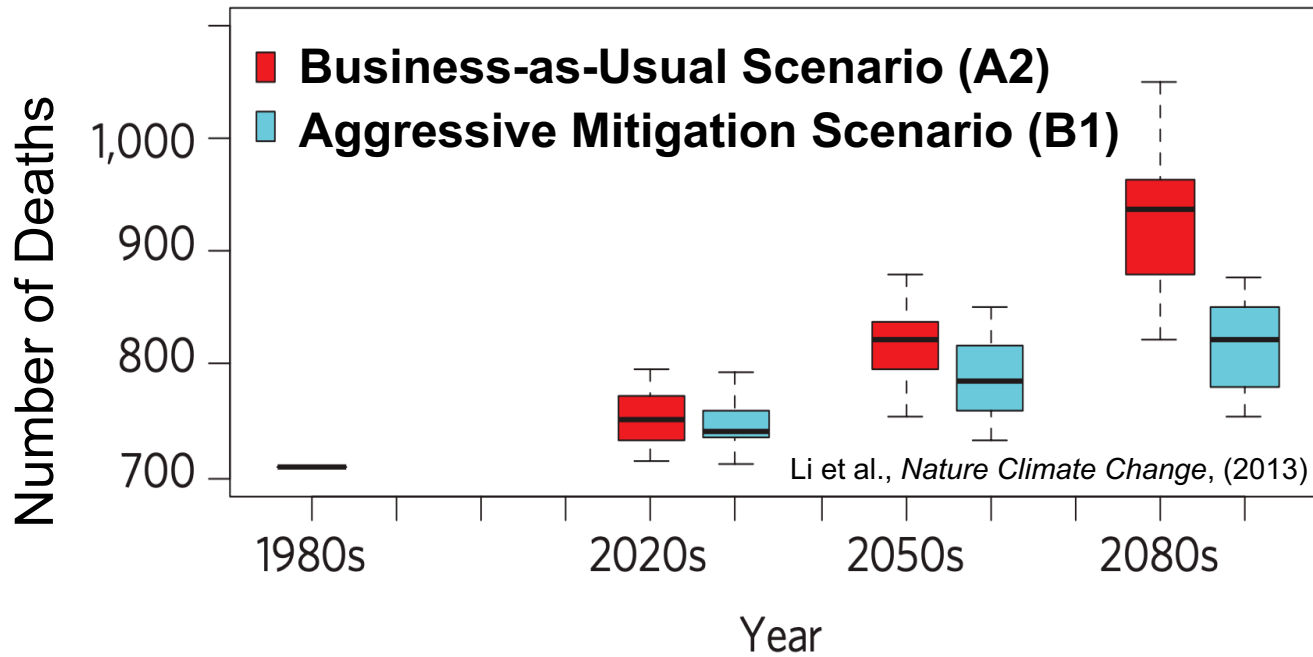
RISK

PROJECTED **TEMPERATURE** CHANGES IN THE US



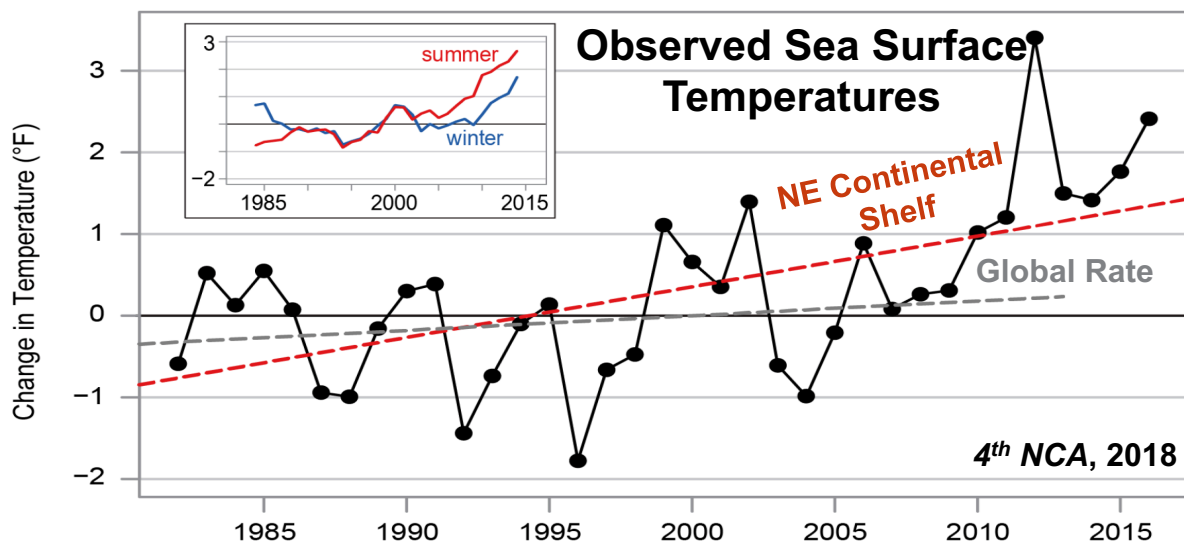
*By 2035, NE is projected to be more than **3.6°F (2°C)** warmer than the preindustrial era.*

ANNUAL TEMPERATURE-RELATED DEATHS IN MANHATTAN, NEW YORK

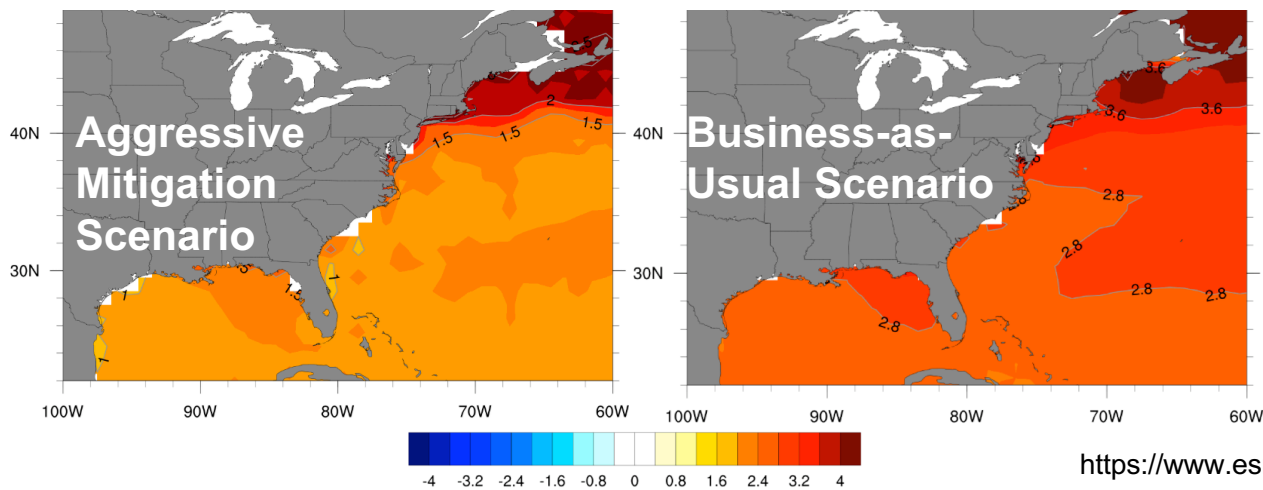


https://www.ucsusa.org/sites/default/files/legacy/assets/documents/global_warming/The-Changing-Northeast-Climate.pdf

SEA SURFACE TEMPERATURES ARE ALSO CHANGING ON THE NORTHEAST CONTINENTAL SHELF



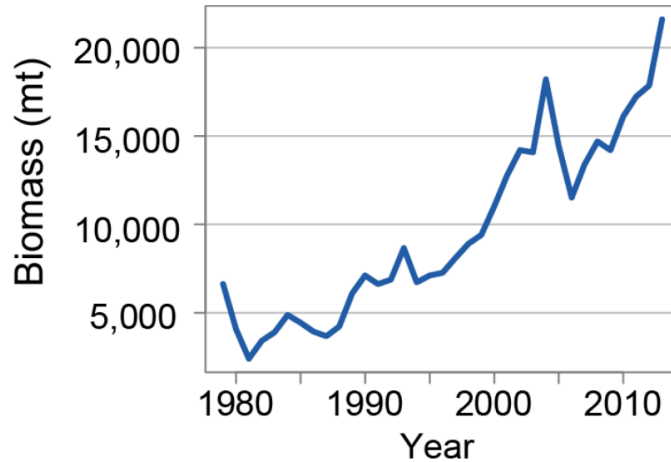
Projected Sea Surface Temperature Changes by 2100



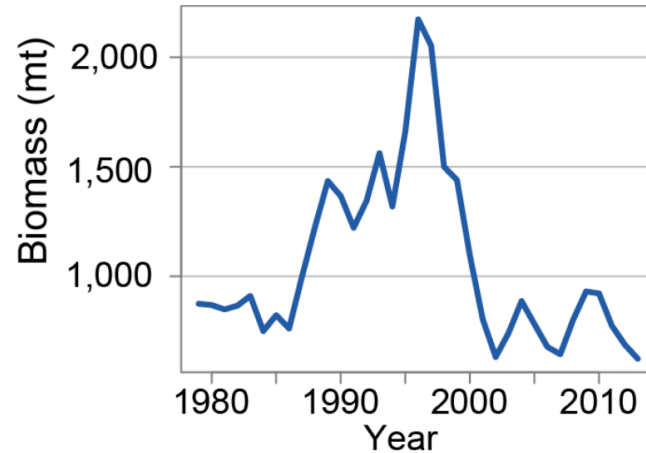
<https://www.esrl.noaa.gov/psd/ipcc/ocn/>

MARINE LIFE IS CHANGING ON THE NORTHEAST CONTINENTAL SHELF

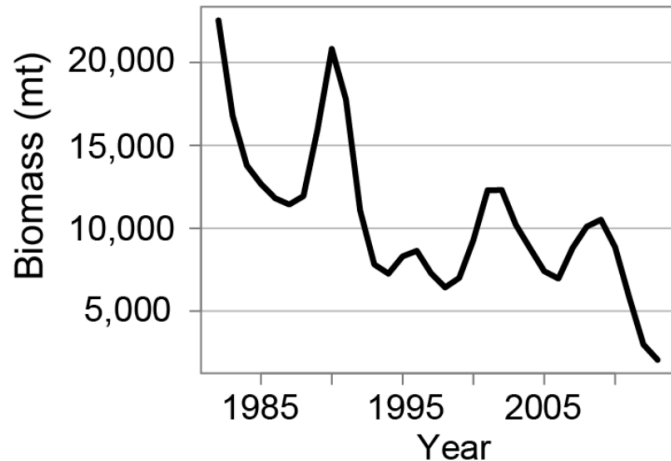
Gulf of Main Lobster



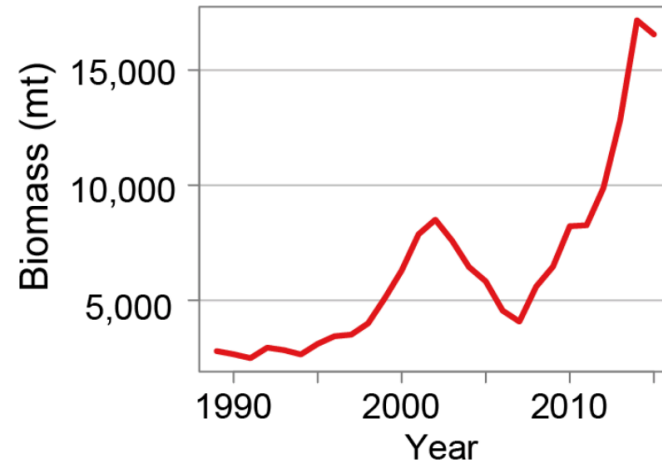
Southern NE Lobster



Gulf of Maine Cod



Black Sea Bass



4th NCA, 2018

EXAMPLES OF IMPACTED NE INDUSTRIES

- **OUTDOOR RECREATION INDUSTRY**
 - **~\$150 billion** in consumer spending to the NE economy
 - Supports more than **1 million jobs** across the region.
- **AGRICULTURE, FISHING, FORESTRY, AND RELATED INDUSTRIES**
 - **~\$100 billion** in economic activity annually
 - Supports more than **0.5 million jobs** in production and processing region-wide.
- **NE WINTER RECREATION INDUSTRY**
 - Between **\$2.6-\$2.7 billion** in revenue annually
 - Supports **~44,500 jobs**

4th National Climate Assessment, 2018

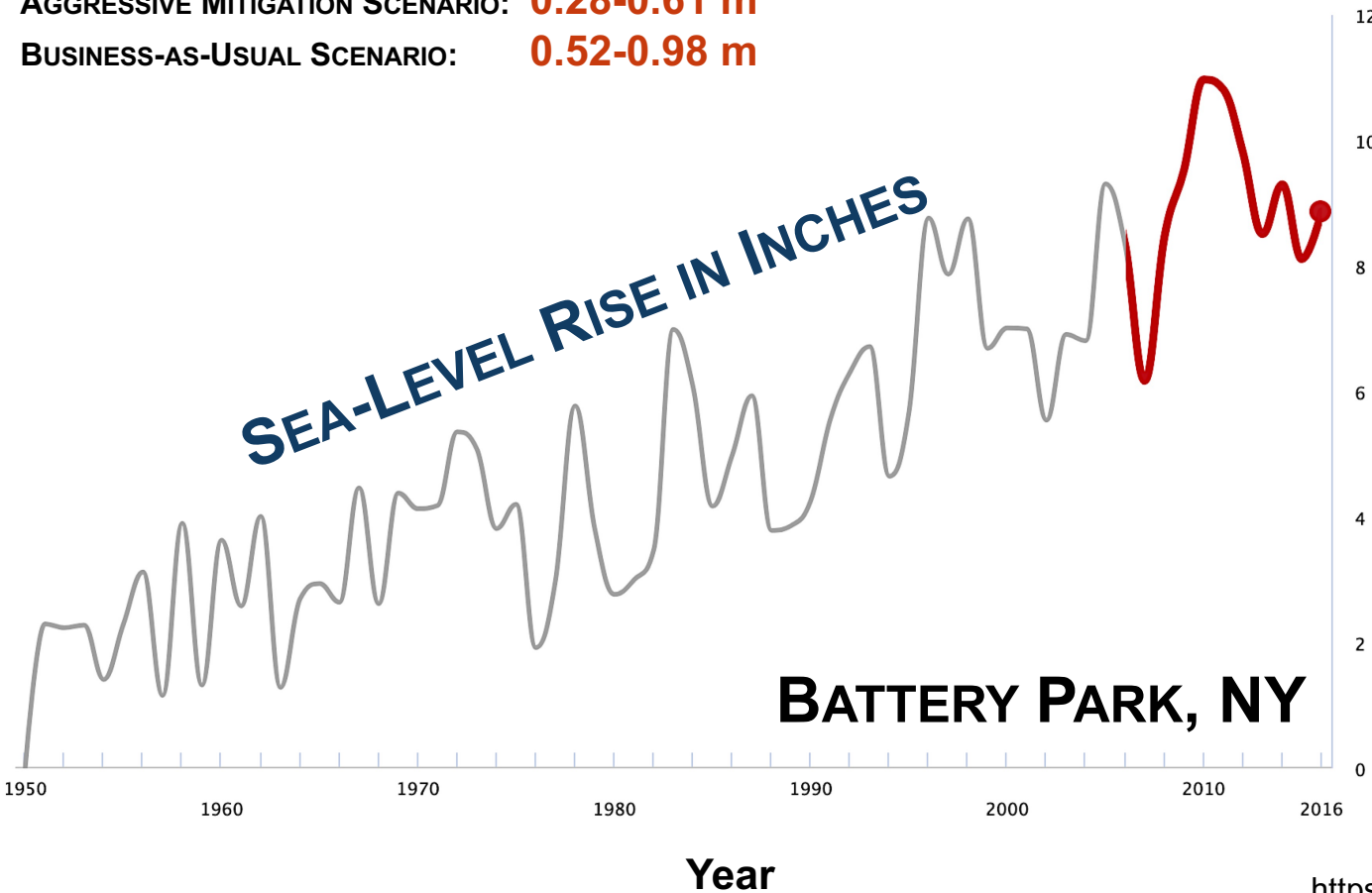
SEA-LEVEL RISE IN NEW YORK, NY

GLOBAL AVERAGE SEA LEVEL RISE PROJECTIONS

AGGRESSIVE MITIGATION SCENARIO: **0.28-0.61 m**

BUSINESS-AS-USUAL SCENARIO: **0.52-0.98 m**

SEA-LEVEL RISE IN INCHES



<https://sealevelrise.org/states/new-york/>

WHY DO WE CARE ABOUT SEA-LEVEL RISE?

KING TIDE FLOODING



Dock Street in Annapolis, Maryland (December 21, 2012), 4th NCA, 2018

STORM SURGES



South Ferry Subway Station

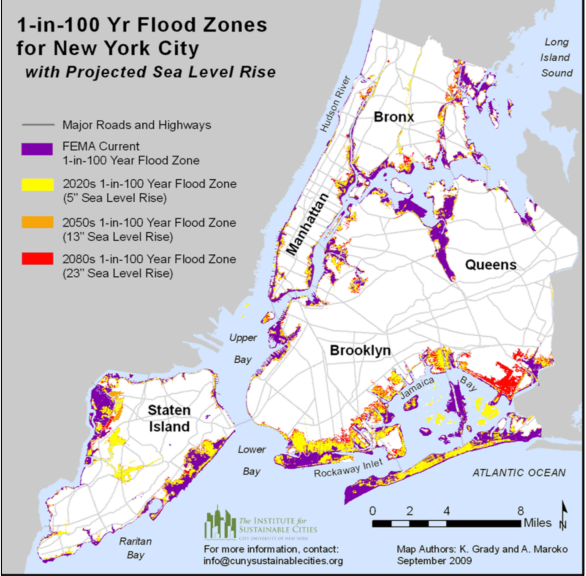
<https://gizmodoemergency.wordpress.com/2012/10/31/the-ultimate-gallery-of-flooded-nyc/>



FOREST DIEBACK

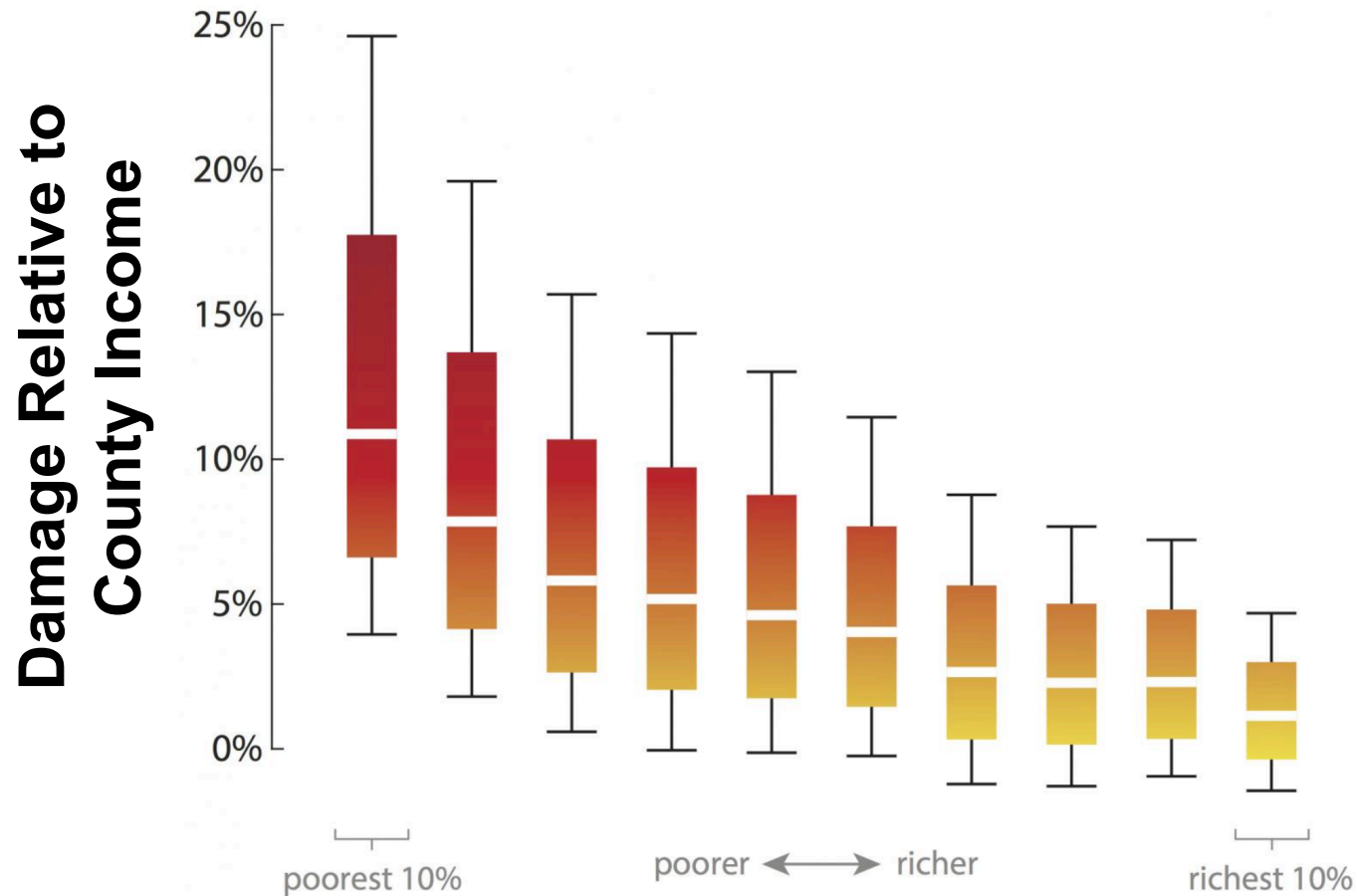


Dying Atlantic White Cedars, Bass River, New Jersey, 4th NCA, 2018



INCREASED URBAN VULNERABILITY

THOSE MOST **VULNERABLE**...



Wealth of US County (per capita income)

<https://phys.org/news/2017-06-climate-economy-inequality.html>

Hsiang et al., *Science*, (2017)

CLIMATE CHANGE DOESN'T MEAN THE END OF THE WORLD

IT REQUIRES US TO PREPARE AND BE SMARTER...

The logo for the Austin Powers film series, featuring the name "AUSTIN POWERS" in a stylized, bubbly, yellow font with a blue outline, set against a white background.

SOME **HELPFUL** RESOURCES

NASA/GISS Global Temperature Record

<https://data.giss.nasa.gov/gistemp/>

Moana Loa Atmospheric CO2 Data

<https://www.esrl.noaa.gov/gmd/ccgg/trends/>

What is Warming the World Animation

<http://www.bloomberg.com/graphics/2015-whats-warming-the-world/>

4th US National Climate Assessment

<https://www.globalchange.gov/nca4>

Sea Level Rise

<https://sealevelrise.org>

SOLAR POWER POTENTIAL



Mathez, E. A. and J. E. Smerdon, *Climate Change: The Science of Global Warming and our Energy Future*, 2nd Ed., Columbia University Press, October 2018.

WORLD'S FIRST COMMERCIAL PLANT FOR DIRECT CARBON CAPTURE

Opened 2017

**900 TONS
CO₂ CAPTURED
ANNUALLY
(~200 CARS)**

Near Zürich, Switzerland

<http://www.sciencemag.org/news/2017/06/switzerland-giant-new-machine-sucking-carbon-directly-air>

A 21ST-CENTURY

“

WE NEED
CHALLENGE

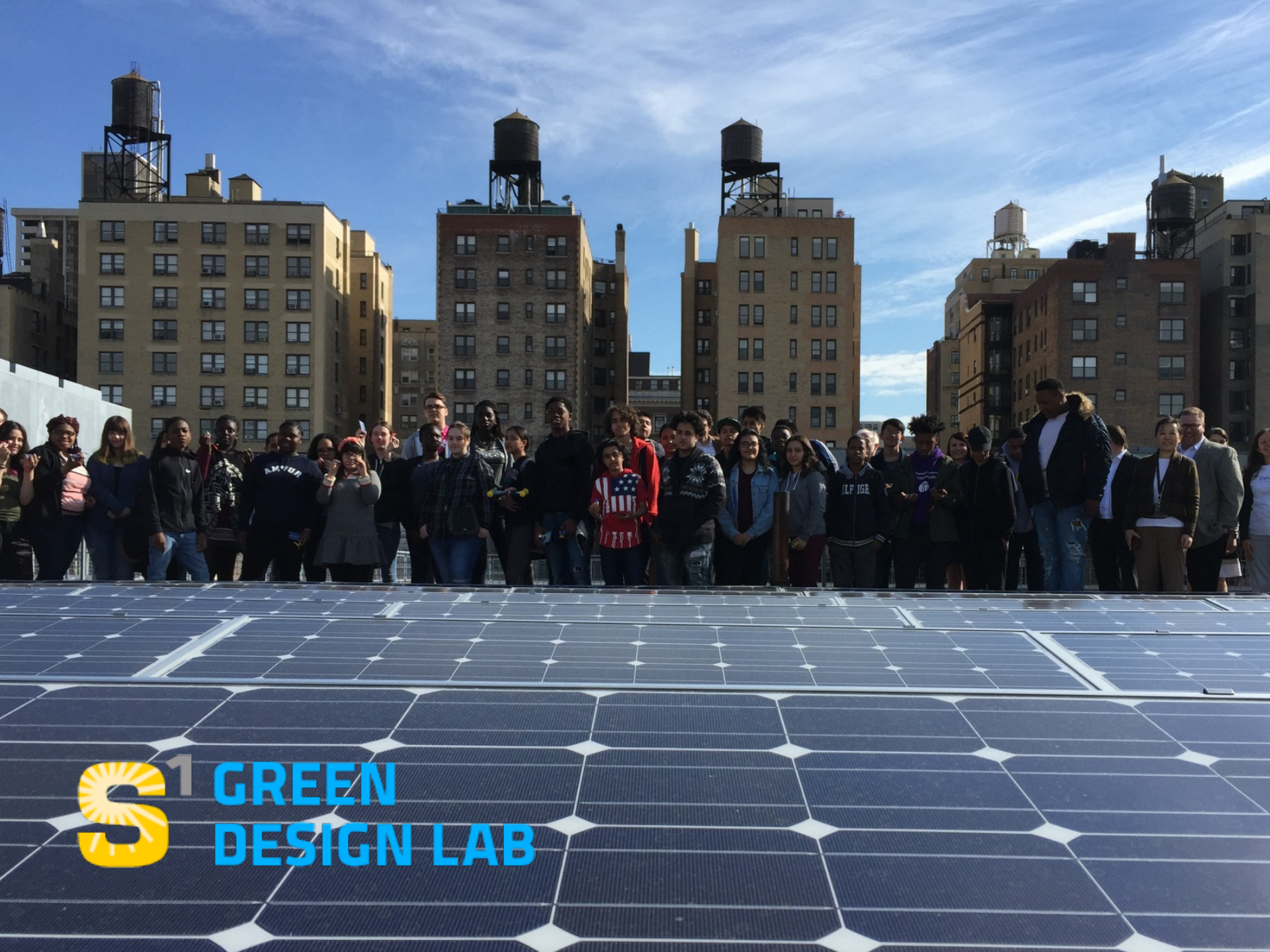
”

COURAGE,

NOT HOPE...

COURAGE IS THE RESOLVE
TO DO WELL WITHOUT THE
ASSURANCE OF A HAPPY ENDING.

KATE MARVEL, ON BEING

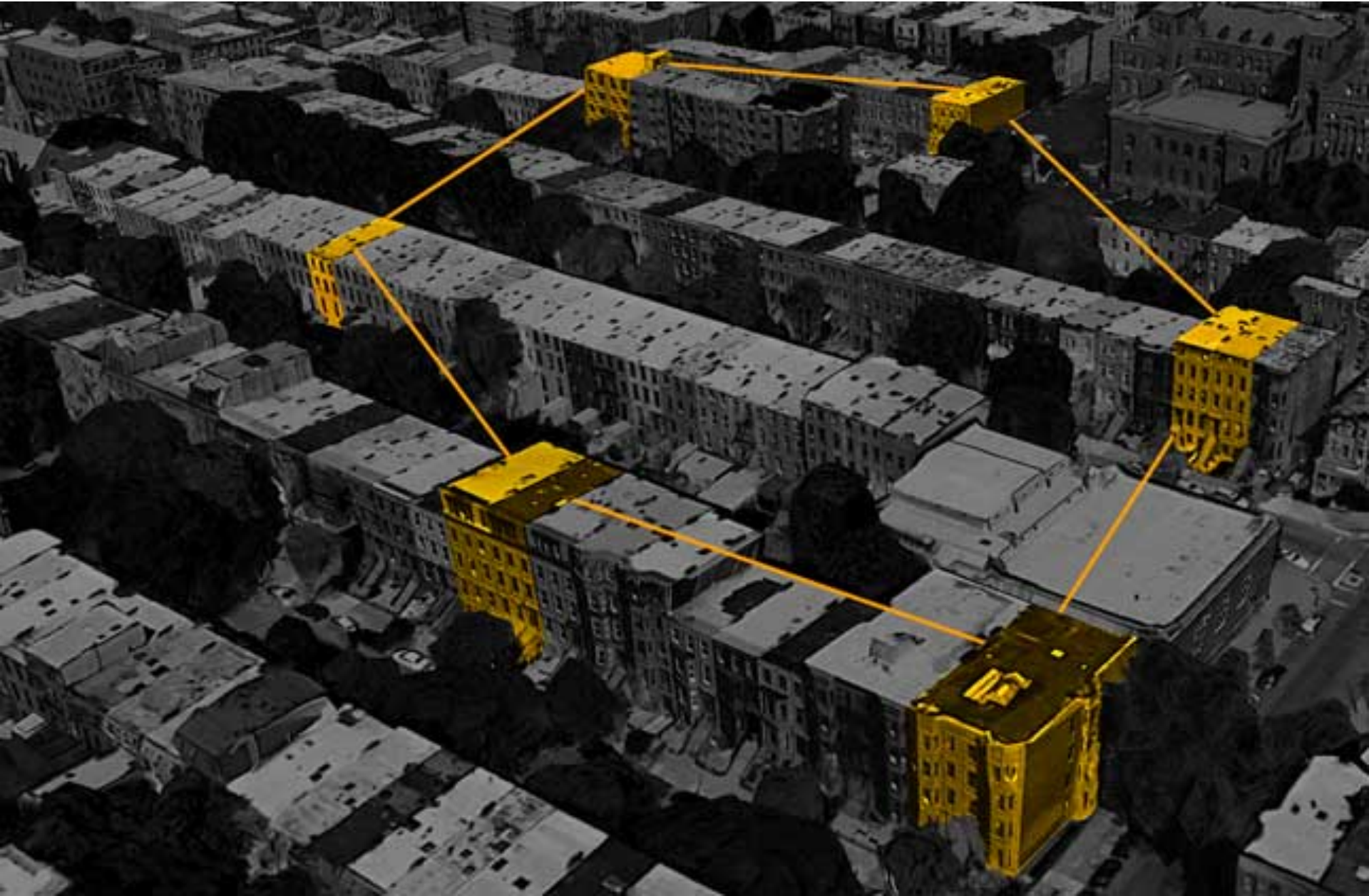


**S¹ GREEN
DESIGN LAB**

Here Comes Solar



Community Solar



Green Workforce Training



Green Design Lab

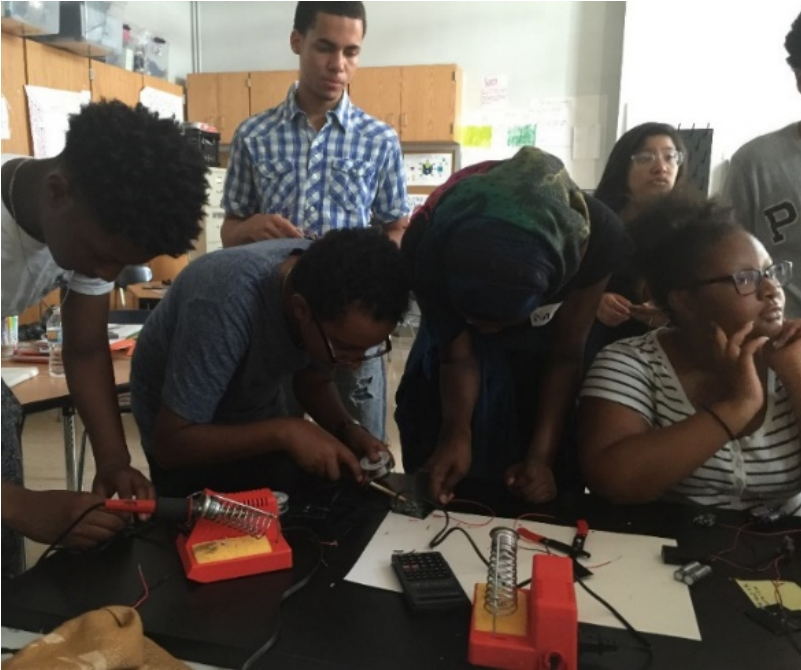




Teachers practicing hands-on solar labs

- Effective STEM programs are interdisciplinary and go beyond teaching environmental literacy to preparing students for STEM careers.- ***Next Generation Science Standards***
- School systems should do more to ensure that English-language learners have access to STEM education. – ***National Academies of Sciences, Engineering, and Medicine***
- Teachers lack PD opportunities focused on climate change- ***National Center for Science Education***

PD Training: Focus on Partnerships



Soldering solar powered USB cell phone chargers



Building Mobile Solar Chargers

- NYC Solar Schools Program
- Multilingual Learners

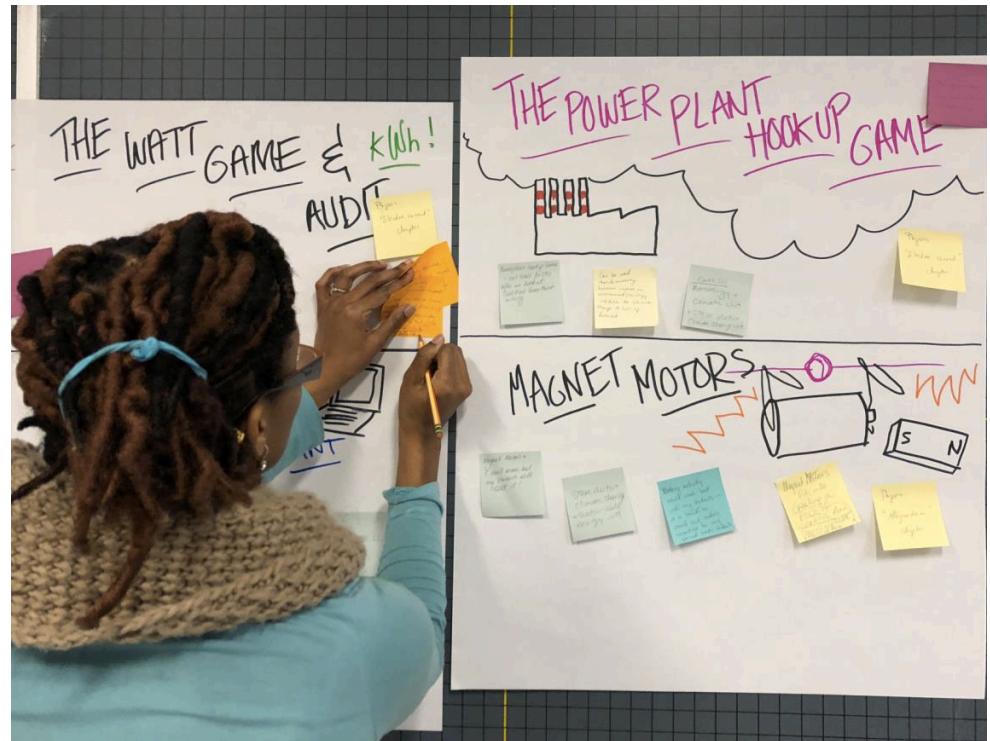
- CareerCLUE
- Environmental Justice Programs



Students working on a Mock Solar Installation

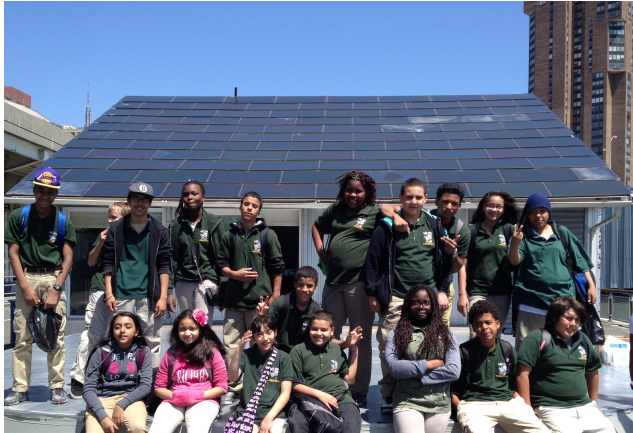
Key Learning and Takeaways

- Green Job training can take many forms
- City agencies can support climate goals with teacher preparation and workforce development
- Workforce Development starts in middle and high school
- Educational networks can connect an entire industry



Solar 1 GREEN DESIGN LAB

Visit: thegreendesignlab.org
Contact: Sarah Pidgeon
education@solar1.org





PS 90



The Magnet School for Environmental Studies and
Community Wellness

Principal Greta Hawkins
Assistant Principal Gayle Gordon

<https://www.ps90.org/>

Follow us on Twitter at
<https://twitter.com/ps90jed>



2017 GrowNYC DSNY Super Recycler!



production restoration
diversity economics **climate change**
engineering conservation preservation
renewable energy research technology
Sustainability agriculture
economy
reduction waste industry consumption
ecosystem health zero waste
innovation **recycling**

business active
nutrition eating well-being health
mindfulness **super foods** calm soothe
Wellness
healthy body
vegetables whole grains protein water
running energy rest nourish

awareness decision
self-esteem strengths discipline choices
goals organization teamwork respect emotions
Social Emotional problem sol
empathy
honesty feelings motivation appreciation
trust confidence responsibility
effort management
kindness expectations caring
communication

air quality waste conservation
responsibility ozone layer renewable energy
atmosphere weather climate change
carbon footprint carbon cycle forestry biology
Environmental Studies
compost **Earth** solar energy food chain
marine biology decomposers ecosystem landfill
ground water **toxic** wind energy global
resources drought population
water cycle

PS 90's 5 Themes

programming URL
bandwidth analyze software network
science robotics wireless multimedia interactive internet
computational thinking input communicate web
modern code data e-mail information CPU digital hardware
prototype **Technology** browser
computer abstraction application bytes broadband
space download connection call firewall algorithms
research domain database debug HTML

REDUCE

YOUR

Carbon
Foot
Print



CLIMATE CHANGE AFFECTS
EVERYONE
BUT NOT EQUALLY



Maleeha



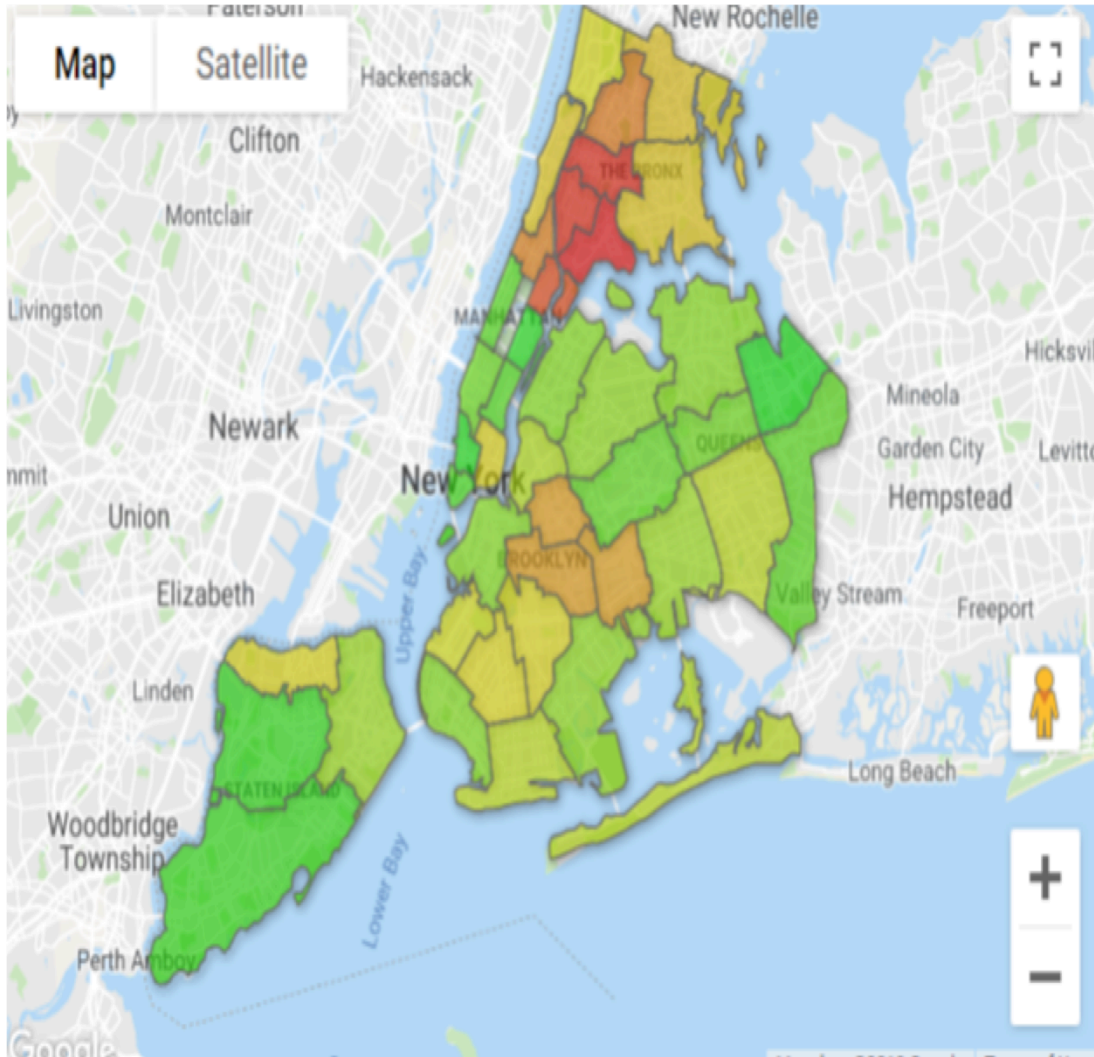
“Like climate change, the conditions of our communities are the consequence of a long history of extraction. We share legacies of fighting colonialism, as well as race, class and gender oppression, while advocating for environmental justice. And we share vision, values and principles that guide our environmental, economic, and social justice organizing. Our communities are the first and most impacted by the storms, fires, floods and droughts, and are disproportionately burdened by the pollution, poverty and systemic violence associated with the multinational corporations driving these ecological crises.” ***Elizabeth Yeampierre***



Fact: Cities Produce A Lot of Waste and Pollution.



Air



The city recently estimated that up to 2,700 premature deaths a year could be attributed to fine particulate matter and ozone in the air.

Roughly 410 out of every 10,000 Bronx children visited the ER for asthma symptoms in 2015, according to the latest data the health department. Citywide the asthma-related ER rate is 223 out of 10,000 children.

Water



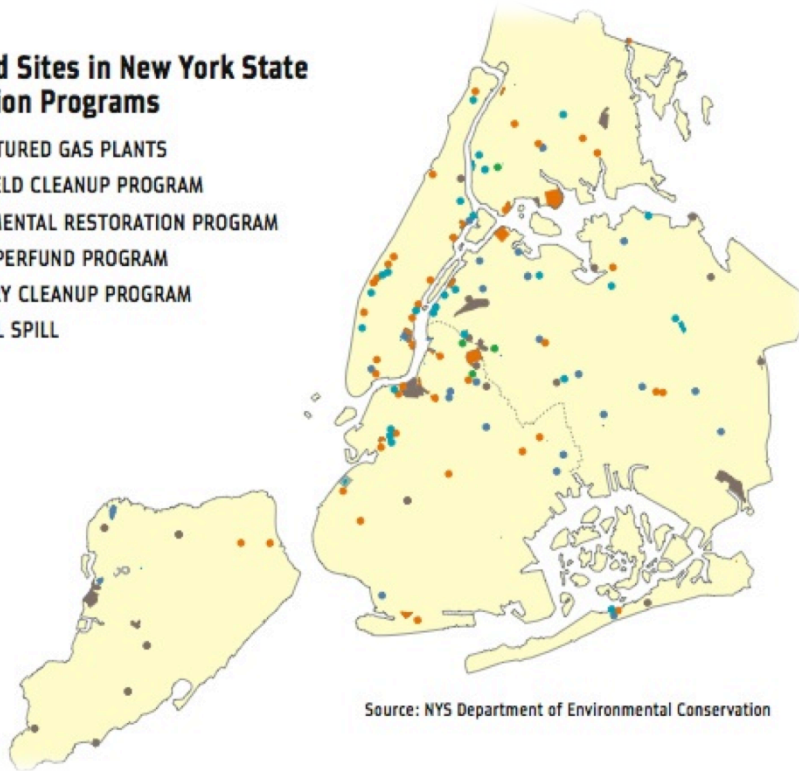
When it rains, it pours raw sewage into New York City's waterways.

Stormwater runoff directly enters local waterways in about a third of the city.

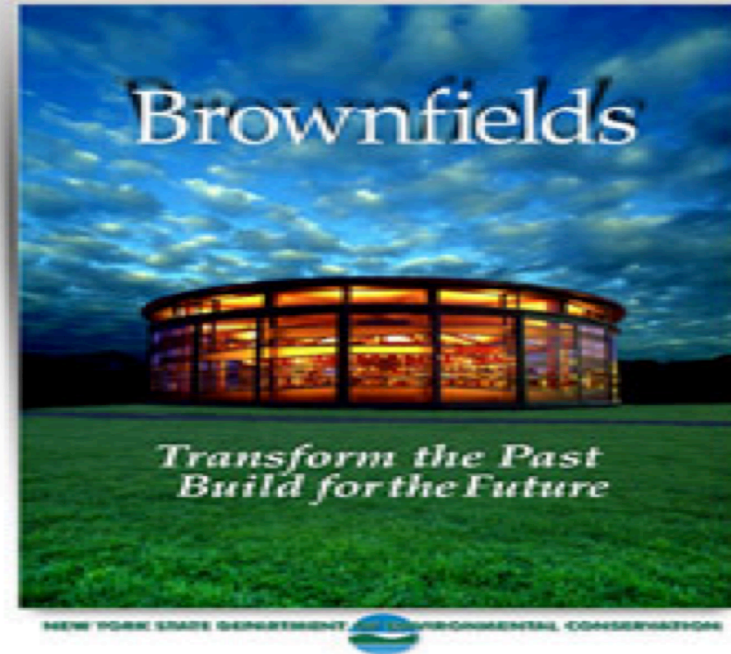
Land

Brownfield Sites in New York State Remediation Programs

- MANUFACTURED GAS PLANTS
- BROWNFIELD CLEANUP PROGRAM
- ENVIRONMENTAL RESTORATION PROGRAM
- STATE SUPERFUND PROGRAM
- VOLUNTARY CLEANUP PROGRAM
- MAJOR OIL SPILL



Source: NYS Department of Environmental Conservation



New York City has over 10,000 properties designated by the City as subject to mandatory environmental study and management.

Food



The Three P's

Processed

Packaged

Poor Quality



Go Vegan! A Healthy You, A Healthy Planet!

DEFORESTATION

1-2 ACRES RAINFOREST
ARE CLEARED
EVERY MINUTE

ANIMAL AGRICULTURE
IS RESPONSIBLE FOR

91% →
OF AMAZON DESTRUCTION



CLIMATE CHANGE

GLOBAL
GREENHOUSE
GAS EMISSIONS

51%  DUE TO LIVESTOCK AND
THEIR BYPRODUCTS

13%  DUE TO TRANSPORT (ROAD
RAIL, AIR & MARINE)

WATER USE



= **660**
GALLONS
WATER



EQUIVALENT TO
SHOWERING FOR
2 MONTHS



WASTE FROM A FARM
OF 2500 DAIRY COWS



WASTE FROM A CITY
OF 411000 PEOPLE



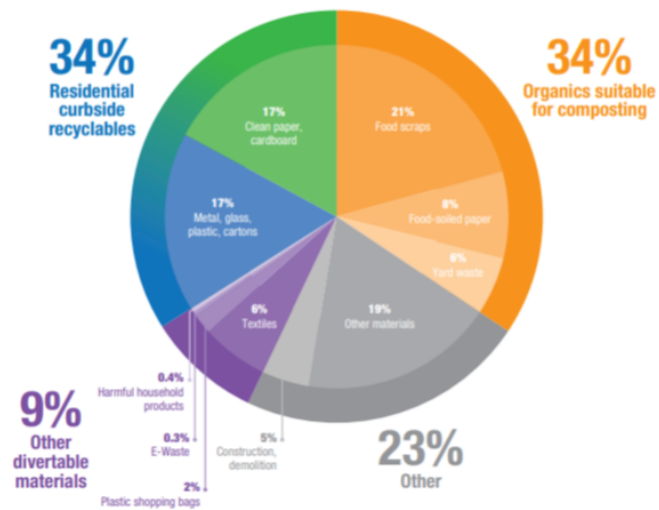
WASTE

Waste Management

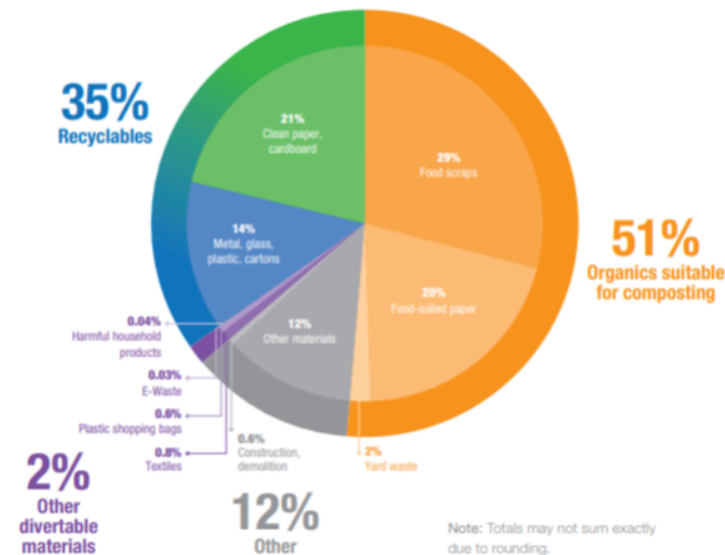
NYCHA launched a recycling action plan in February 2015. Two developments started recycling in May 2015; since then, staff have worked with residents and partners like the DSNY, GrowNYC, Green City Force, and NYC Service to bring recycling to all 328 developments.

NYC Residential Waste Profile in 2017

2017 Composition of Residential Curbside Aggregate Discards

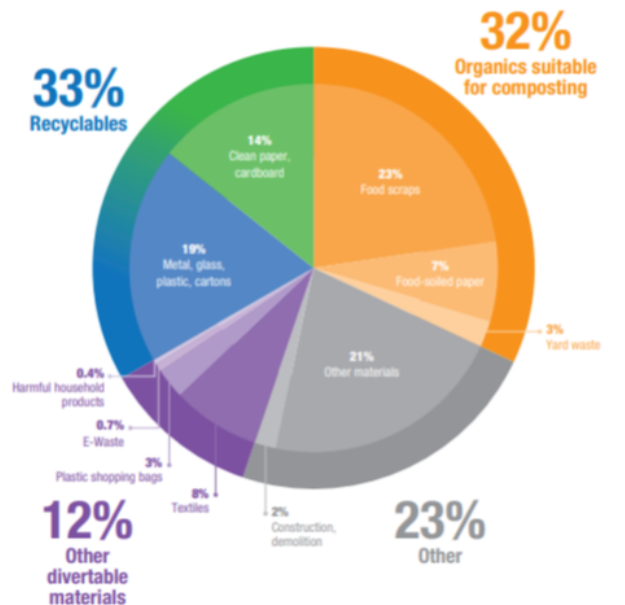


7 Composition of Schools Aggregate Discards



Note: Totals may not sum exactly due to rounding.

2017 Composition of NYCHA Refuse



Community Norms



We Have to Care



In a landfill far
far away...

OUT OF
SIGHT,
OUT OF
MIND.

10%

What are WE doing to Educate the Future?



Air Quality

- Planting and Care for our 20 Trees on our property
- School Garden
- Free Plant Giveaway
- Awareness and Education
- Community Outreach
- Encourage the use of public transportation
- Air Quality Testing
- Signage and follow through



Water

- World Ocean Day
- Beach/ School yard clean up
- Billion Oyster Project
- Bring Your Own Bottle Campaign
- Two Water Stations



Health and Wellness

- One of 4 Vegetarian School in NYC
- Health and Wellness Curriculum
- Parent Wellness Presentations
- Mental Health Consultant/ Dentist and Vision
- Garden to Café / Indoor Garden and Hydroponics systems
- After School Wellness Programming
- Monthly Yoga
- Active Design Yoga stations
- Monthly Newsletter and Morning Announcements
- Family Food Night and Family Fridays
- Monthly Exercise programming
- Sensory Room
- CookShop
- SEL Curriculum
- P.O.W.E.R. Programming for parents



Waste

- 10 Stream Recycling
- Share Table
- PS 90's Material for the Arts
- Composting and Vermicomposting
- Waste Data Collections
- Waste Inspection and Audits
- Energy Saving Campaigns
- Green Team/ Wellness Committee



Climate Action Academy



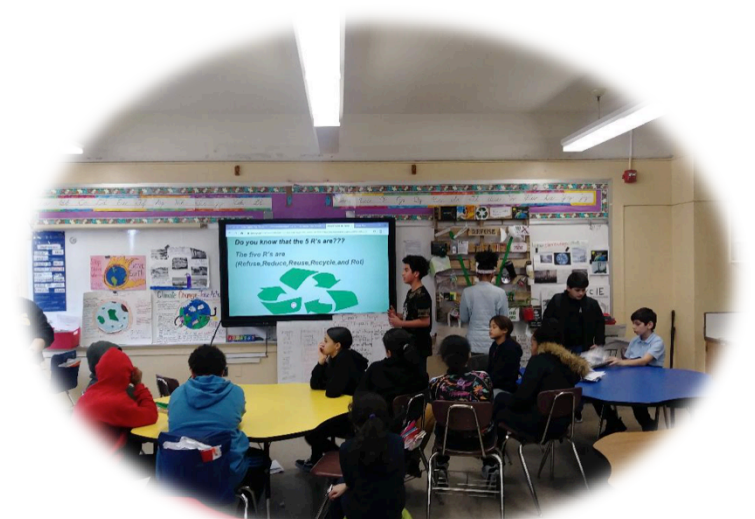
Climate Change to *Climate Action*
Rationale for a
Climate Action Academy at PS90

"Climate change is the defining issue of our time and we are at a defining moment. We face a direct existential threat. Climate change is moving faster than we are and its speed has provoked a sonic boom SOS across our world.

We have the tools to make our actions effective. What we still lack – even after the Paris Agreement – is the leadership and the ambition to do what is needed. We know what we need to do. And we even know to do it. But sadly, the ambition of our action is nowhere it needs to be.

I am calling on civil society, **and young people in particular**, to campaign for climate action. Let us use the next year for transformational decisions in boardrooms, executive suites and parliaments across the world. Let us raise our sights, build coalitions and make our leaders listen. There is no more time to waste."

— Secretary General of the United Nations António Manuel de Oliveira Guterres September 10, 2018.



Our Partners



Think — Move — Achieve —



NEW YORK AQUARIUM

CookShop



CookShop is a program of the Food Bank For New York City



BROOKLYN BOTANIC GARDEN



Advice 1

Administration
Support + Passion + Students = Success

Simple Formula

Advice 2

Focus on one thing you can be successful in and are passion about.



Marc Rolla

PS 90 The Magnet School for Environmental Studies
and Community Wellness

Science and Wellness Coordinator

marcerolla@yahoo.com

mrolla@schools.nyc.gov





THANK YOU

Please visit

www.tc.columbia.edu/sustainability