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SOS Education Forum



National Oceanic and Atmospheric Administration
U.S. Department of Commerce

January 17, **2024**

WOW





Agenda

Update on the ELP-SOS Workshop

Overview of the Fifth [National Climate Assessment \(NCA5\)](#) - Tom DiLiberto,
NOAA Communications

[Carbon Dioxide Tagged by Source](#) - Mark Subbarao, NASA Scientific
Visualization Studio

[Solar Energy Potential](#) - Beth & Juan Pablo

[Climate 101](#) *new* Live Program - Hilary

4





Join us for the ELP-SOS Workshop!

You should have received a SAVE THE DATE for the workshop (Nov 29, 2023)

- The Wild Center is hosting the first SOS-ELP (Environmental Literacy Program) Workshop
 - May 7-9
 - Plan to travel May 6-10 due to rural location in New York
- Invitation, registration, travel assistance, and presentation proposal forms will be sent out ~Feb 1



Clipboard Slides Font Paragraph Drawing Editing

Paste New Slide Layout Reset Section

Font: 32, Bold, Italic, Underline, Strikethrough, Color, Size, Font Face

Paragraph: Text Direction, Align Text, Convert to SmartArt

Drawing: Shape Fill, Shape Outline, Shape Effects, Arrange, Quick Styles

Editing: Find, Replace, Select

Create and Share Adobe PDF Adobe Acrobat



The fifth National Climate Assessment, or NCA5, is the most up-to-date and comprehensive assessment of how climate change is affecting all of us, here in the United States

- a. It was written over the last four years by 750 authors and contributors from every state in the Nation.

FIFTH NATIONAL CLIMATE ASSESSMENT

nca2023.globalchange.gov



National Climate Assessment Basics

- Evaluates a wide range of scientific and technical inputs from diverse and authoritative sources. Applies best expert judgment to characterize certainty.
- **Relevant for policy and decision-making but does not prescribe specific policy interventions or advocate for a particular viewpoint.**
- **Assesses a range of potential impacts, helping decision-makers better identify risks that could be avoided or reduced**
- Fully compliant with the Global Change Research Act (GCRA) and other applicable laws and policies
- Provides multiple opportunities for public engagement
- Employs an extensive review process

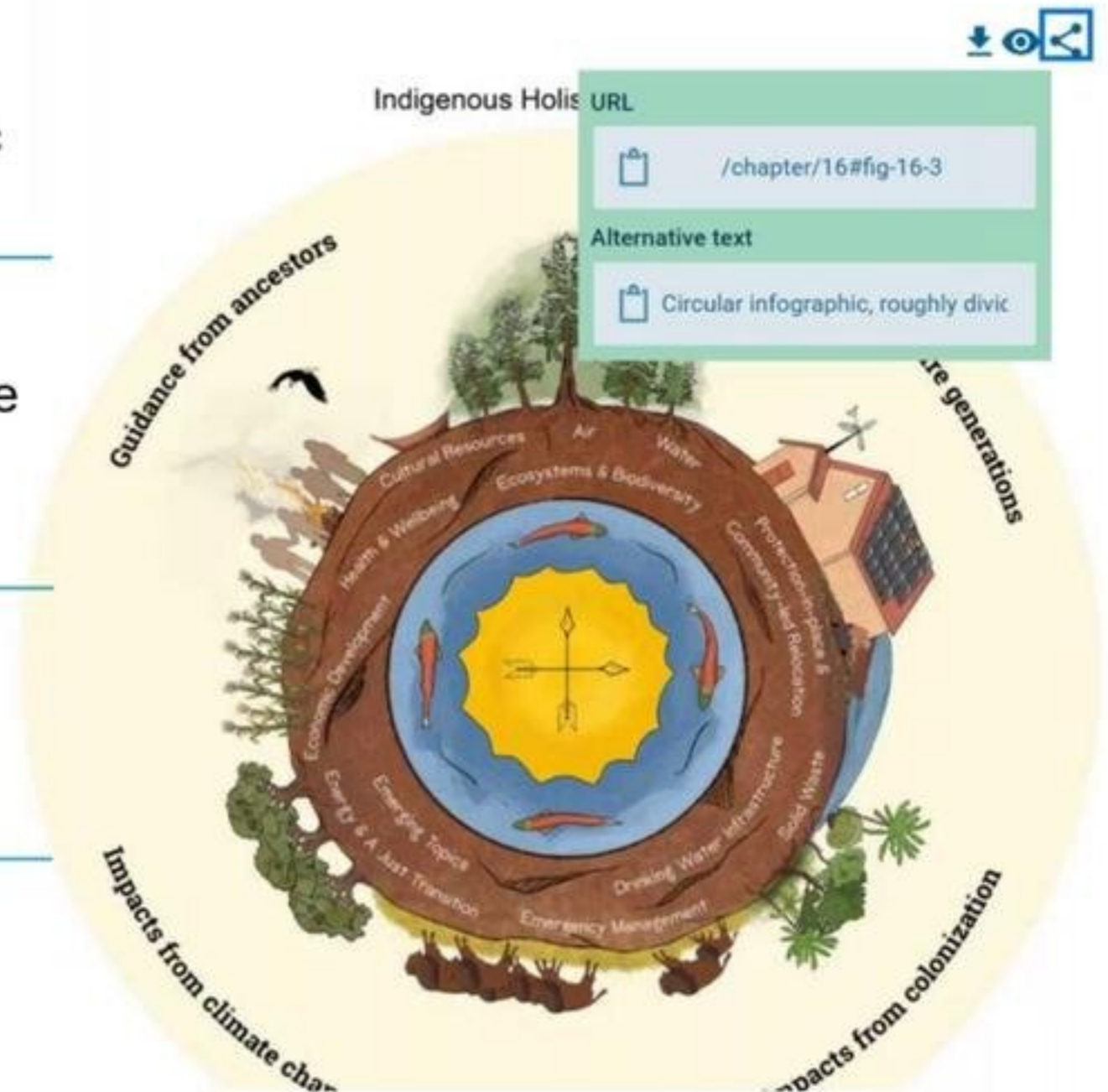
Process and Structure

Broadened participation and more public engagement opportunities

Stronger documentation requirements and updated information quality guidance with source-specific considerations for inclusion (e.g., Indigenous Knowledge)

Improving accessibility and functionality (e.g., alt text for all figures, improved search function, Spanish translation)

Expanded representation of regions outside of the contiguous U.S. across Assessment figures (still room for improvement!)



NCA5 Table of Contents

- Overview
 - Climate Trends
 - Earth System Processes
 - Water
 - Energy
 - Land Cover and Land Use
 - Forests
 - Ecosystems and Biodiversity
 - Coastal Effects
 - Oceans and Marine Resources
 - Agriculture
 - Built Environment
 - Transportation
 - Air Quality
 - Human Health
 - Tribes and Indigenous Peoples
 - International
 - Complex Systems
 - [Economics](#)
 - [Social Systems and Justice](#)
 - Northeast
 - Southeast
 - U.S. Caribbean
 - Midwest
 - Northern Great Plains
 - Southern Great Plains
 - Northwest
 - Southwest
 - Alaska
 - Hawai'i and U.S.-Affiliated Pacific Islands
 - Adaptation
 - Mitigation
- Focus on...
- [Compound Extreme Events](#)
 - [Western Wildfires](#)
 - [COVID-19](#)
 - [Supply Chains](#)
 - [Blue Carbon](#)
- Appendices
- Process
 - IQA
 - Data Tools
 - [Indicators](#)

* New chapters or features highlighted in blue

Key Takeaways from NCA5

1. The United States is taking action on climate change
2. People in the United States are experiencing increased risks from extreme events
3. Climate change exacerbates social inequities
4. Available mitigation strategies can deliver substantial emissions reductions, but additional options are needed to reach net zero
5. Climate action is an opportunity to create a more resilient and just nation

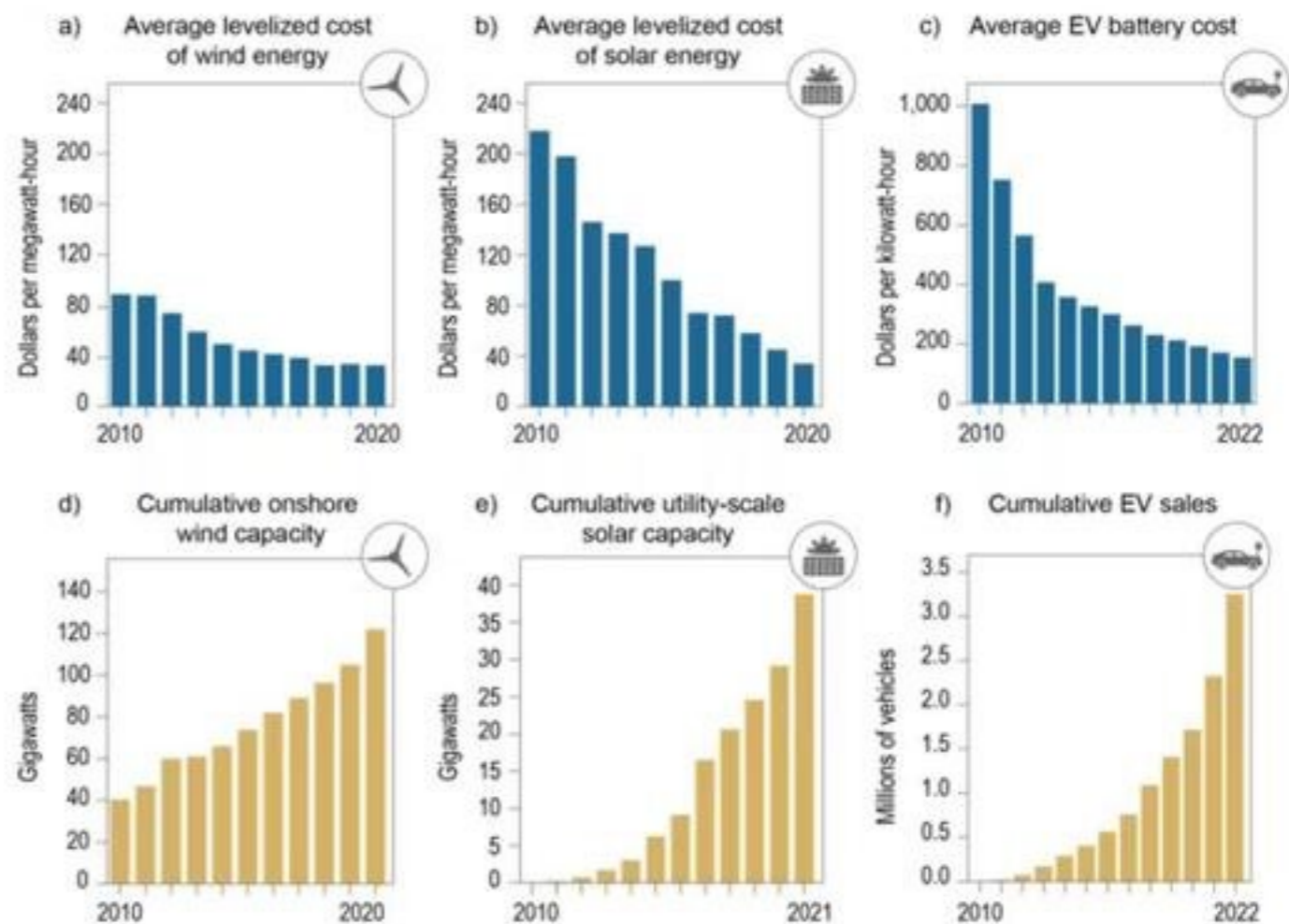
KEY TAKEAWAY 1

The United States is Taking Action on Climate Change

Recent growth in renewable capacities is supported by rapidly falling costs of zero- and low-carbon energy technologies, which can support even deeper emissions reductions

Recent legislation is expected to increase deployment of low- and zero-carbon technology

Historical Trends in the Unit Costs and Deployment of Low-Carbon Energy Technologies in the United States



Increasing capacities and decreasing costs of low-carbon energy technologies are supporting efforts to further reduce emissions.

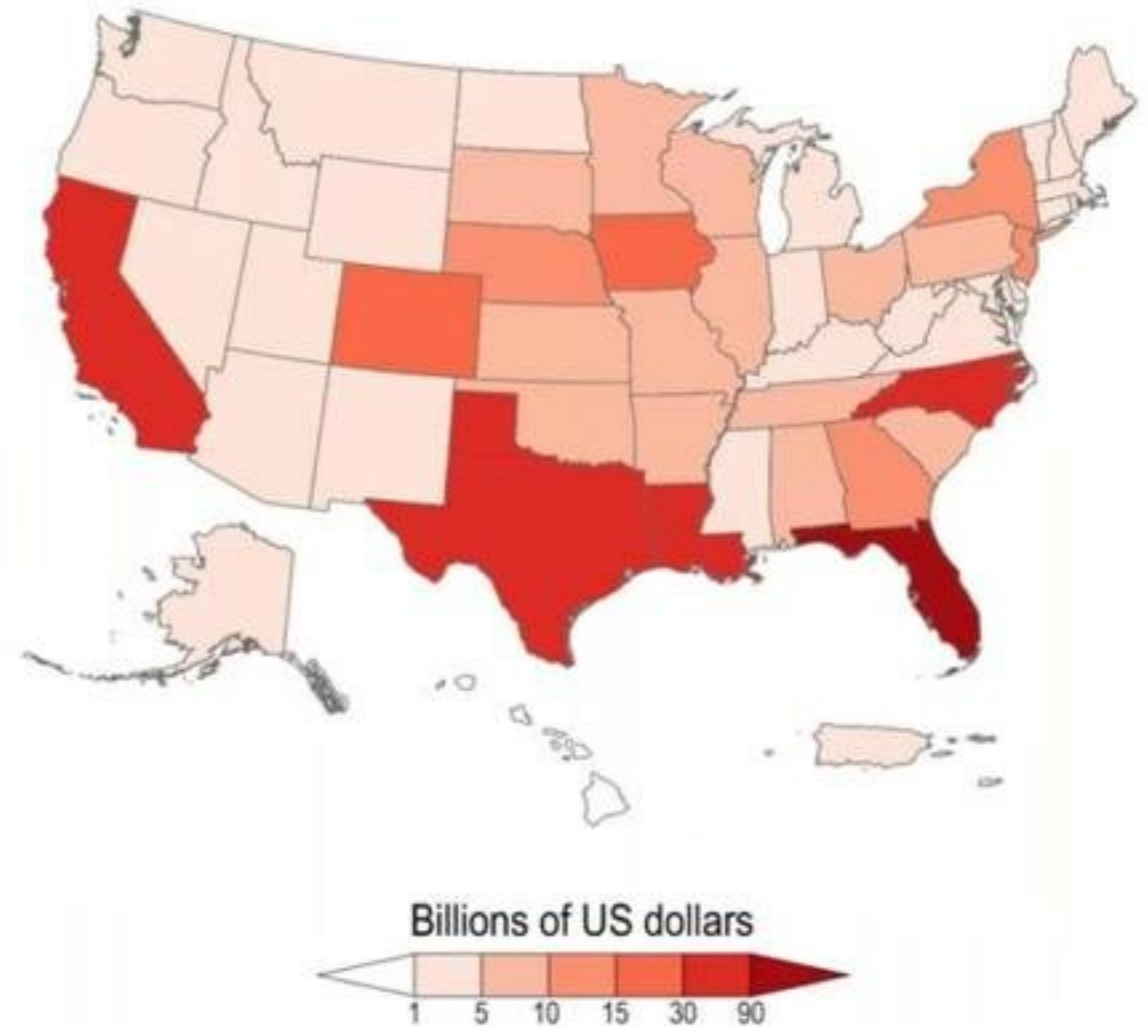
KEY TAKEAWAY 2

People in the U.S. Are Experiencing Increased Risks from Extreme Events

In the 1980s, the United States experienced one (inflation-adjusted) billion-dollar disaster every four months, on average; now, there is one every three weeks

Each additional increment of global warming is expected to lead to more damage and greater economic losses; at the same time, each avoided increment of warming will reduce risks and harmful impacts

Damages by State from Billion-Dollar Disasters in the United States (2018–2022)



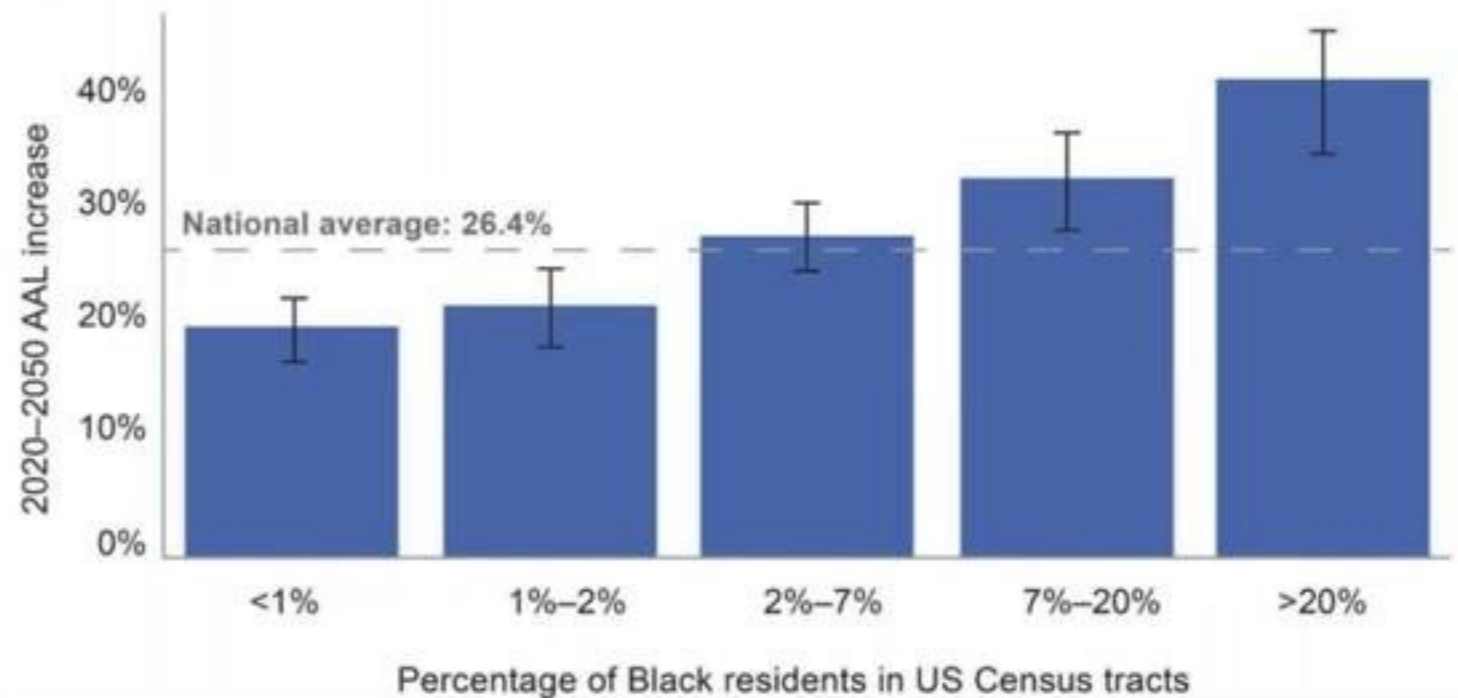
KEY TAKEAWAY 3

Climate Change Exacerbates Social Inequities

Neighborhoods that are home to racial minorities and low-income residents have the highest inland (riverine) flood exposures in the South

Black communities nationwide are expected to experience a disproportionate share of future flood damages

Projected Increases in Average Annual Losses (AALs) from Floods by 2050






KEY TAKEAWAY 4

Additional Mitigation and Adaptation Strategies are Needed to Power Our Transition

Limiting global warming to 1.5°C (2.7°F) above preindustrial levels requires a path to net-zero GHG emissions in the US by 2050

In many cases, transformative adaptation will be necessary to adequately address the risks of current and future climate change

Table 1.3. Incremental Versus Transformative Adaptation Approaches

Examples of incremental adaptation	Examples of transformative adaptation
 Using air-conditioning during heatwaves	Redesigning cities and buildings to address heat
 Reducing water consumption during droughts	Shifting water-intensive industry to match projected rainfall patterns
 Elevating homes above flood waters	Directing new housing development to less flood-prone areas

KEY TAKEAWAY 5

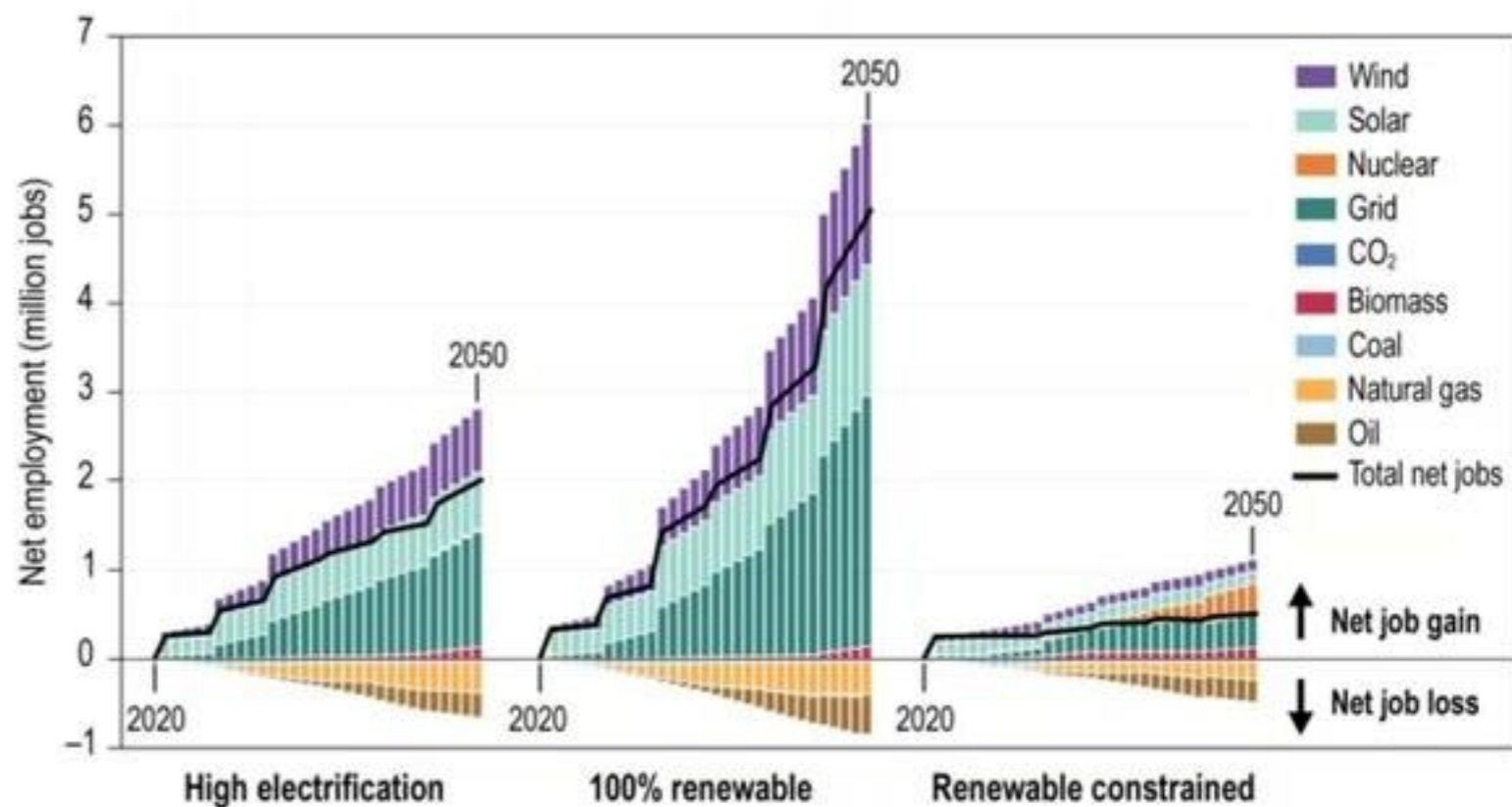
Climate Action is an Opportunity to Create a More Resilient and Just Nation

Actions taken now to accelerate net emissions reductions and adapt to ongoing changes can reduce risks to current and future generations

A “just transition” ensures equitable access to:

- jobs;
- affordable, low-carbon energy;
- environmental benefits such as reduced air pollution; and
- quality of life for all

Energy Employment (2020–2050) for Alternative Net-Zero Pathways



Creative Communication

Improved accessibility and functionality
(e.g., alternate text for all figures, Spanish translation)

Inclusion of artworks from NCA's first-ever call for visual art and the poem "Startlement," written for the Assessment by the 24th US Poet Laureate Ada Limón

Interactive online Atlas allows users to generate and download their own regional and local maps

Six podcast episodes featuring interviews with authors

Recorded "audiobook" reading of the Overview chapter



TAMMY WEST
KEEP IT TOGETHER
(2021, site-specific installation)

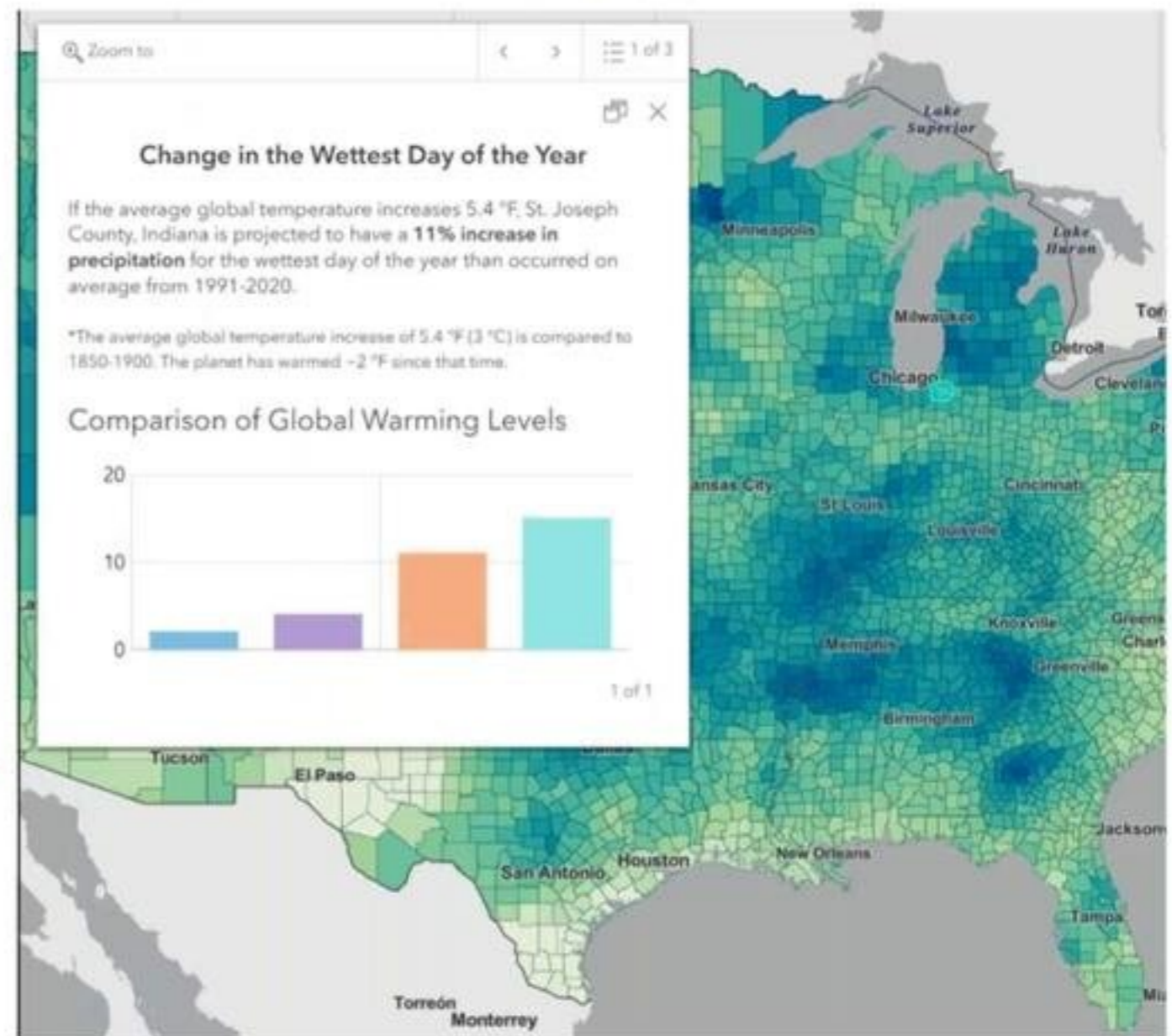
NCA Atlas (atlas.globalchange.gov)

A digital data viewer developed as an extension of the NCA5 text and figures

Atlas variables were produced with the same methodology as the downscaled climate data in NCA5

Interactive features allow users to generate and download their own regional and local maps

Users can select from a range of global warming levels and impact-relevant climate variables (e.g., “days over 95°F”)



NCA5 Resources

NCA5 website: nca2023.globalchange.gov

- Downloadable and shareable figures
- Downloadable slides for each chapter
- 2-3 page chapter summaries
- Art x Climate gallery
- Ada Limón's poem, "Startlement"
- NCA5 Glossary

USGCRP website: globalchange.gov

- Six podcast episodes
- Audiobook recording of NCA5 Overview
- List of webinar series dates, times, and links

NCA5 Atlas: atlas.globalchange.gov

Interactive online tool that allows users to explore different scenarios and climate variables to highlight local climate projections

WEBINARS

FIFTH NATIONAL
CLIMATE ASSESSMENT

NOVEMBER 2023

-
MARCH 2024



[GLOBALCHANGE.GOV/NCA5](https://globalchange.gov/nca5)

Thank you

Tom Di Liberto
Tom.DiLiberto@noaa.gov

Recommended report citation

USGCRP, 2023: *Fifth National Climate Assessment* [Crimmins, A.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, B.C. Stewart, and T.K. Maycock (eds)]. U.S. Global Change Research Program., Washington, DC, USA. <https://doi.org/10.7930/NCA5.2023>

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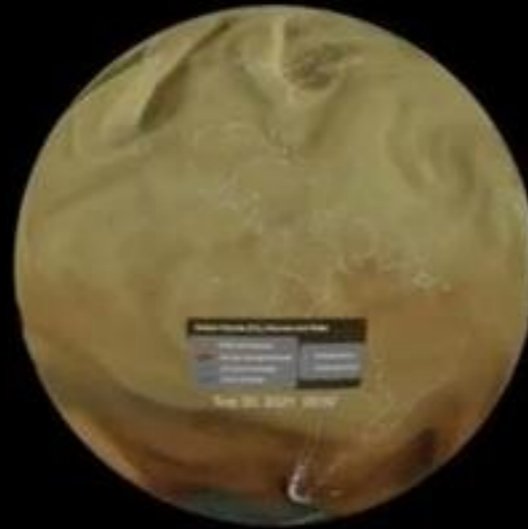
GlobalChange.gov

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Carbon Dioxide Tagged by Source

[Home](#) >> [Catalog](#) >> [Datasets](#) >> [Carbon Dioxide Tagged by Source](#)



Details [↗](#)

Added to the Catalog

20 Dec. 2023

Available for

SOS

Categories

Air: Human Impact, Chemistry

Keywords

Atmosphere, Carbon Dioxide, Chemistry, Climate, CO2, Global Warming, Model, Photosynthesis, Respiration

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Description [↗](#)

Carbon dioxide (CO₂) is the most prevalent greenhouse gas driving global climate change. However, its increase in the atmosphere would be even more rapid without land and ocean carbon sinks, which collectively absorb about half of human emissions every year. Advanced computer modeling techniques in NASA's Global Modeling and Assimilation Office allow us to disentangle the influences of sources and sinks and to better understand where carbon is coming from and going to.

This visualization shows the CO₂ being added to Earth's atmosphere over the

Notable Features [↗](#)

- During the growing season plants absorb CO₂ through photosynthesis, but release much of this carbon through respiration during winter months
- The fast oscillation over the Amazon rainforest shows the impact of plants absorbing carbon while the sun is shining and then releasing it during nighttime hours



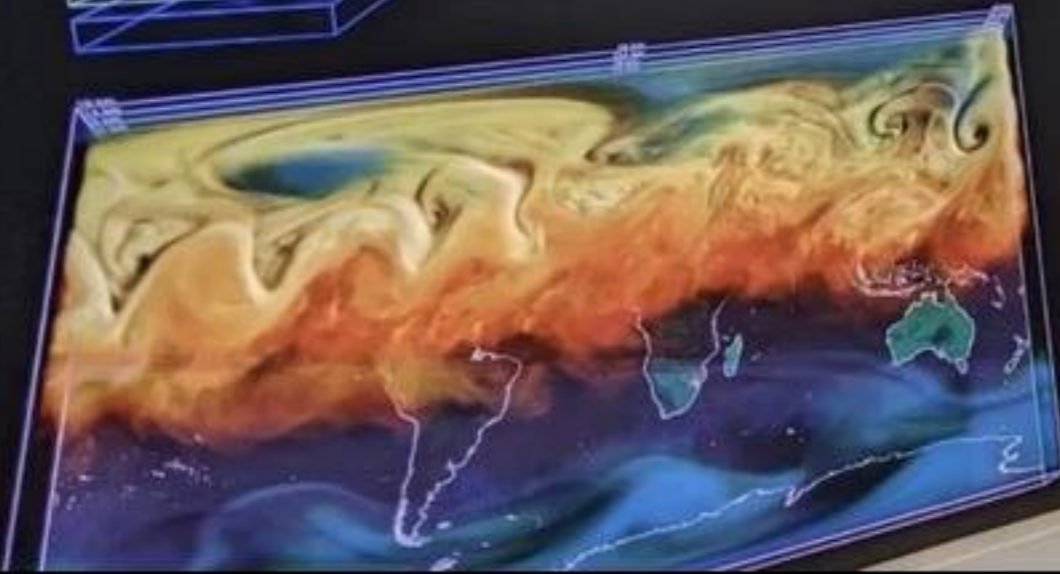
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JUNE 23, 2023

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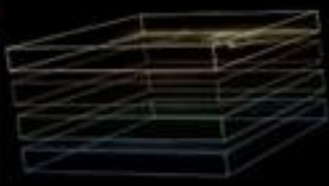
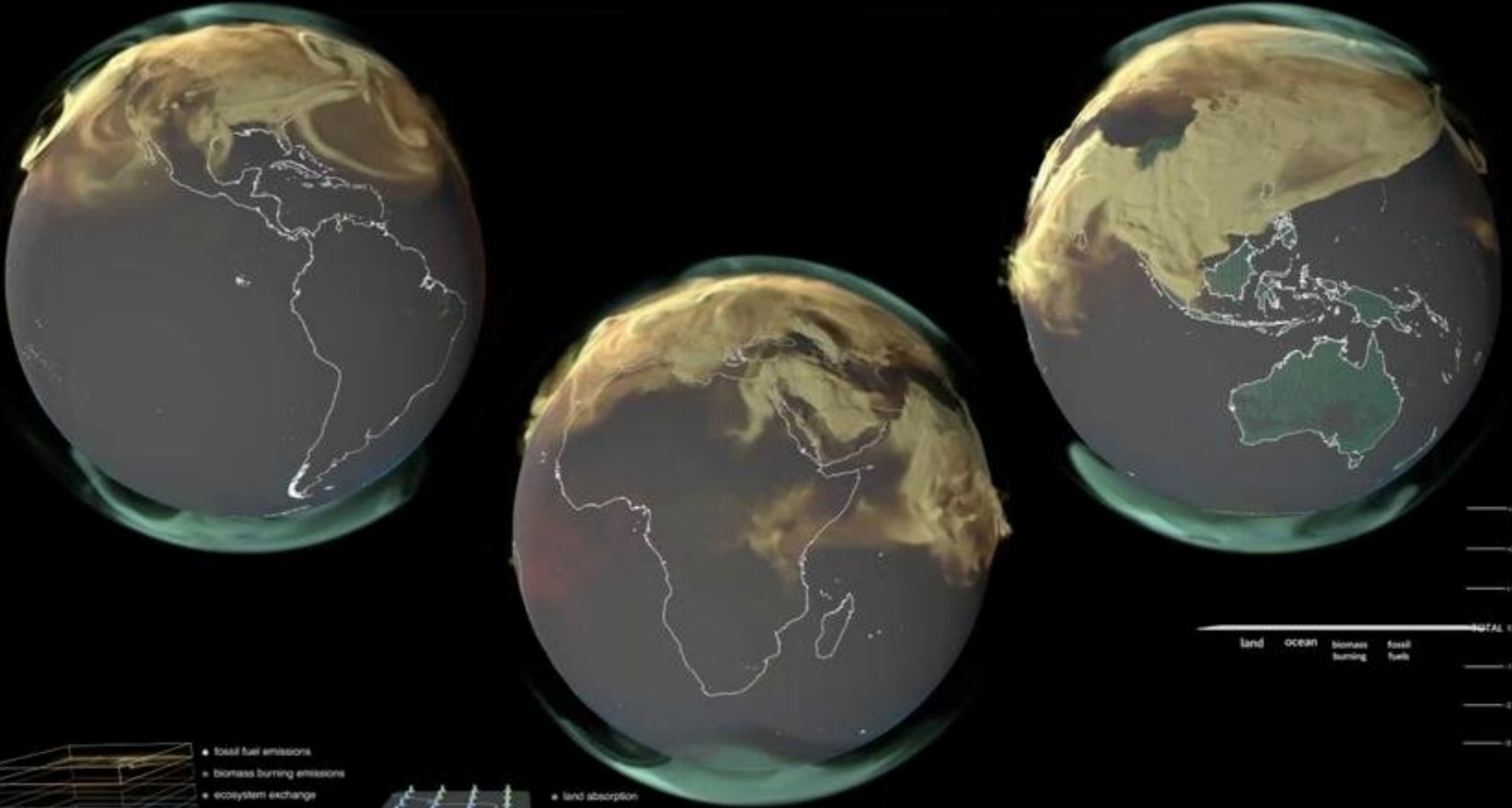
Carbon Dioxide Sources & Sinks

NASA models the flow of carbon dioxide, its emission and transport around the globe, and its absorption by the ocean and biosphere.



The Flow of Carbon Dioxide (CO₂)

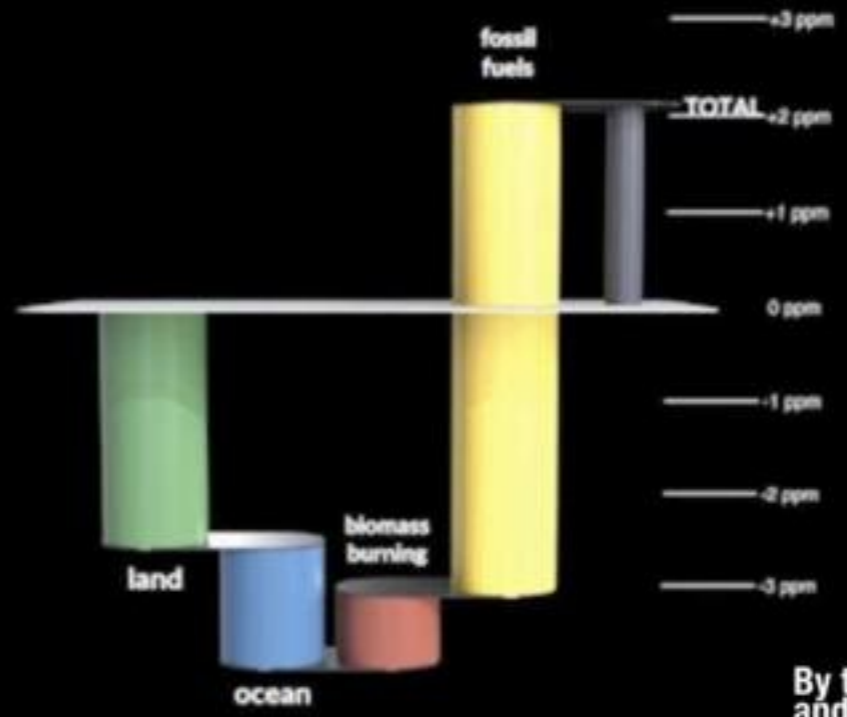
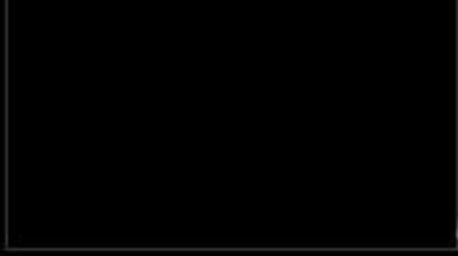
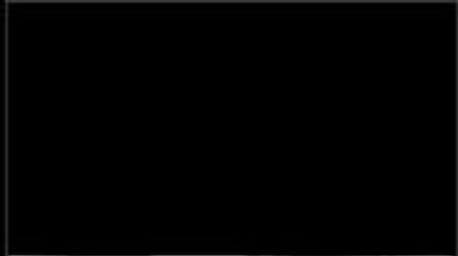
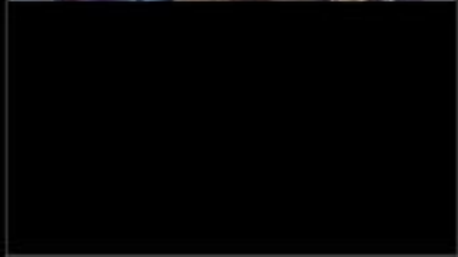




- total fuel emissions
- biomass burning emissions
- ecosystem exchange
- ocean exchange
- land absorption
- ocean absorption

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

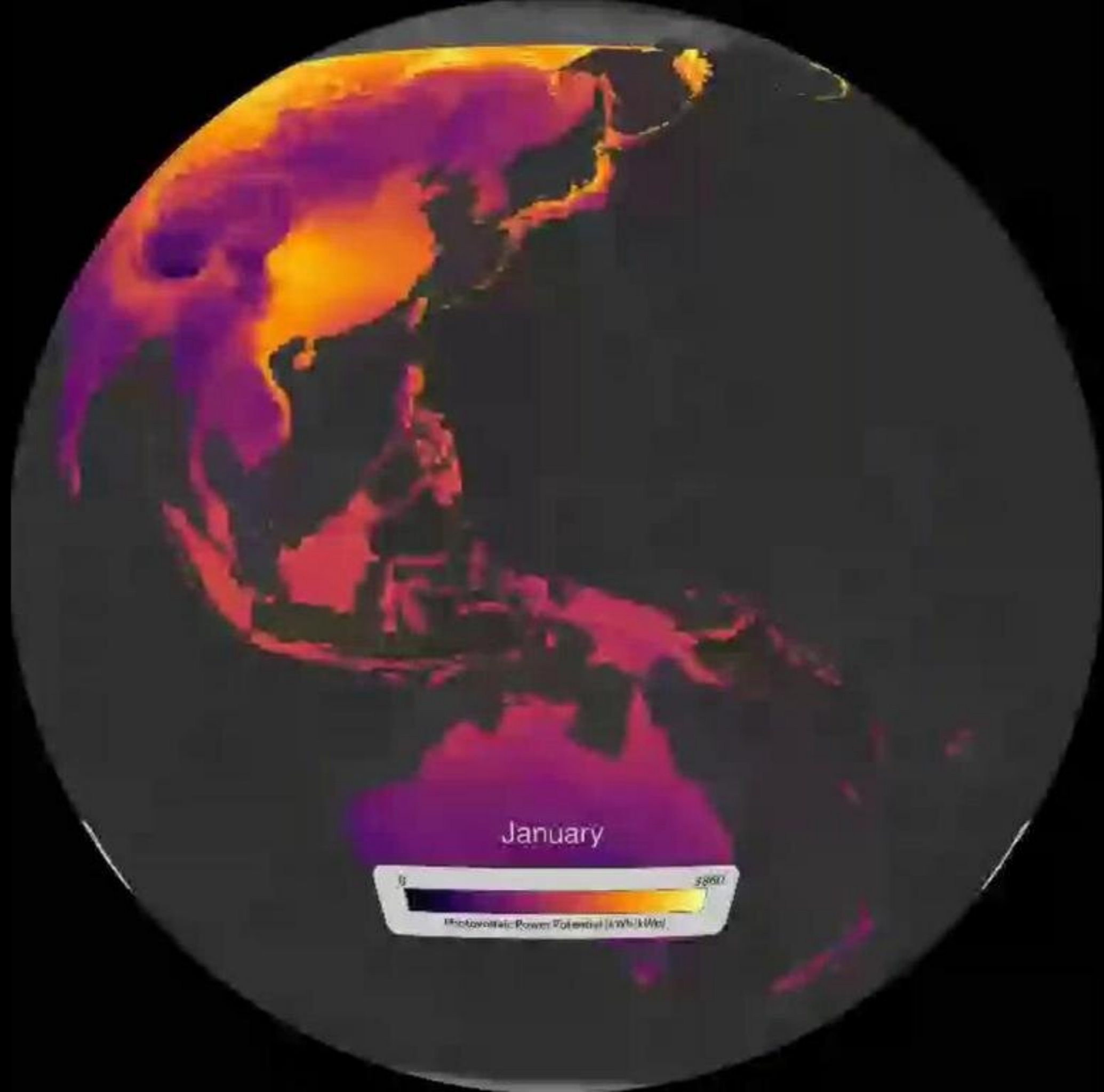


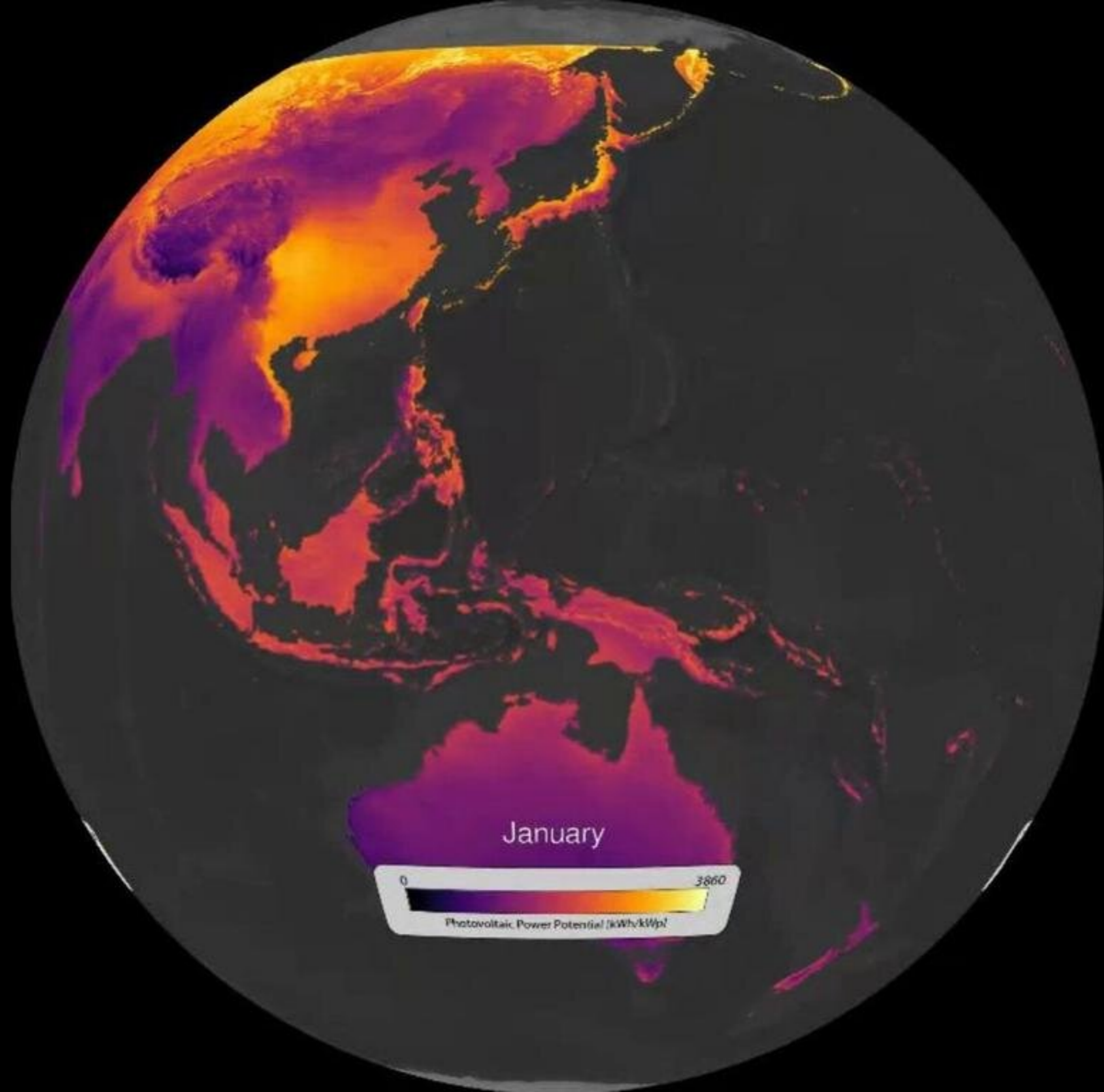


By the end of the year, the world's plants and oceans have combined to absorb about half of fossil fuel emissions, helping to slow the progression of climate change.





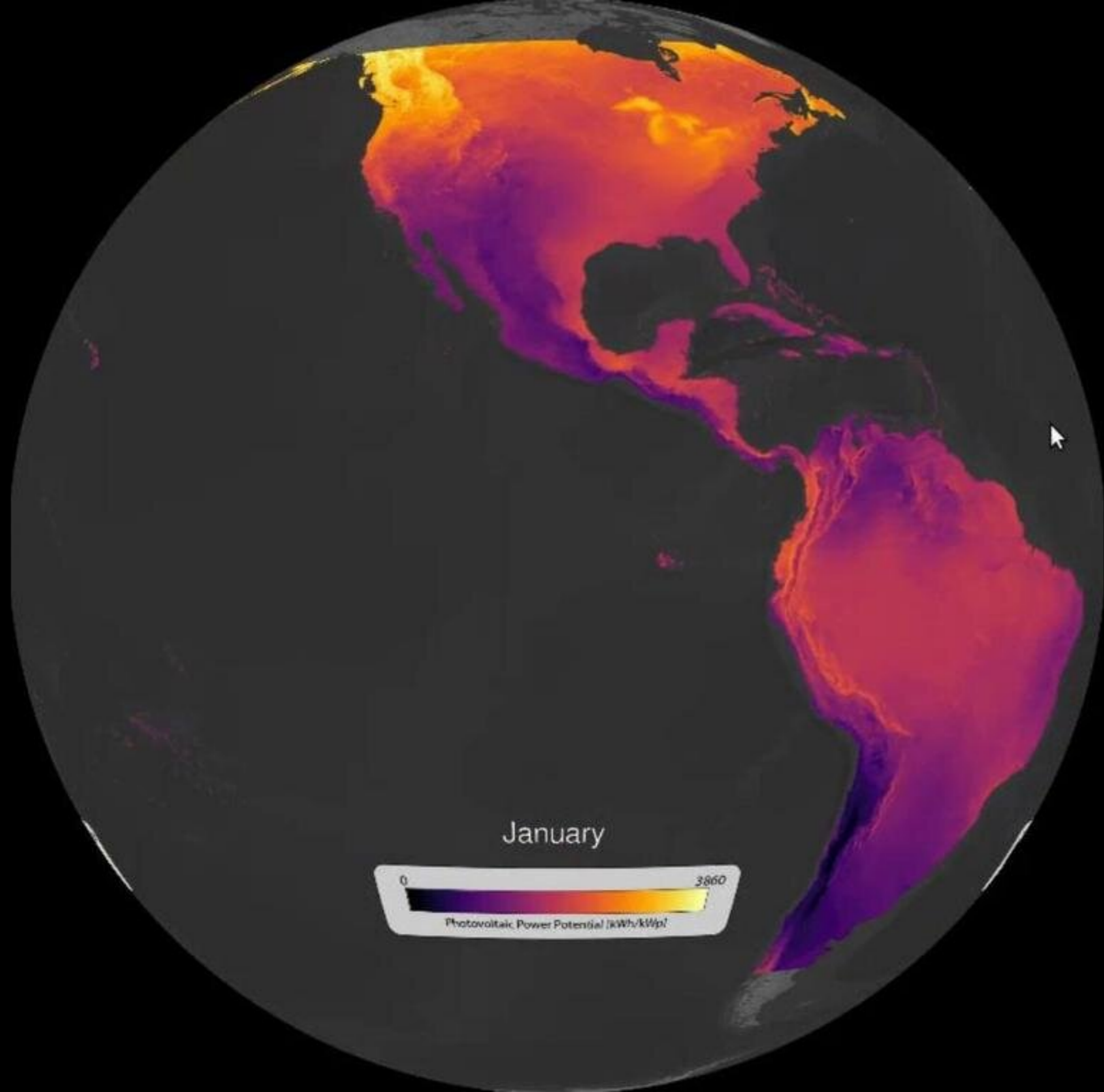


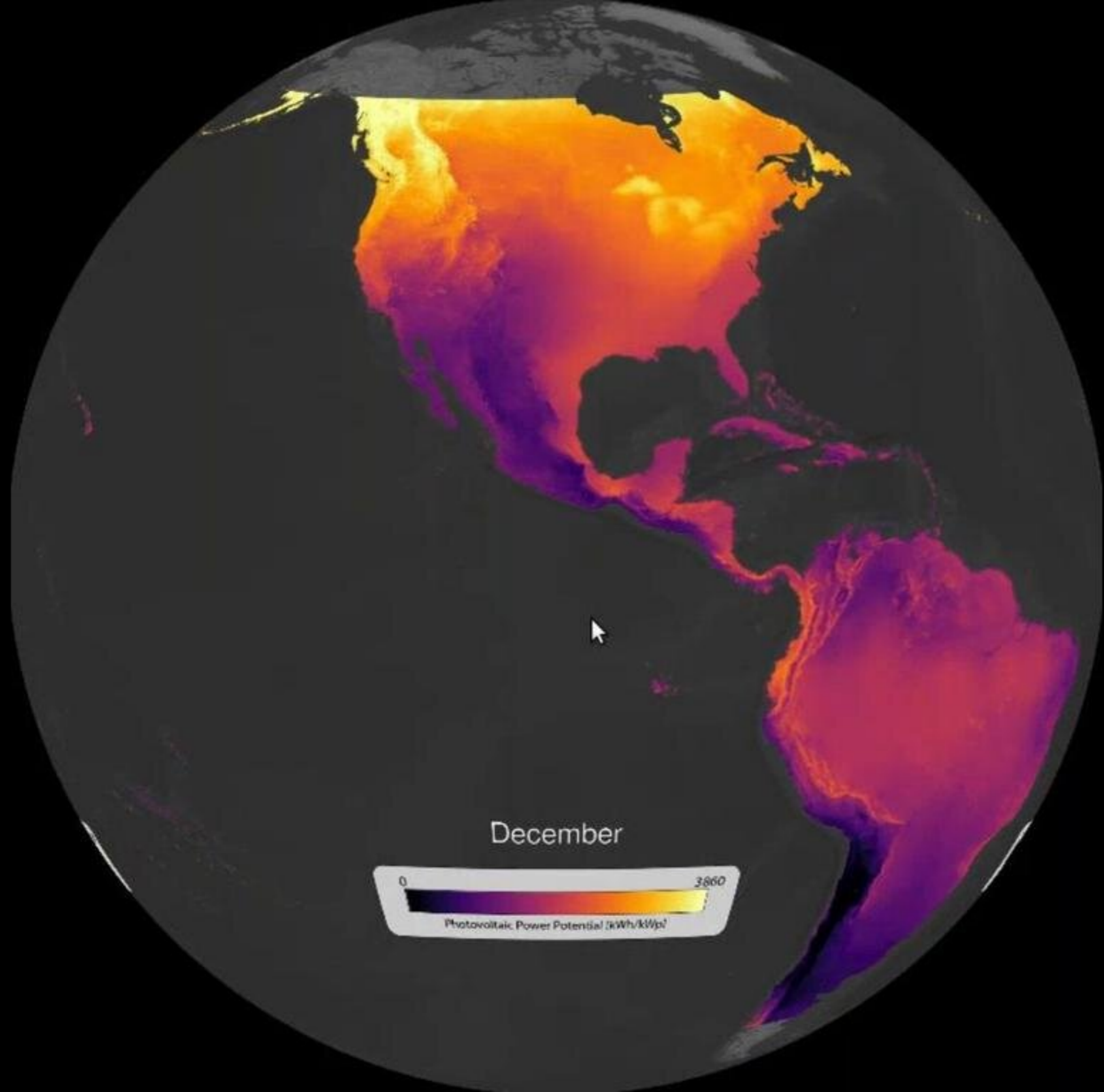


January

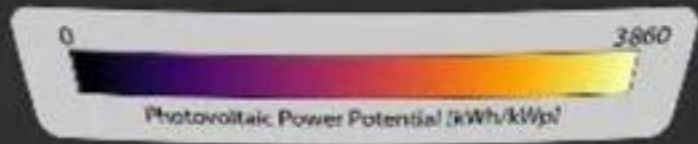
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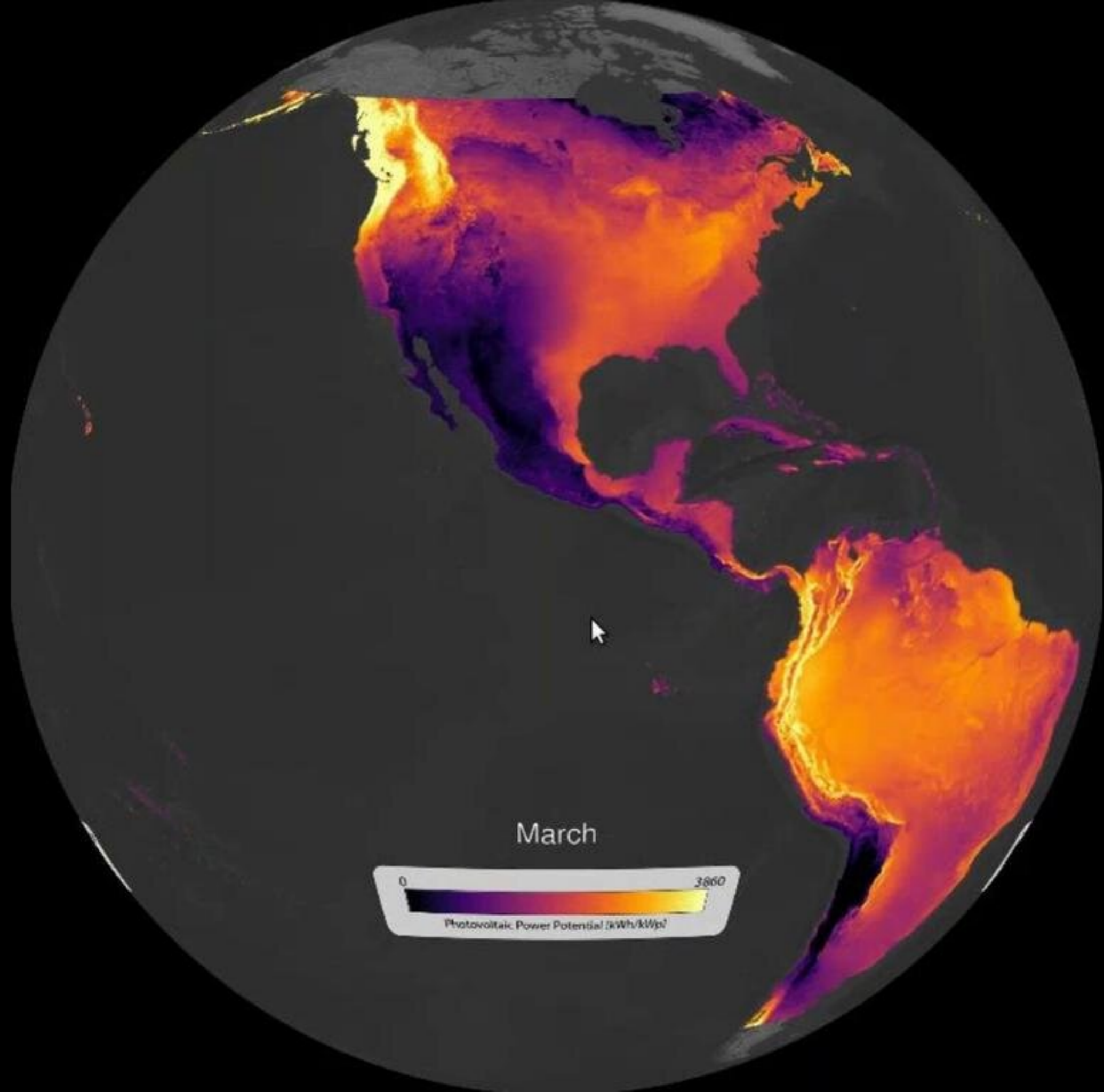
Photovoltaic Power Potential (kWh/kWp)





December

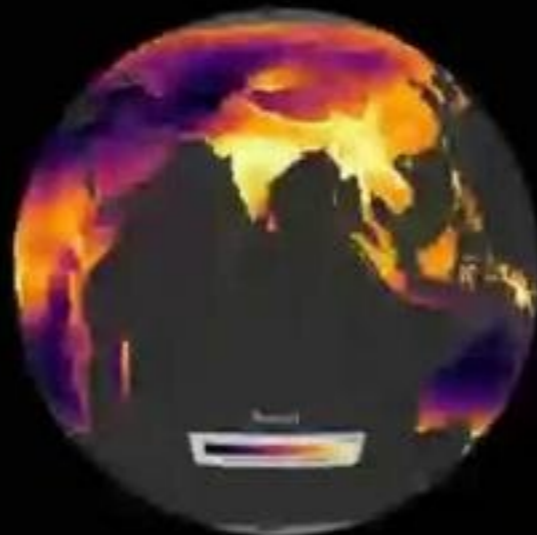






Climate Change 101 - Human Activities, Emissions, Consequences, Solutions, Different Futures

HOME >> CLIMATE >> LIVE PROGRAMS >> Climate Change 101 - Human Activities, Emissions, Consequences, Solutions, Different Futures



Details

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12 Jan, 2024

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Snow and Ice: Live Programs

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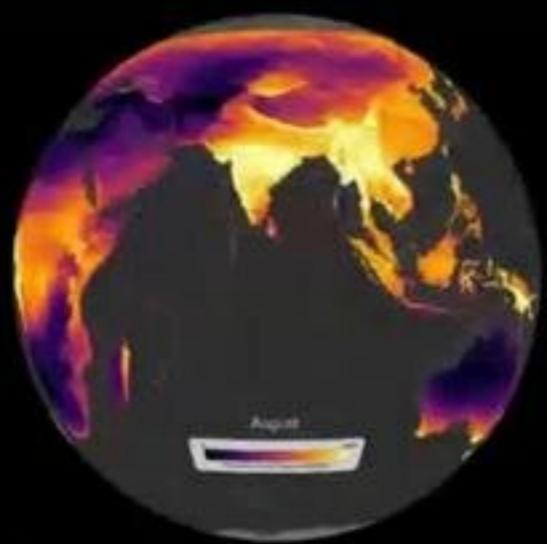
Description

The urgency to address climate change is undeniable, however, communicating about climate change can often lead to more questions than answers (for both the



Consequences, Solutions, Different Futures

Home >> Catalog >> Live Programs >> Climate Change 101 - Human Activities, Emissions, Consequences, Solutions, Different Futures



Details

Added to the Catalog

12 Jan. 2024

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Categories

Air: Live Programs

Extras: Live Programs

Land: Live Programs

People: Live Programs

Snow and Ice: Live Programs

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Description

The urgency to address climate change is undeniable, however, communicating about climate change can often lead to more questions than answers (for both the teacher and the student). This program is designed to unravel the complexities of climate change, guiding the user through its causes, consequences, and potential futures. Explore three possible climate scenarios, which offer different insights that empower individuals to make informed decisions.



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Description [🔗](#)

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Within these scenarios, we examine the potential of solar energy and showcase a resilient community for sustainable living. Using a figure from the [Fifth National Climate Assessment](#) report, we show a map of mitigation efforts in the U.S., emphasizing where state and city efforts are being prioritized, and where extra efforts may be needed.

The inclusion of captivating photographs, sourced through [NOAA Environmental Literacy Program](#) grants, underscores the tangible impact communities can achieve. We hope this program sparks meaningful conversations about actions that can be taken within your community. Together, let us embark on the journey towards a more sustainable and resilient future.

Resources [🔗](#)

- [Script](#)

Datasets included [🔗](#)

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- [Blue Marble](#)
- [Nighttime Lights](#)
- [Human Transportation](#)
- [CarbonTracker: Fixed Scale](#)
- [Temperature Anomaly: Yearly - 1850 - Present](#)
- [Drought Risk - Real-time](#)
- [Sea Ice Extent - September Only](#)
- [Climate Model - Sea Surface Temperature Change: SSP5 \(Fossil-fueled Development\): 2015 - 2100](#)
- [Climate Model - Surface Temperature Change: SSP2 \(Middle of the Road\): 2015 - 2100](#)
- [Solar Power Potential - Monthly Average](#)
- [Resilient Community](#)

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- [Solar Power Potential - Monthly Average](#)
- [Resilient Community](#)
- [Climate Model - Surface Temperature Change: SSP1 \(Sustainability\)- 2015 - 2100](#)
- [Mitigation and Resilience](#)

Suggested Educational Materials [↗](#)

- [Climate Literacy and Energy Awareness Network \(CLEAN\): Teaching Climate and Energy - Principle 5](#)
- [Climate Interactives - Climate Change Solutions Simulators](#)

Datasets included

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- [Climate Literacy and Energy Awareness Network \(CLEAN\): Webinar Series](#)
- [Climate Literacy and Energy Awareness Network \(CLEAN\): Climate Model Resource Collection](#)
- [Data Puzzles - CIRES Education and Outreach](#)
- [Antarctica: Connecting Climate Change, Melting Ice Shelves, and Popping Penguins - CIRES Education and Outreach](#)
- [Arctic Feedbacks - Not All Warming is Equal - CIRES Education and Outreach](#)
- [Climate and Resiliency Education - CIRES Education and Outreach](#)

Contacts

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3. [Human Transportation](#)

Take a moment and look at the different colors here and tell me what you think these are.

Red lines represent 87,000 daily flights connecting cities and countries around the world. Blue lines represent the paths of 3,500 commercial vessels over the course of a year, which is only 10% of the total ocean shipping traffic. Green lines represent the world's roads, used by over one billion motor vehicles. This colorful globe shows the interconnected nature of the world, but also shows how much energy we use to move people and goods around the planet's surface.

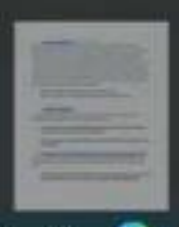
4. [CarbonTracker](#)

Nearly all of those lights we just saw and just about everything we do is tied to fossil fuel - oil, coal and natural gas - extraction and consumption. We have impacted our planet in a dramatic way by digging up carbon and extracting oil that was in the ground for hundreds of millions of years to fuel our modern world and our way of life. Unfortunately, burning fuel puts a lot of carbon dioxide (among other pollutants) into our atmosphere. Carbon dioxide (CO₂) acts like a blanket that surrounds the Earth. More CO₂ in our atmosphere means a thicker blanket that traps more heat.

Here we are looking at carbon dioxide amounts in the atmosphere (not temperature like sometimes red makes us think). When we fast forward through the last decade and a half, that's 15 years, we can see how the carbon dioxide is pooling with almost nowhere to go - remember how small our atmosphere is and the ocean takes on some too. Since the late 1800's we've known that greenhouse gasses, like carbon dioxide, trap heat that would otherwise go back out to space. I think we've figured out what we need to do; the bigger challenge is to take action. Therefore, the planet is heating up and the ocean is acidifying.

5. [Temperature Anomaly - 1850 - 2022](#)

In order to see the change in our climate - or our temperature over time - it's best to use an anomaly map, which shows the difference between the current and past temperatures. For example, we have collected the average temperature for each area on the globe for each year from 1850 to now, then we subtract that value from the average temperature of that area on the globe during the 20th century. More simply, if you see white, there is little to no difference. If you see red, it's hotter now than in the past, and where you see blue, it's colder now than in the past. This dataset is a great way to consider the change over a long



Climate Change 101 - Human Activities, Emissions, Consequences, Solutions, Two Different Futures

1. Blue Marble

This is a mosaic or a patchwork of satellite images called The Blue Marble. It reminds me of a picture taken of Earth by astronaut William Anders. On Christmas Eve in 1968 during the Apollo 8 mission, a picture was taken of Earth rising over the moon and for the first time Earth was seen as small and fragile, one little planet floating in space. That photo, named "Earthrise," is considered to be the most influential environmental photo ever taken. What I love about this particular view of Earth is that if you were sitting on a GOES satellite, 22,000 miles from the surface of Earth, you would be three Earth radii away and it would look just like this in size and similar in color. Imagine that you could also see the atmosphere off the surface of the sphere.



How thick do you think the atmosphere would be? Show me with your hands. (answer: ~1.5cm or a little more than half an inch thick)

It's beautiful, don't you think? What words come to your mind when you see this image?

2. [Nighttime lights](#)

Perhaps this view of Earth brings different words to mind? We can also look at the whole Earth on SOS as it looks at night. This tells more of a human story. For example, there are some places where a lot of people live, and some places where fewer people live.

What do you think powers all these lights?

In 2022, over 80% of primary energy consumption in the world and over 60% of its electricity was from fossil fuels. Over 70% of the greenhouse gas emissions due to human activity in 2022 was CO2 from burning them.