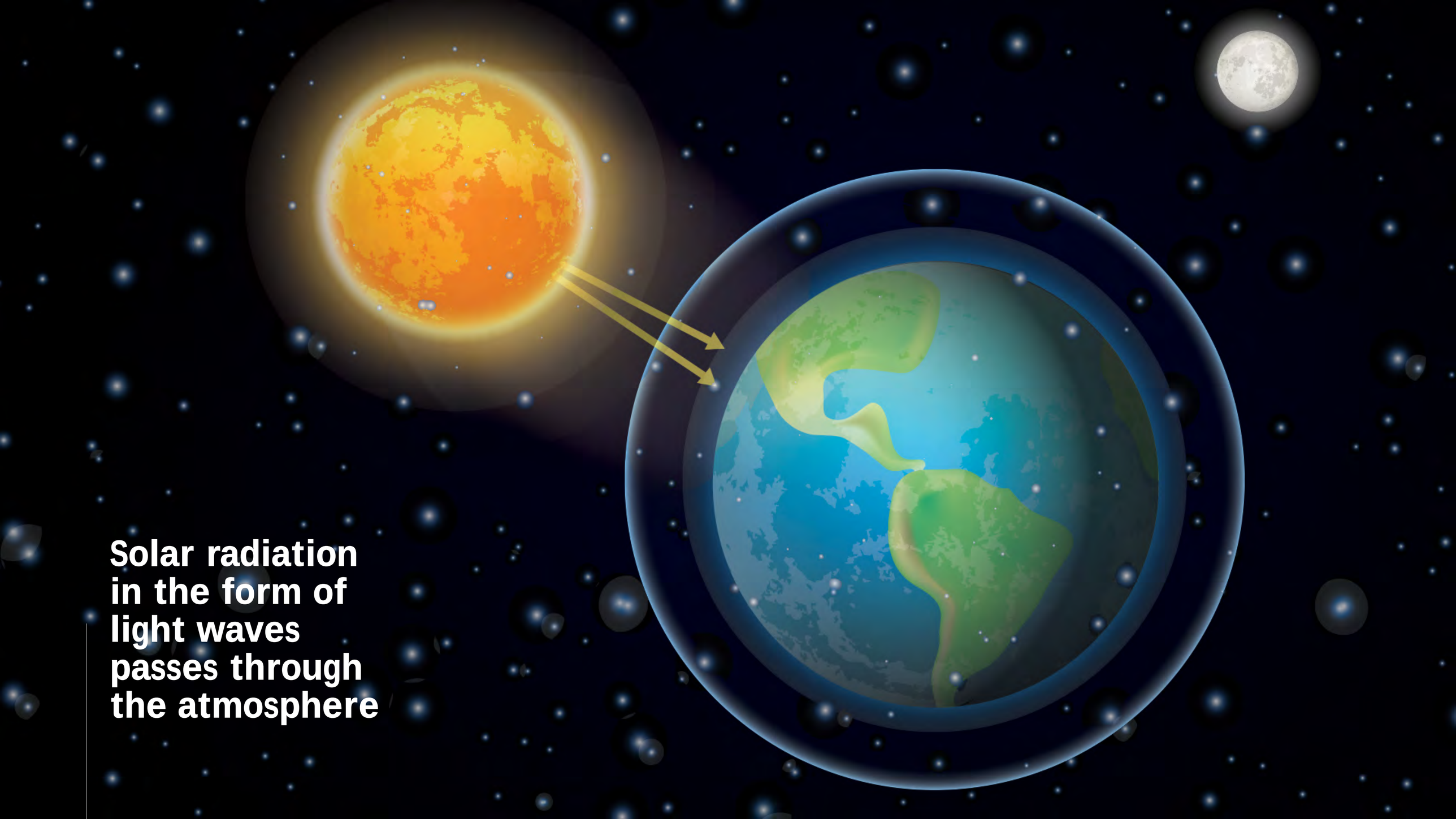
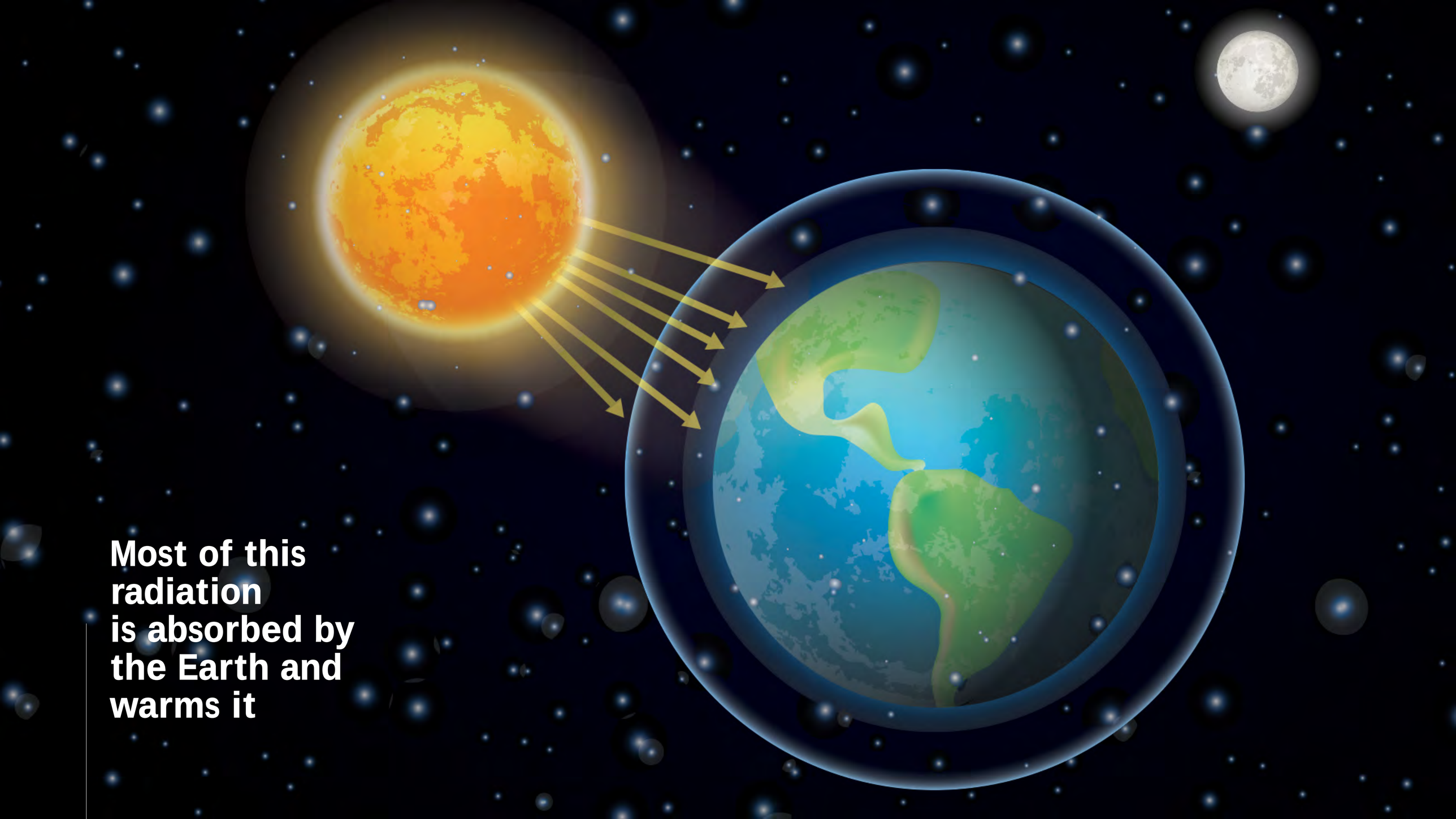
Climate Change
&
What it Means For Ohio

Why Are We Here and Why Does Energy Efficiency Matter?

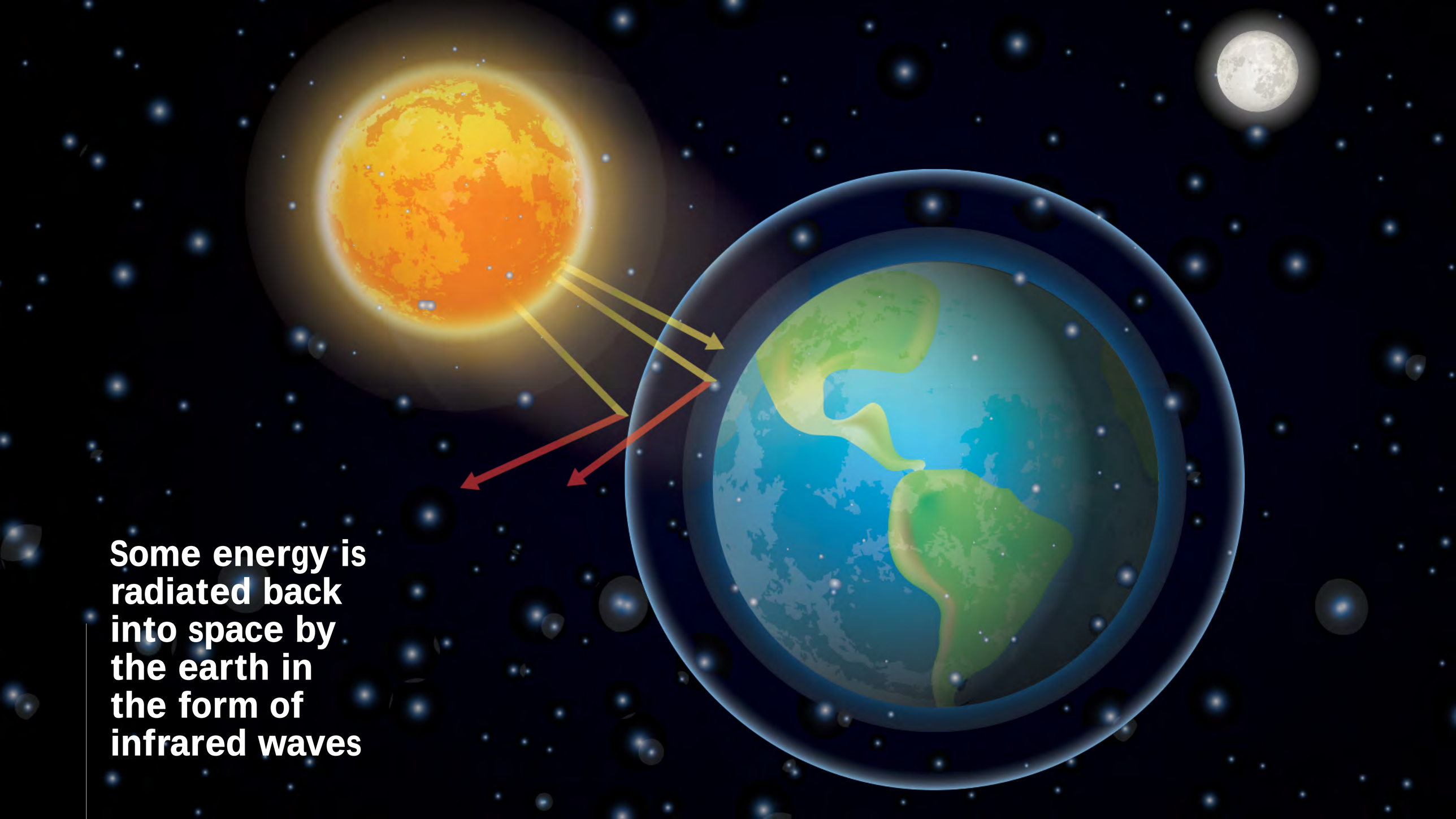
SUSTAINABLE DEVELOPMENT GOALS


Understanding Our Atmosphere

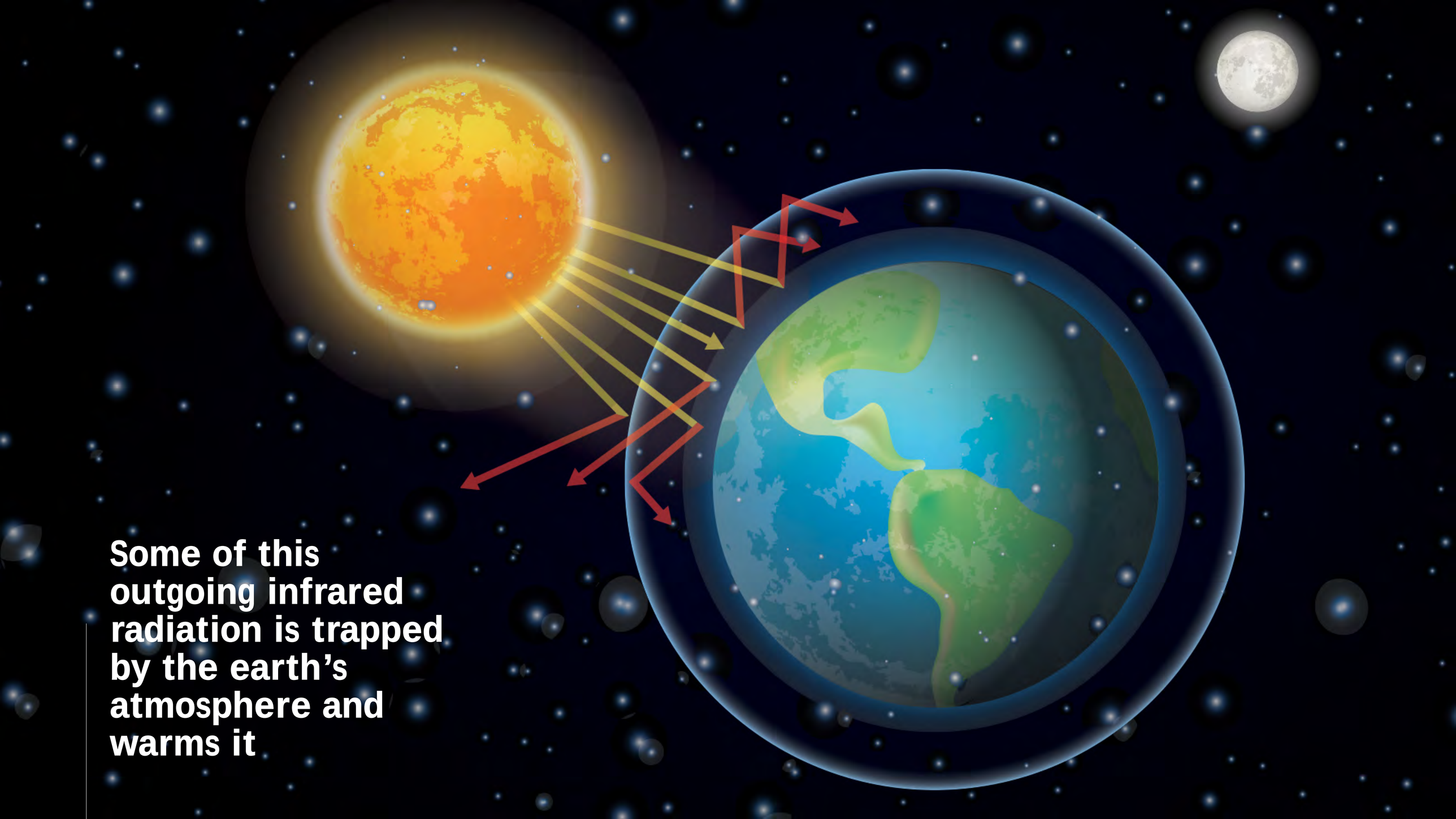

Solar radiation in the form of light waves passes through the atmosphere



Most of this radiation is absorbed by the Earth and warms it



Some energy is radiated back into space by the earth in the form of infrared waves

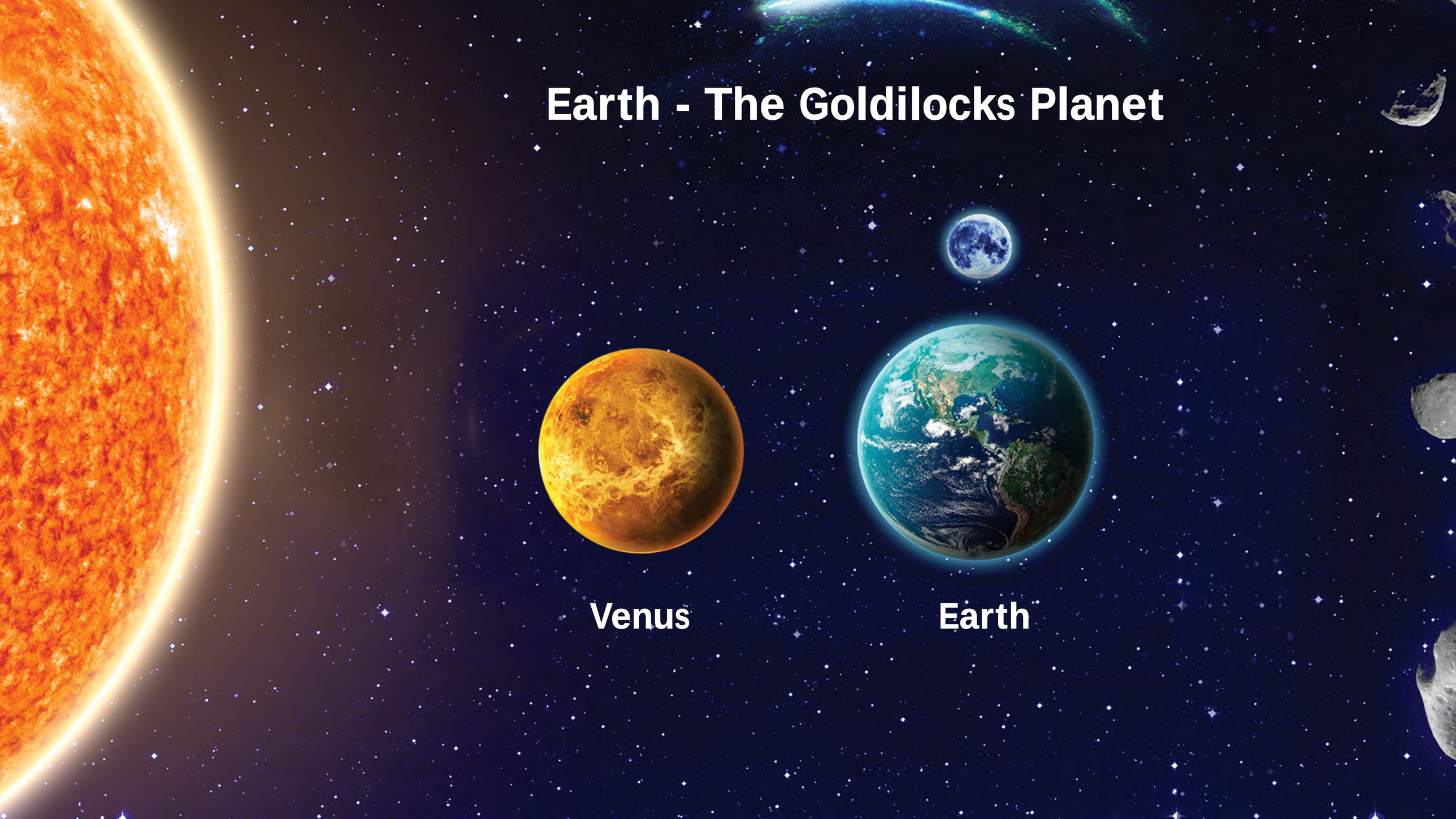


Some of this outgoing infrared radiation is trapped by the earth’s atmosphere and warms it

Earth - The Goldilocks Planet

Earth

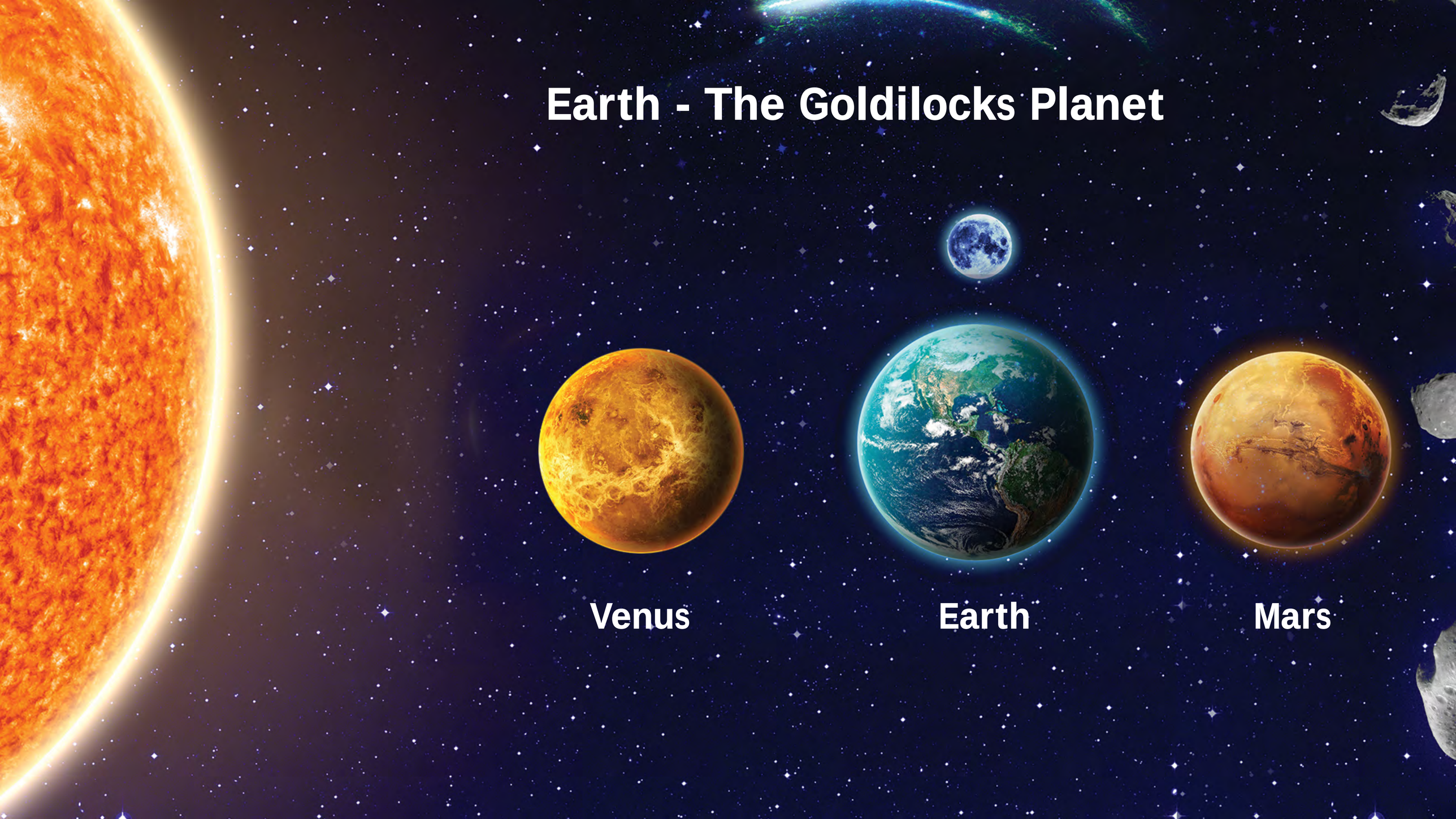
Earth - The Goldilocks Planet



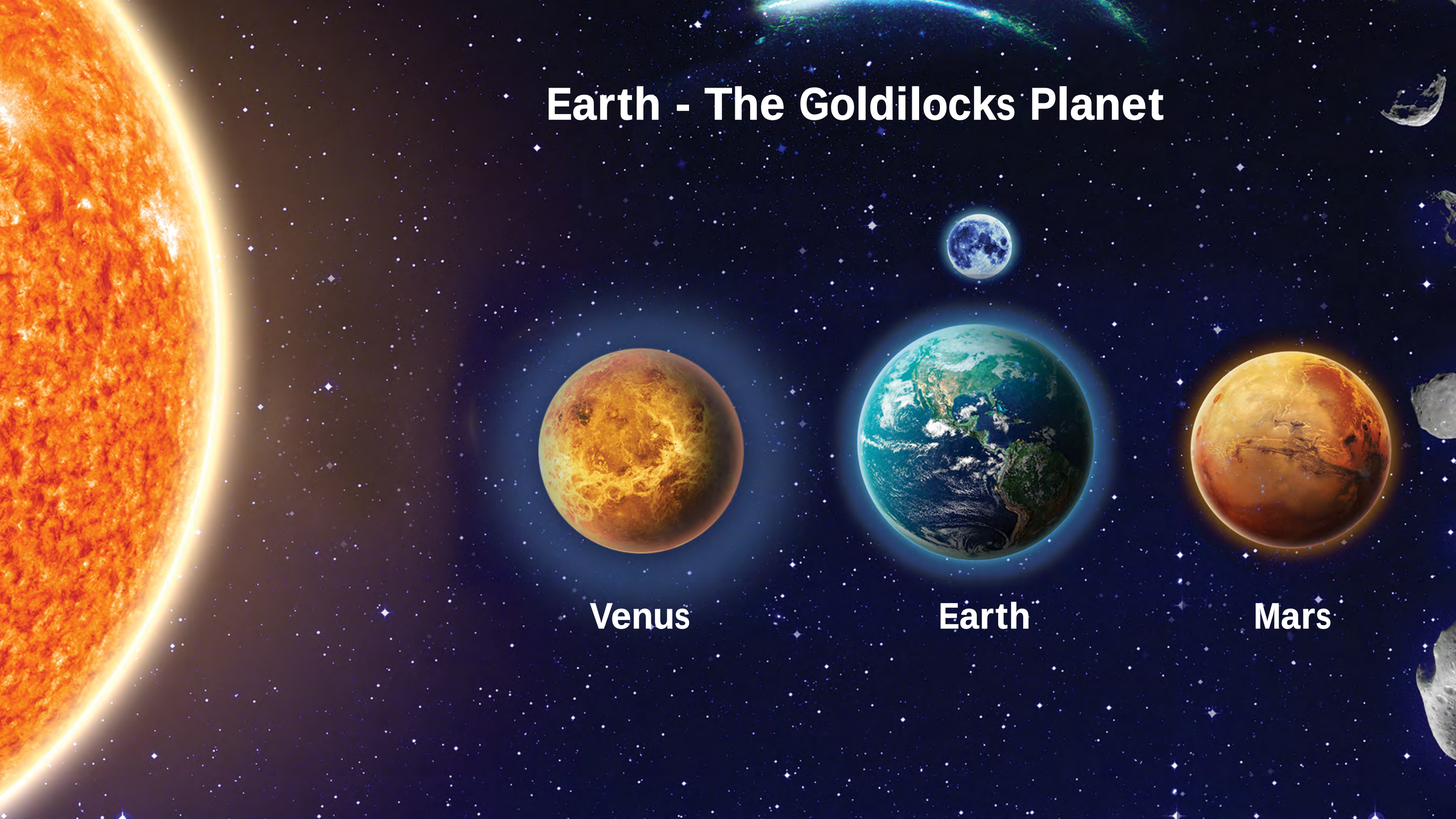
Venus

Earth

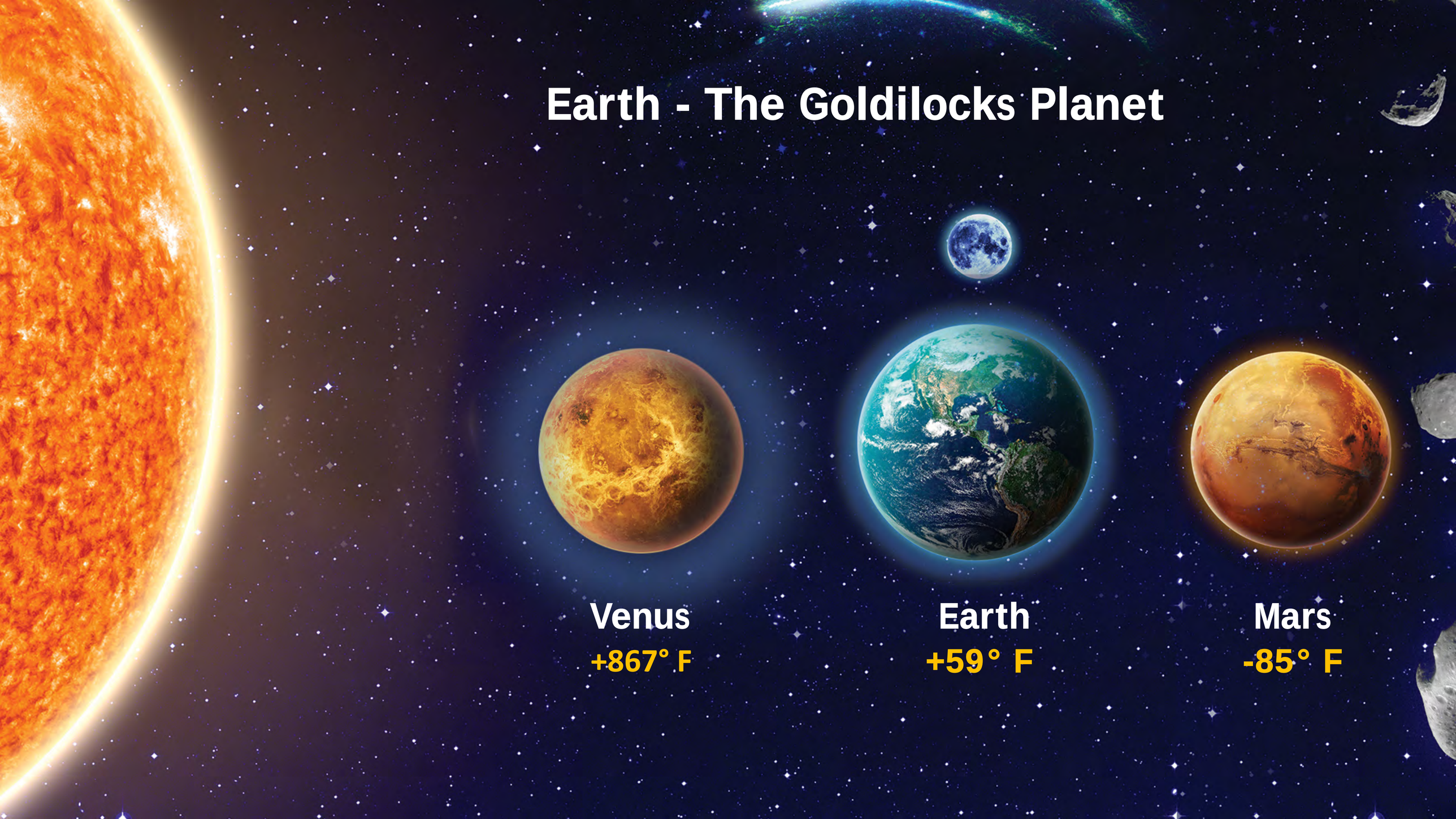
Earth - The Goldilocks Planet



Earth - The Goldilocks Planet



Earth - The Goldilocks Planet

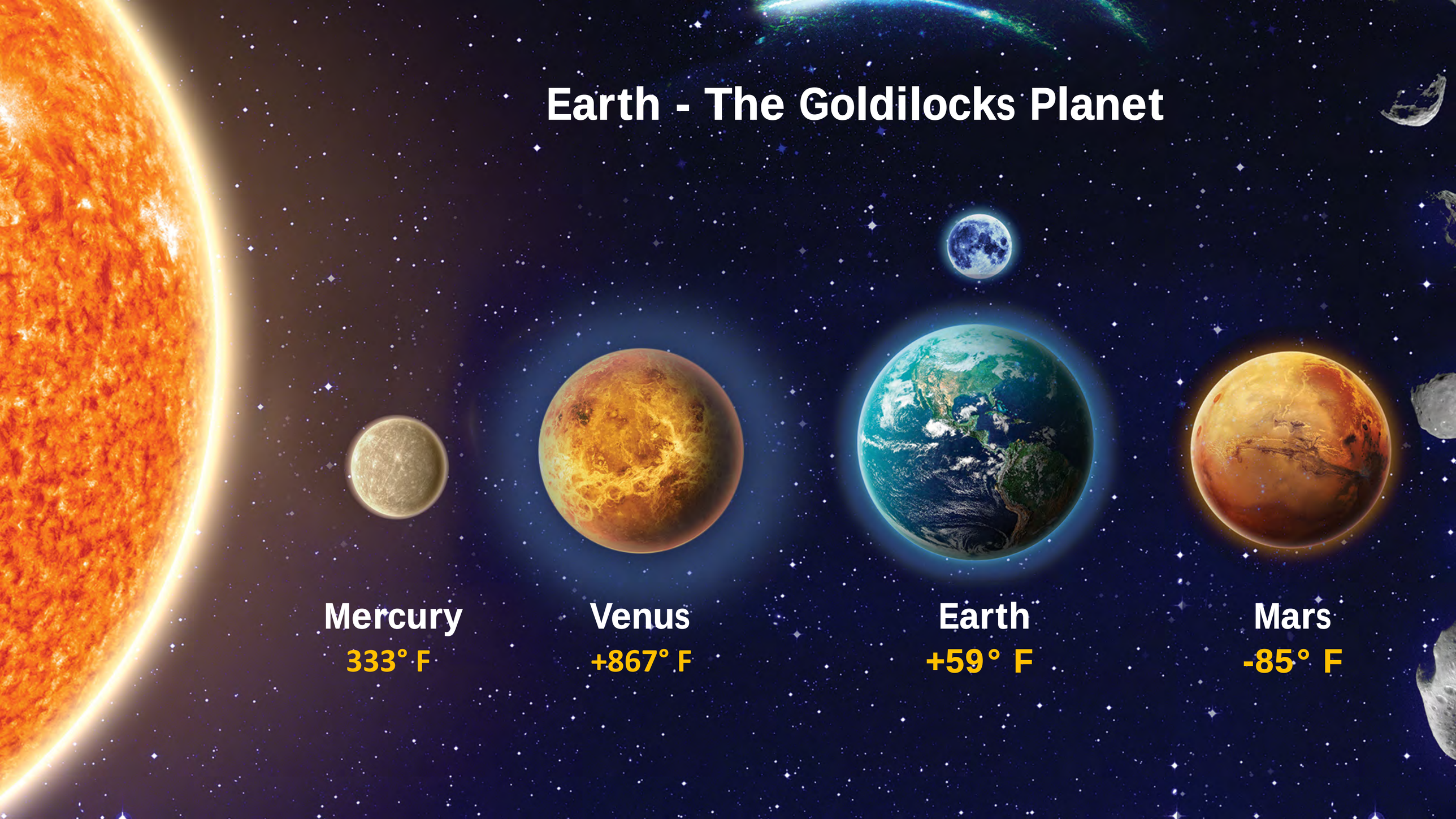


Venus
+867° F

Earth
+59° F

Mars
-85° F

Earth - The Goldilocks Planet



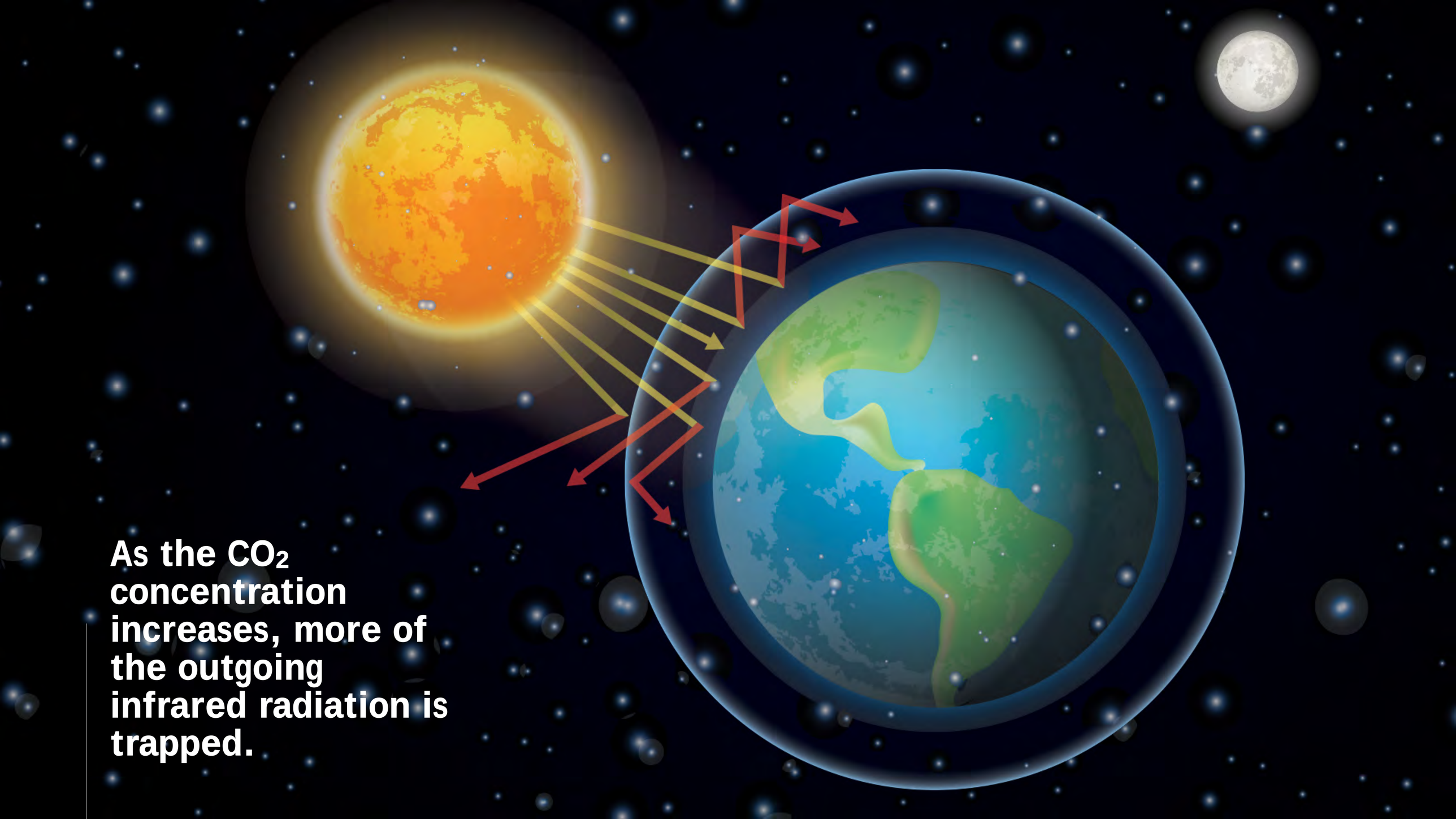

We are now spewing 110 million tons of manmade global warming pollution into the thin shell of our atmosphere every 24 hours, as if it were an open sewer.

- Climatologist agree the biggest cause for global warming trend is caused by humans further exasperating the greenhouse effect. This occurs when the atmosphere traps heat radiating from earth towards outer space

- Humans have generated a ***40% increase in atmospheric carbon dioxide*** since the onset of the industrial revolution - 1958

- The Intergovernmental Panel on Climate Change, a group of 1,300 independent scientific experts from countries all over the world, and part of the United Nations, concluded there's more than a ***95 percent probability that human activities over the past 50 years have warmed our planet***

- Industrial activities, such as data centers consuming power generated by burning fossil fuels, have raised carbon dioxide levels from ***280 ppm to 400 ppm over the last 150 years***



As the CO_2 concentration increases, more of the outgoing infrared radiation is trapped.


AIR TRANSPORT
THAWING
PERMAFROST
LANDFILLS
COAL MINING
COAL PLANTS
OIL PRODUCTION
INDUSTRIAL PROCESSES
FERTILIZATION
LAND TRANSPORT
© 2017 Don Foley

18 of the 19 Hottest Years on Record Have Occurred Since the Year 2001

2016 2019 2017 2015 2018 2014 2010 2005 2007

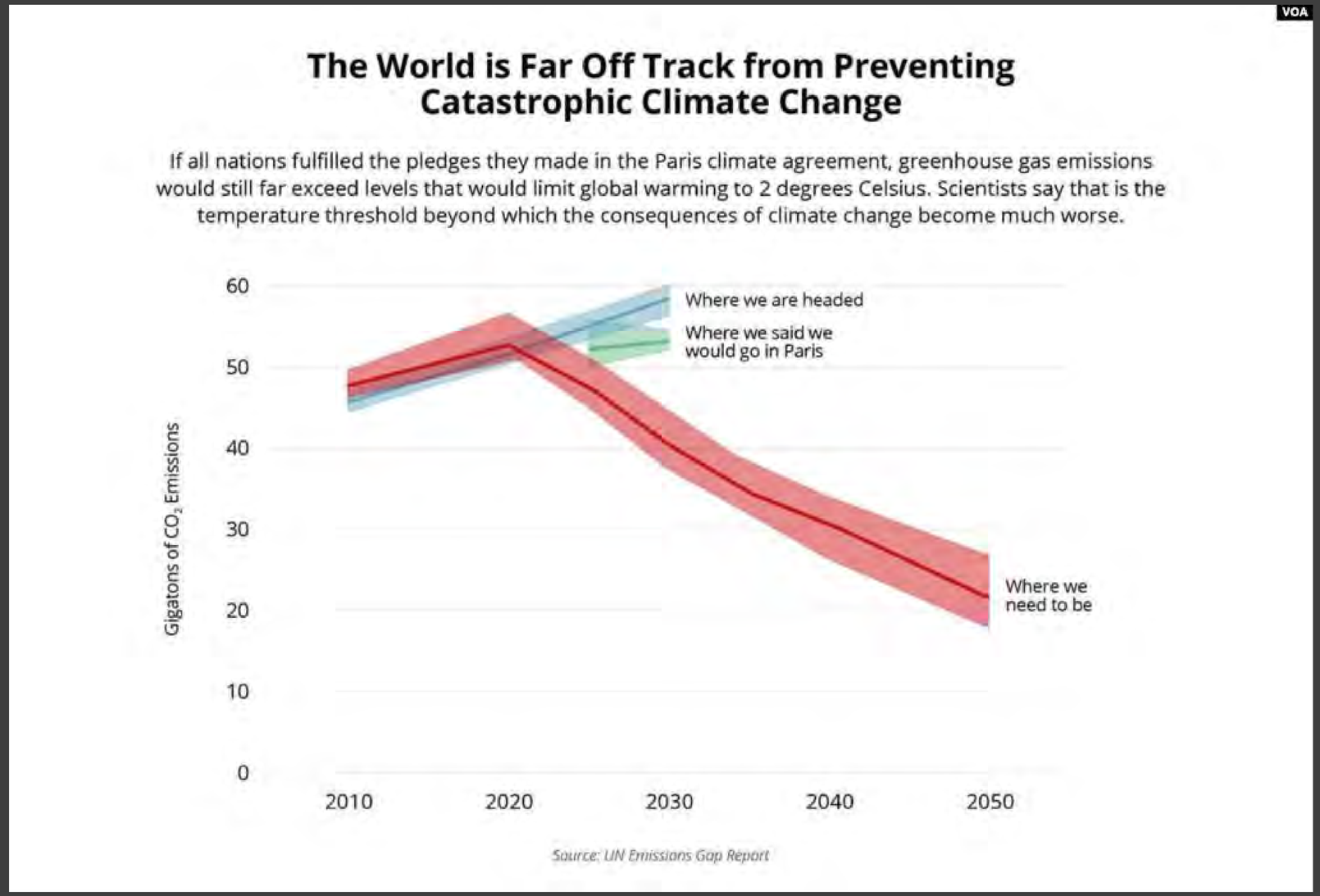
2013 2009 2012 2006 1998 2002 2003 2011 2004

The Hottest of All Have Been the Last Five Years

2016 2019 2017 2015 2018

The IPCC Warning

The IPCC warns global carbon emissions need to drop *45% below 2010 levels by 2030* to avoid devastating consequences for the planet.



Banking on Fossils Fuels

Bank financing for over 1,800 companies active across the fossil fuel life cycle

RANK	BANK	2016	2017	2018	TOTAL
1	JPMORGAN CHASE	$62.714 B	$69.046 B	$63.903 B	$195.663 B
2	WELLS FARGO	$36.041 B	$54.207 B	$61.351 B	$151.599 B
3	CITI	$41.560 B	$44.674 B	$43.259 B	$129.493 B
4	BANK OF AMERICA	$36.062 B	$36.879 B	$33.745 B	$106.687 B
5	RBC	$28.846 B	$36.810 B	$34.881 B	$100.537 B
6	BARCLAYS	$30.543 B	$29.897 B	$24.740 B	$85.179 B
7	MUFG	$23.723 B	$26.103 B	$30.213 B	$80.039 B
8	TD	$20.516 B	$29.227 B	$24.408 B	$74.151 B
9	SCOTIABANK	$18.302 B	$24.170 B	$27.098 B	$69.571 B
10	MIZUHO	$21.523 B	$18.557 B	$27.630 B	$67.710 B
11	MORGAN STANLEY	$23.736 B	$23.714 B	$19.481 B	$66.931 B
12	GOLDMAN SACHS	$22.509 B	$19.412 B	$17.337 B	$59.257 B
13	HSBC	$17.461 B	$21.556 B	$18.791 B	$57.808 B
14	CREDIT SUISSE	$18.800 B	$21.609 B	$17.010 B	$57.419 B
15	BANK OF MONTREAL	$16.599 B	$20.309 B	$19.669 B	$56.577 B
16	BANK OF CHINA	$19.253 B	$14.207 B	$22.043 B	$55.503 B
17	DEUTSCHE BANK	$20.660 B	$18.649 B	$14.631 B	$53.939 B
18	BNP PARIBAS	$17.243 B	$17.234 B	$16.497 B	$50.974 B
19	ICBC	$19.486 B	$14.021 B	$14.501 B	$48.007 B
20	CHINA CONSTRUCTION BANK	$17.111 B	$11.724 B	$10.697 B	$39.532 B
21	SMBC GROUP	$10.548 B	$11.617 B	$15.934 B	$38.098 B
22	CIBC	$11.933 B	$13.137 B	$12.302 B	$37.372 B
23	SOCIÉTÉ GÉNÉRALE	$12.343 B	$10.708 B	$13.419 B	$36.469 B
24	CRÉDIT AGRICOLE	$8.677 B	$10.867 B	$12.618 B	$32.162 B
25	UBS	$7.659 B	$8.147 B	$10.038 B	$25.844 B
26	ING	$9.265 B	$7.437 B	$8.852 B	$25.555 B
27	AGRICULTURAL BANK OF CHINA	$11.604 B	$5.850 B	$7.619 B	$25.073 B
28	BPCE/NATIXIS	$4.513 B	$6.039 B	$10.278 B	$20.830 B
29	UNICREDIT	$6.490 B	$6.629 B	$3.942 B	$17.061 B
30	STANDARD CHARTERED	$2.272 B	$4.791 B	$8.180 B	$15.244 B
31	SANTANDER	$5.761 B	$4.636 B	$4.576 B	$14.973 B
32	BBVA	$4.422 B	$3.178 B	$4.480 B	$12.080 B
33	RBS	$3.706 B	$662 M	-	$4.368 B
	GRAND TOTAL	$611.882 B	$645.702 B	$654.123 B	$1.911 T

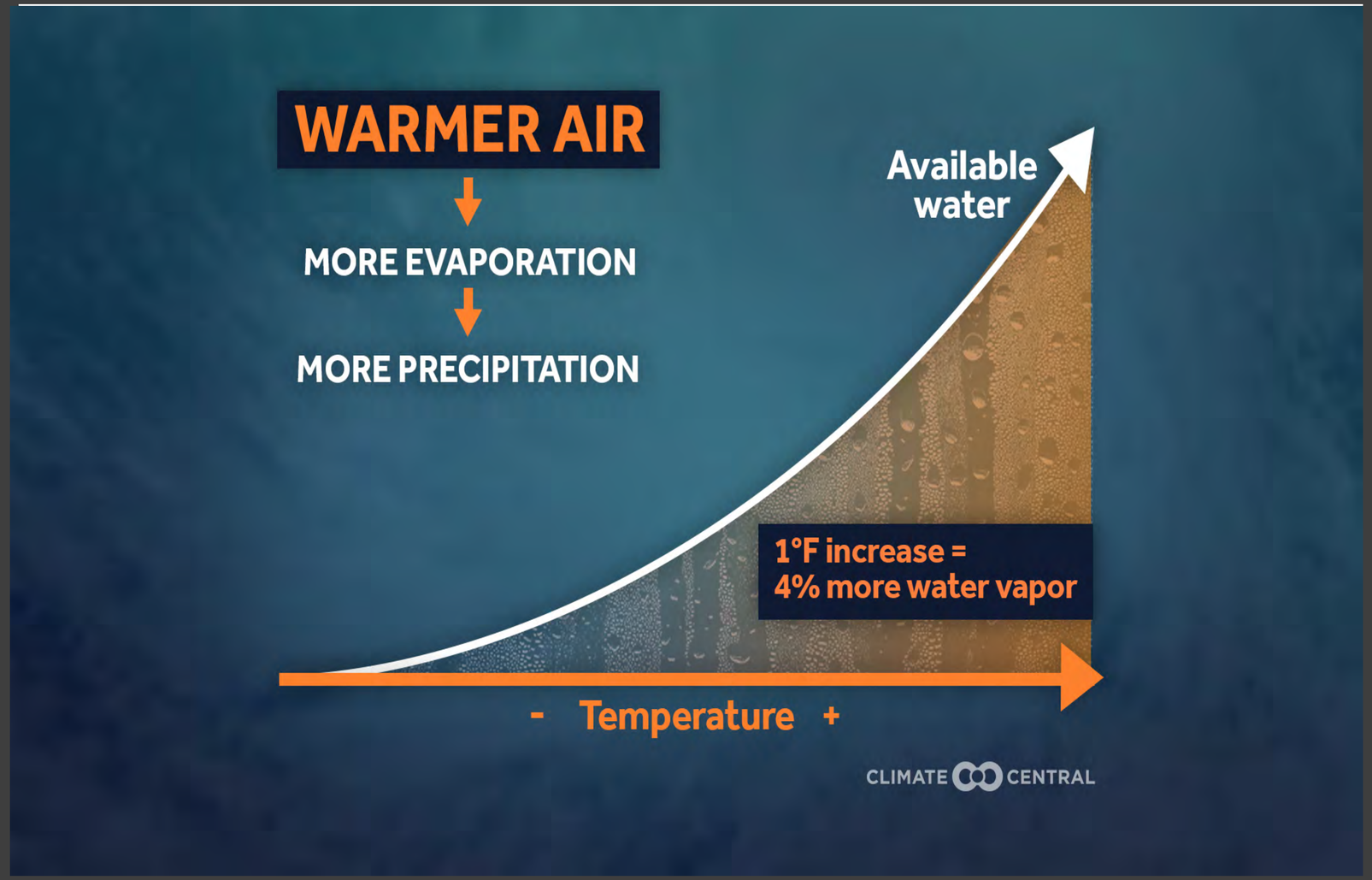
CREDIT TO CLIMATE CHANGE REPORT CARD 2019

Enough solar energy reaches Earth **every hour** to fill all the world's energy needs **for a full year**

Time Is Running Out

Scientists have long known that rising temperatures are melting Antarctica's vast ice sheet, sending water into the Southern Ocean and raising sea levels around the world. But many were surprised this past summer by a new study showing that Antarctica's ice is melting three times faster today than just a decade ago.

- Thwaite Glacier
- Brunt Ice Shelf
- Larson C



The Energy Used in Google Search

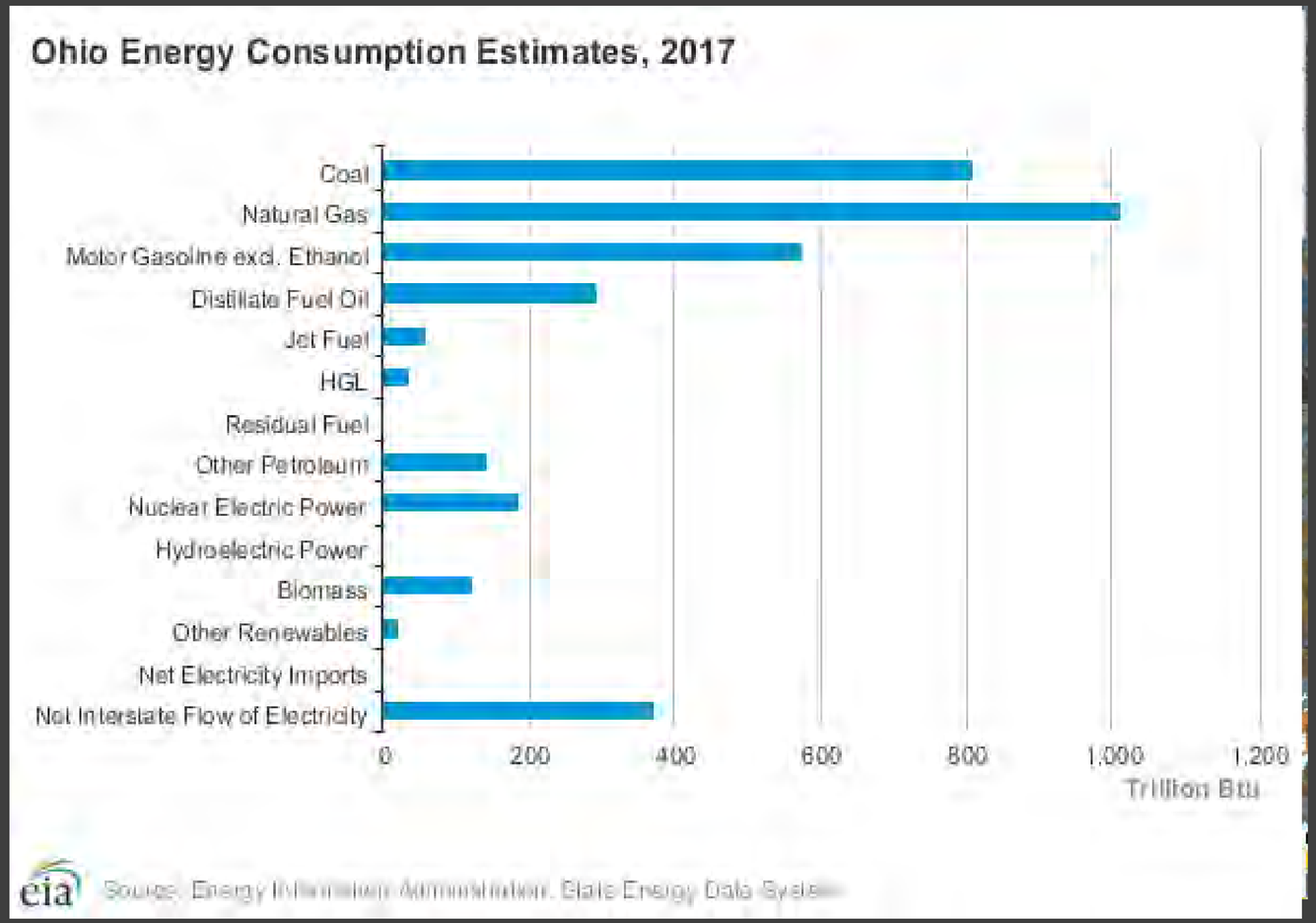
As the world's largest search engine, Google processes nearly 13 Billion monthly searches. They are able to handle such large volumes of data because they have huge datacenters with thousands of servers capable of handling immense capacities. Such large amounts of computing power require a great deal of electricity. This electricity consumption translates directly into carbon emissions. Take a look below:

Based on data provided at http://googleblog.blogspot.com/2009/01/powering-google-search.html

Time Is Running Out

OHIO

- Ohio is the third-largest coal-consuming state in the nation after Texas and Indiana, and nearly 90% of the coal consumed in Ohio is used for electric power generation
- Ohio has the seventh-largest crude oil-refining capacity in the nation, and the state's four refineries can process nearly 600,000 barrels of oil per calendar day
- Ohio is the eighth-largest ethanol-producing state in the nation, supplying about 550 million gallons of the biofuel per year
- Ohio’s two nuclear power plants, located along Lake Erie, supplied about 15% of the state’s net generation in 2018.



OHIO'S CO2 FOOTPRINT

Rank	State	Total Carbon Dioxide Emissions (million metric tons)
1	Texas	707.0
2	California	359.0
3	Florida	227.0
4	Louisiana	226.0
5	Pennsylvania	215.0
6	Ohio	204.0
7	Illinois	201.0
8	Indiana	176.0
9	New York	157.0
10	Michigan	152.0
11	Georgia	132.0
12	Missouri	122.0
13	North Carolina	115.0
14	Kentucky	114.0
15	Alabama	108.0
16	New Jersey	101.0
17	Virginia	98.0
17	Tennessee	98.0
17	Wisconsin	98.0
20	Oklahoma	93.0
21	West Virginia	91.0
22	Minnesota	88.0
23	Colorado	87.0
24	Arizona	86.0
25	Washington	78.0
26	Iowa	76.0
27	South Carolina	69.0

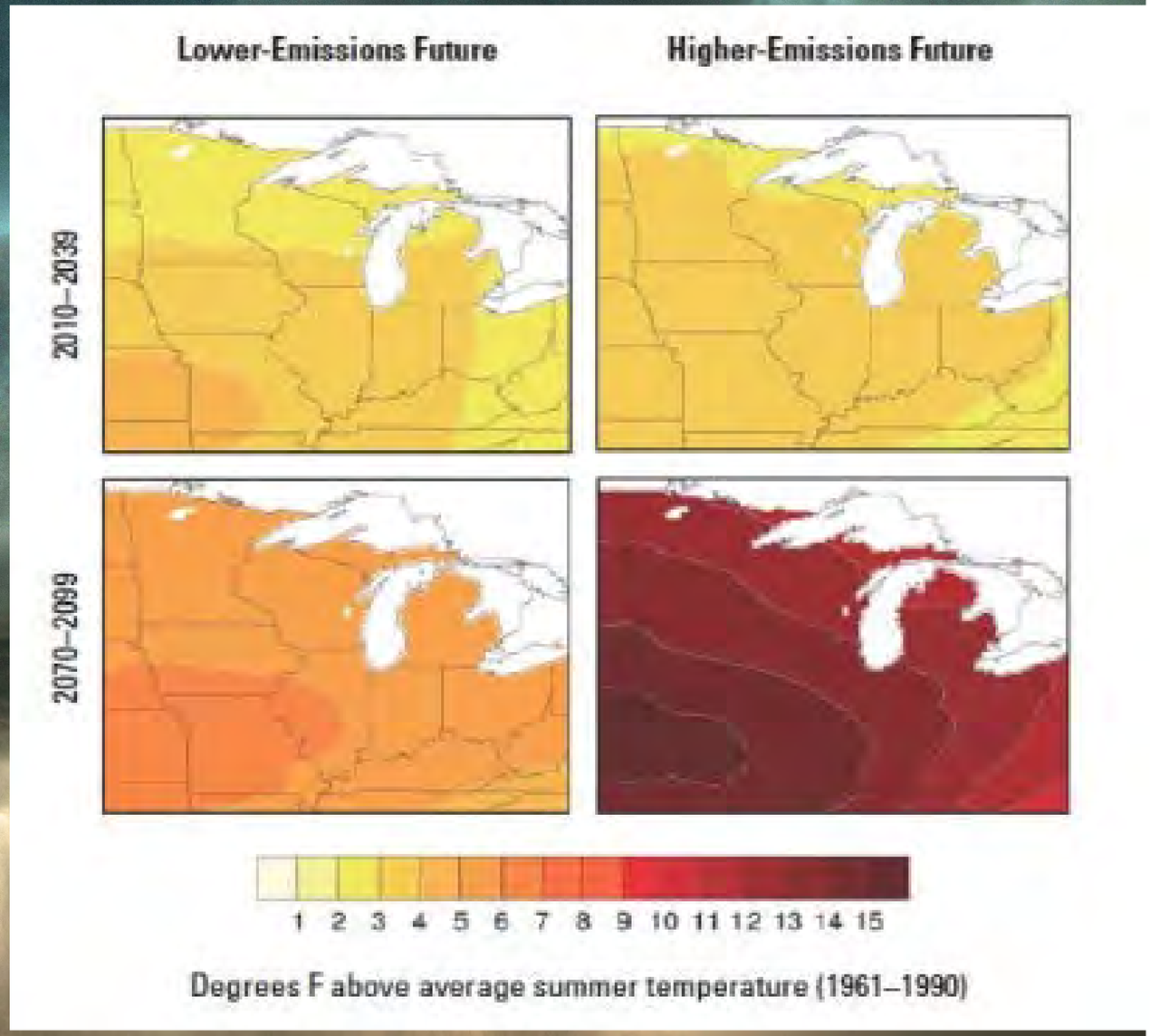
February, 2018

Cincinnati, Ohio

CLIMATE CHANGE & OHIO

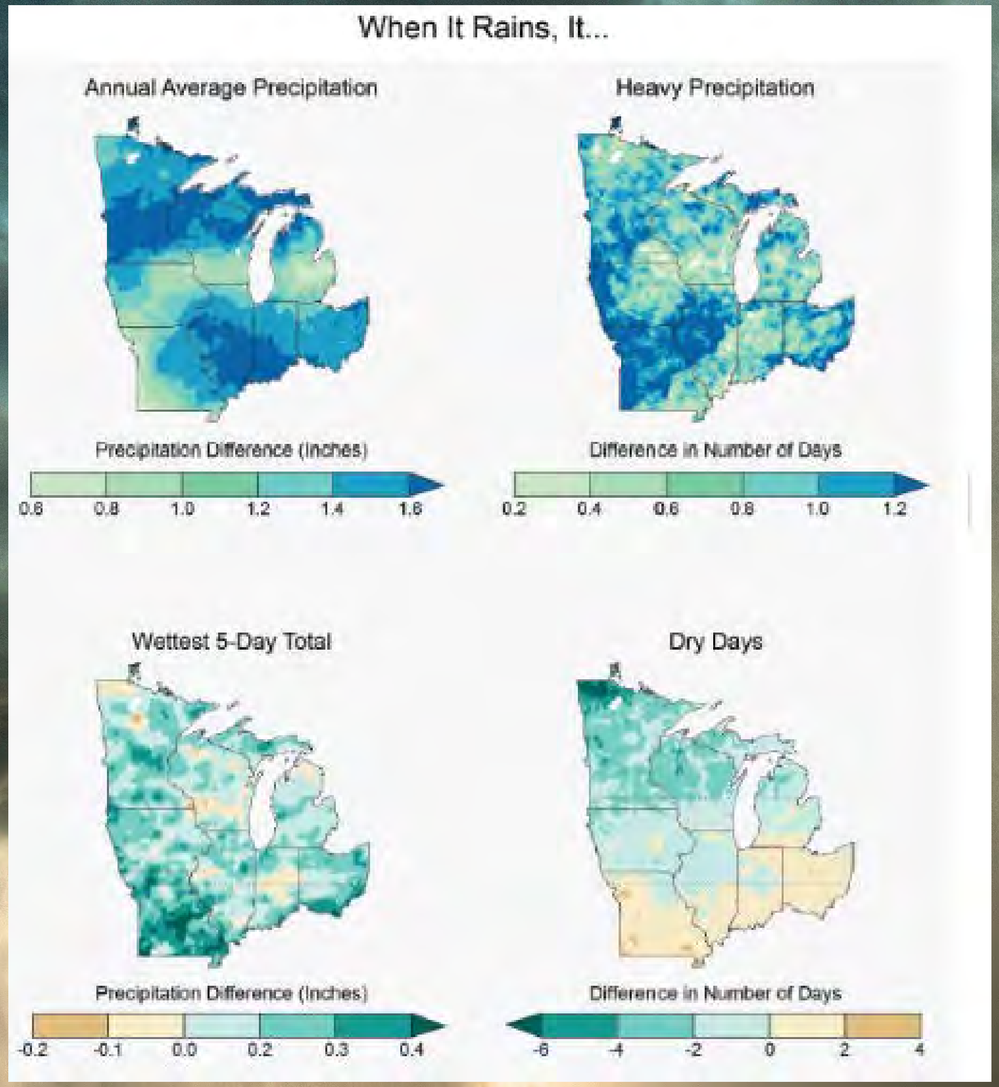
Changes in Temperature Average

- Annual temperatures for the southern Great Lakes region have increased by 1.3F since 1895
- By mid-century annual temperatures are expected to rise by 3F to 4F with the greatest increases in winter and spring
- By end of the century, average summer temperatures could rise by 12°F



Changes in Precipitation

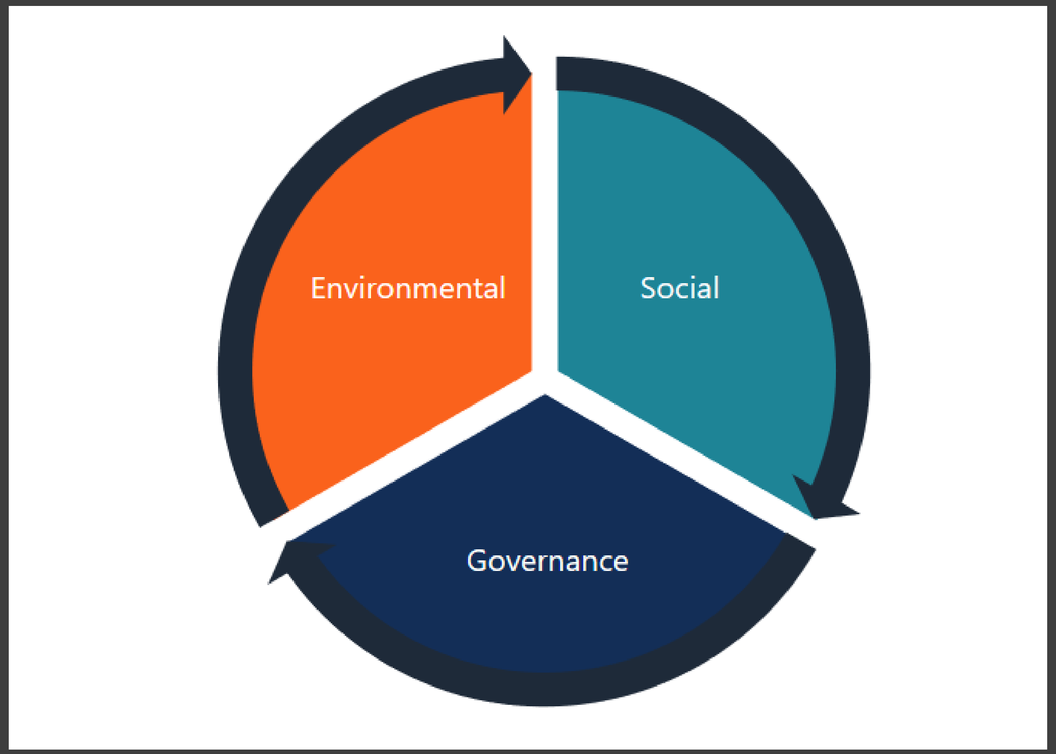
- All seasons will see increased precipitation with the exception of summer – 5% less
- Spring, Fall, & Winter will see precipitation increase of 15% over the next several decades and upwards of 30% by the end of the century
    - More Flooding, delays in planting of spring crops, & declining water quality in creeks, rivers, and lakes
- Increased Extreme Weather Events
    - The future 100-year flood for Dayton will most likely increase by 10-20%
    - Heavy downpours are already twice as frequent in the Midwest as they were a century
    - Under the higher-emissions scenario Cincinnati is projected to experience a 30 percent increase in heavy rainfalls



U.S. Environmental Protection Agency, Climate Change and Ohio (Washington, D.C.: U.S. EPA


What can I do?

Environmental, Social, and Governance (ESG)



THREE STEPS TOWARDS A MORE SUSTAINABLE DATA CENTER

The Three “R’s” Strategy

- Develop, Publish, Execute A Strategy That Covers Sustainability Programs Geared for the Three Rs

  - ***Renewal*** - Outline a transition towards sourcing more renewable energy

  - ***Recovery*** - address improvements in energy efficiency

  - ***Removal -*** control and reduce greenhouse gas emissions

Set Up Organizational Business Line For Sustainability & Renewables

- Sustainability lines should manage non-operational 3R programs

- Renewable lines should own the operational value chain and implement 3R plans

Govern Sustainability & Renewable Programs For Reporting & Audit

- Assess, Measure, Track, Report…….
  REPEAT

- Prepare for board reviews, internal audit

ONE SMALL CHANGE YOU CAN MAKE AT HOME = BIG DIFFERENCE

Be A Vegetarian – One Day Each Week!!!

UNITED NATIONS

Little Changes

- Being A Vegetarian One Day a Week
  - Reduces Personal Meat Consumption by 15% Thus Decreasing Environmental Consequences
  - Equivalent of 91 Billion Miles Driven or 7.6 Million Cars Off The Roads!!!

UNITED NATIONS

Animal Agriculture’s Impact On Climate Change

- Animal Agriculture includes Over One Trillion Aquatic Animals & Over 82 Billion Land Animals
- 26% percent of the Planet’s ice-free land is used for livestock grazing
- 33% of croplands are used for livestock feed production
- One Hamburger = 2,420 Liters of Water

kWh Decrease	# End User	kW/h - /Day	kW/h -Year Group	Carbon Footprint Reduction - Year Reduction
25	1	600.00	219,000.00	131.65
kWh Decrease	**# End User**	**kW/h - /Day**	**kW/h -Year Group**	**Carbon Footprint Reduction - Year Reduction**
25	50	30,000.00	10,950,000.00	6,582.50
kWh Decrease	**# End User**	**kW/h - /Day**	**kW/h -Year Group**	**Carbon Footprint Reduction - Year Reduction**
25	100	60,000.00	21,900,000.00	13,165.00
kWh Decrease	**# End User**	**kW/h - /Day**	**kW/h -Year Group**	**Carbon Footprint Reduction - Year Reduction**
25	250	150,000.00	54,750,000.00	32,912.50
kWh Decrease	**# End User**	**kW/h - /Day**	**kW/h -Year Group**	**Carbon Footprint Reduction - Year Reduction**
25	500	300,000.00	109,500,000.00	65,825.00
kWh Decrease	**# End User**	**kW/h - /Day**	**kW/h -Year Group**	**Carbon Footprint Reduction - Year Reduction**
25	885	531,000.00	193,815,000.00	116,510.25
kWh Decrease	**# End User**	**kW/h - Day Reduction**	**kW/h -Year Group**	**Carbon Footprint Reduction - Year Reduction**
25	1000	600,000.00	531,000,000.00	131,650.00
kWh Decrease	**# End User**	**kW/h - Day Reduction**	**kW/h -Year Group**	**Carbon Footprint Reduction - Year Reduction**
25	8,000,000	4,800,000,000.00	1,752,000,000,000.00	1,053,200,000.00

I Want to Hear From You

Questions or Comments!

Kevin Kent
kevin@cfespue.com