

UNDERSTANDING CLIMATE CHANGE

BY

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The illiterate of the 21st century will not be those who can not read or write, but those who can not learn, unlearn and relearn.

-Alvin Toffler.

WHAT IS CLIMATE CHANGE?

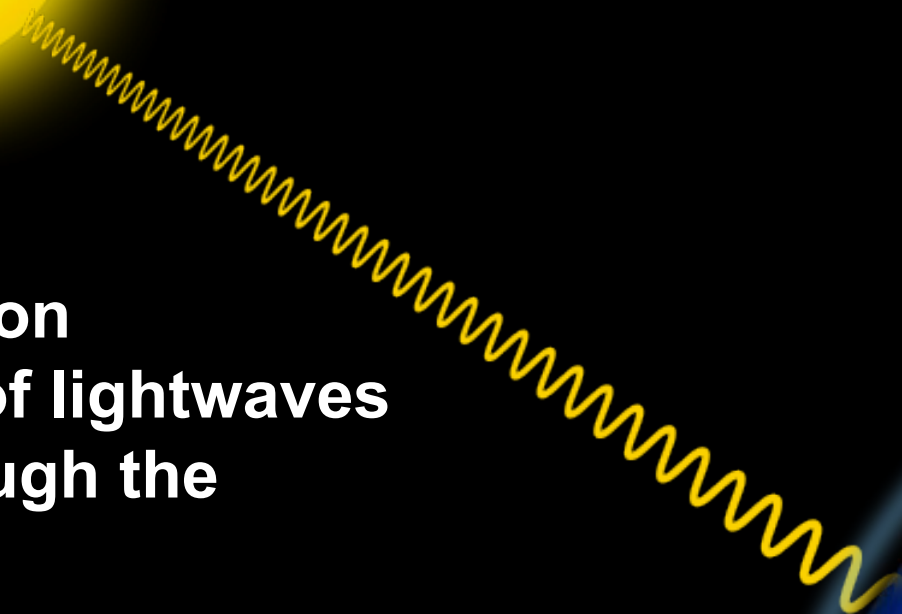


Source: NASA

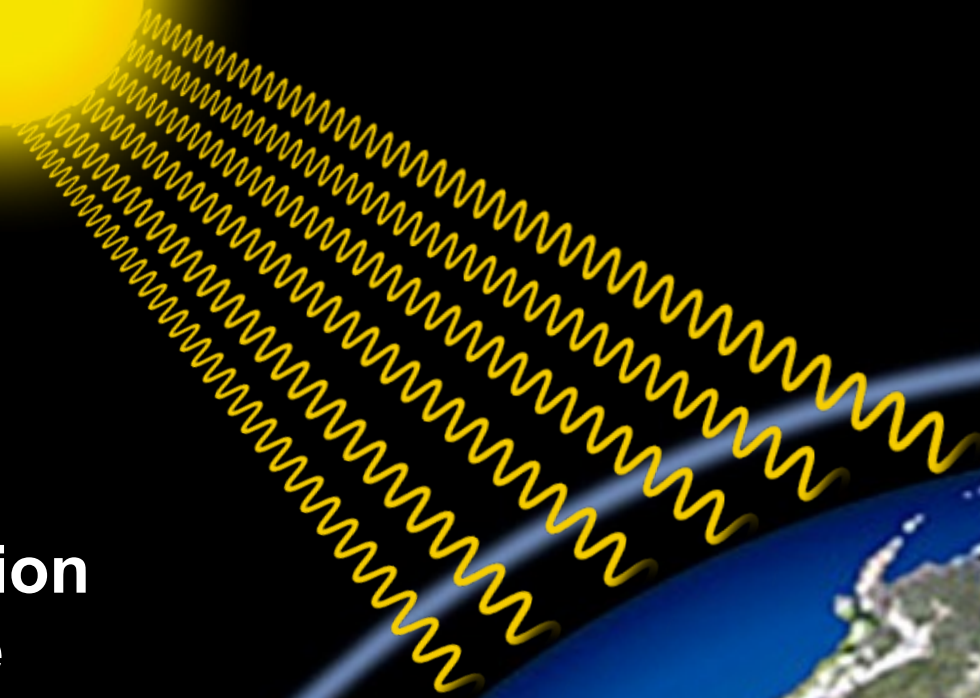
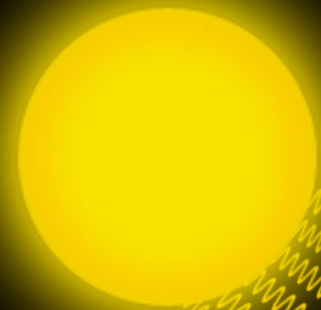


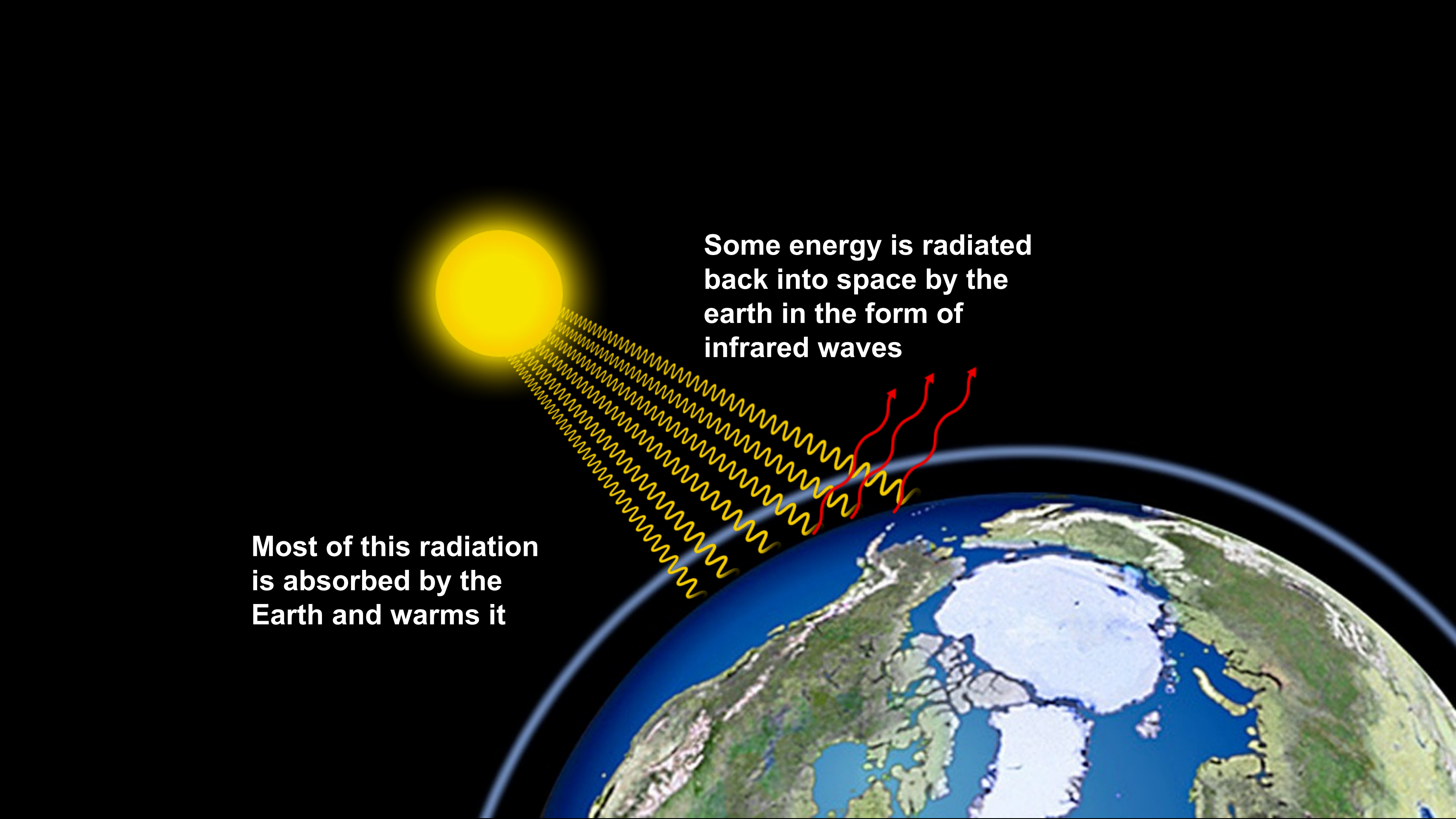
Source: NASA

**Solar radiation
in the form of lightwaves
passes through the
atmosphere**



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

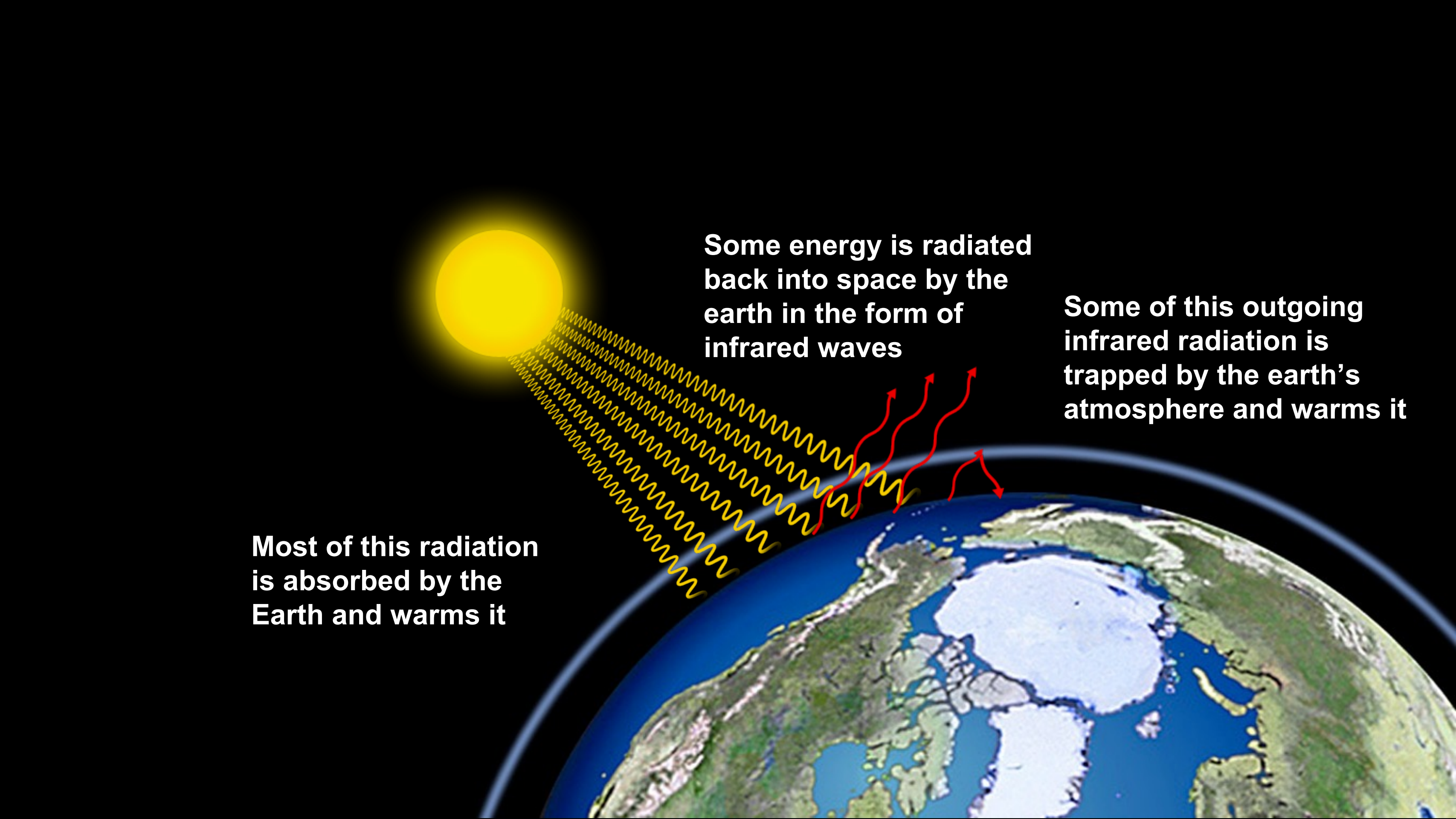




**Most of this radiation
is absorbed by the
Earth and warms it**

The diagram illustrates the greenhouse effect. A bright yellow sun in the upper left corner emits a series of parallel yellow wavy lines representing solar radiation towards the Earth. The Earth is shown as a curved horizon with a detailed view of the Arctic region, including Greenland and surrounding landmasses. Three red wavy lines with arrows at their ends originate from the Earth's surface and point away from the planet, representing outgoing infrared radiation. The background is a solid black space.

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



**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**

IT IS CALLED GREENHOUSE GASES







Where Do Greenhouse Gases Come From?



THAWING PERMAFROST

AIR TRANSPORT

COAL MINING

COAL PLANTS

OIL PRODUCTION

INDUSTRIAL PROCESSES

CROP BURNING

FERTILIZATION

FOREST BURNING

INDUSTRIAL AGRICULTURE

LAND TRANSPORTATION

LANDFILLS

Natural Vs Man Made Greenhouse Sources

Greenhouse Gas	Natural sources	Man-made sources
Carbon Dioxide	Organic decay, Forest fires, Volcanoes	Burning fossil fuels – car and factory emissions, electricity generation
Methane	Wetlands, Organic decay, Termites	Natural gas & oil extraction, Biomass Burning, Rice cultivation, Cattle, Refuse landfills
Nitrous Oxide	Forests, Grasslands, Oceans, Soils, Soil cultivation; Fertilizers	Biomass burning; Burning of fossil fuels
Chlorofluorocarbons (CFCs)	None	Refrigerators; Aerosol spray propellants; Cleaning solvents

GREENHOUSE GASES LAST A LONG TIME

METHANE 10
YEARS

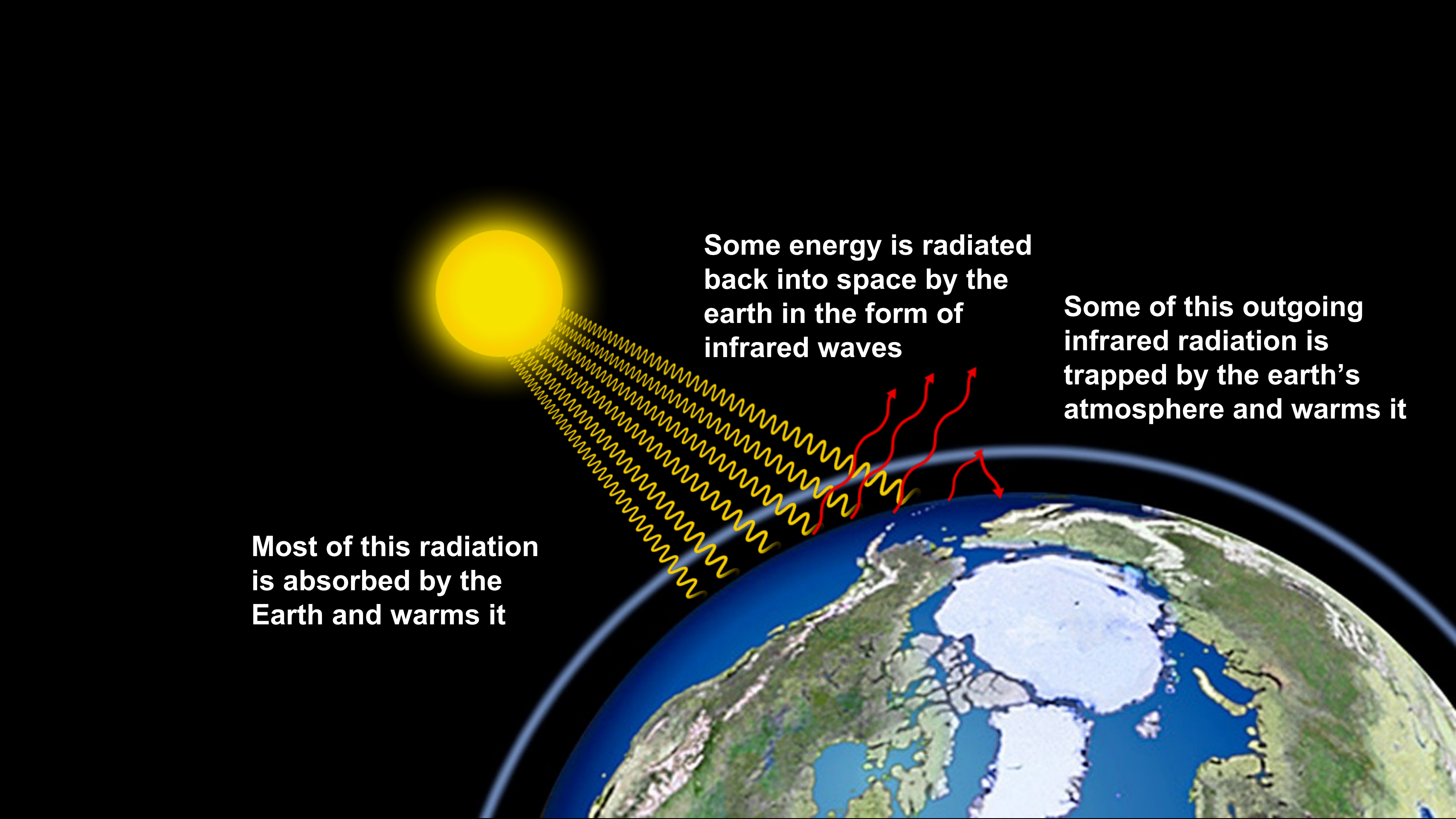
NITROUS OXIDE 100
YEARS

CARBON DIOXIDE 1000+ YEARS

Numbers based on lifetime in atmosphere, not their warming potential

CLIMATE  CENTRAL

WHAT GREENHOUSE DO?

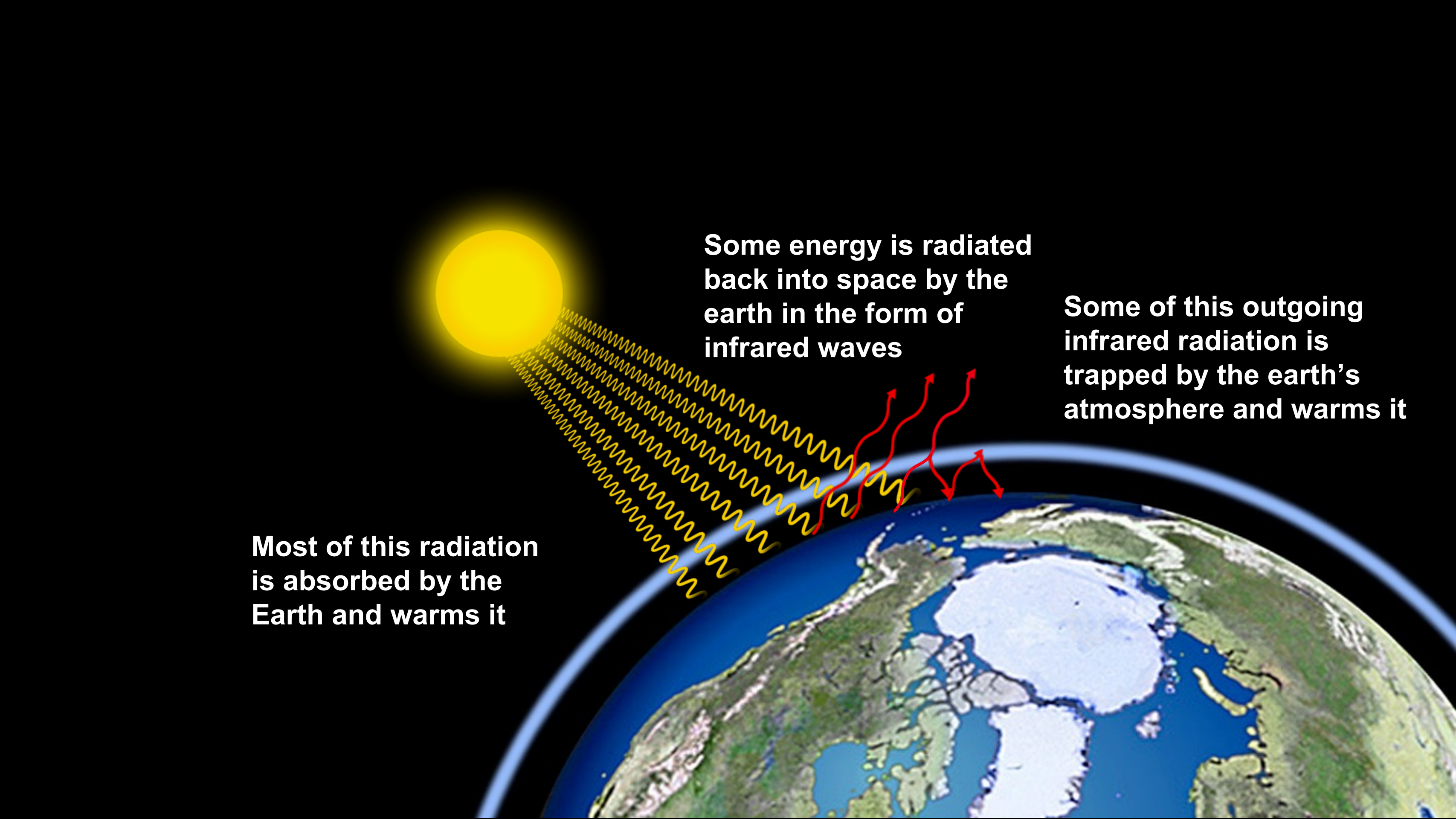


**Most of this radiation
is absorbed by the
Earth and warms it**

The diagram illustrates the greenhouse effect. A bright yellow sun in the upper left emits yellow wavy lines representing solar radiation towards the Earth. The Earth is shown as a curved horizon with a detailed view of the Arctic region, including Greenland and surrounding landmasses. Most of the yellow radiation lines are shown hitting the Earth's surface. From the surface, red wavy lines representing infrared radiation point upwards towards the atmosphere. Some of these red lines are shown being reflected back down to the surface by the atmosphere, while others point away from the Earth into space.

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earth in the form of
infrared waves**

**Some of this outgoing
infrared radiation is
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atmosphere and warms it**



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

The diagram illustrates the greenhouse effect. A bright yellow sun in the upper left corner emits a series of parallel yellow wavy lines representing solar radiation towards the Earth. The Earth is shown as a curved horizon with a blue atmosphere and a landmass featuring green continents and white ice sheets. Most of the yellow wavy lines terminate at the Earth's surface. From the surface, several red wavy lines with arrows at their ends point upwards into the atmosphere, representing outgoing infrared radiation. Some of these red lines are shown reflecting back down towards the Earth's surface, indicating that the atmosphere is trapping some of the heat. The background is a solid black space.

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**Some of this outgoing
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**The energy trapped by man-made
global warming pollution is now
“...equivalent to exploding**

400,000

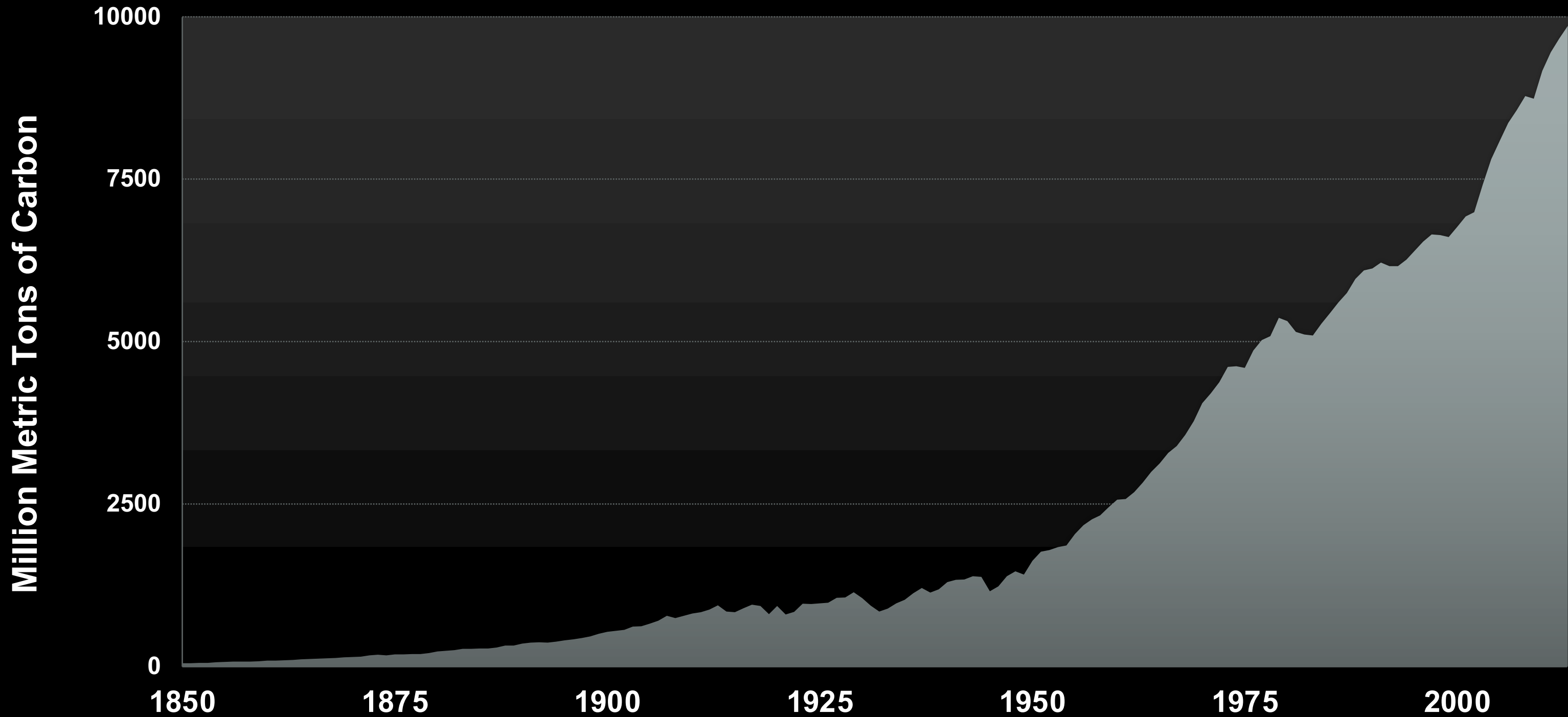
**Hiroshima atomic bombs
per day 365 days per year.”**

James Hansen

Former Director, NASA Goddard Institute for Space Studies

400,000
Times per day

Global Carbon Emissions from Fossil Fuels



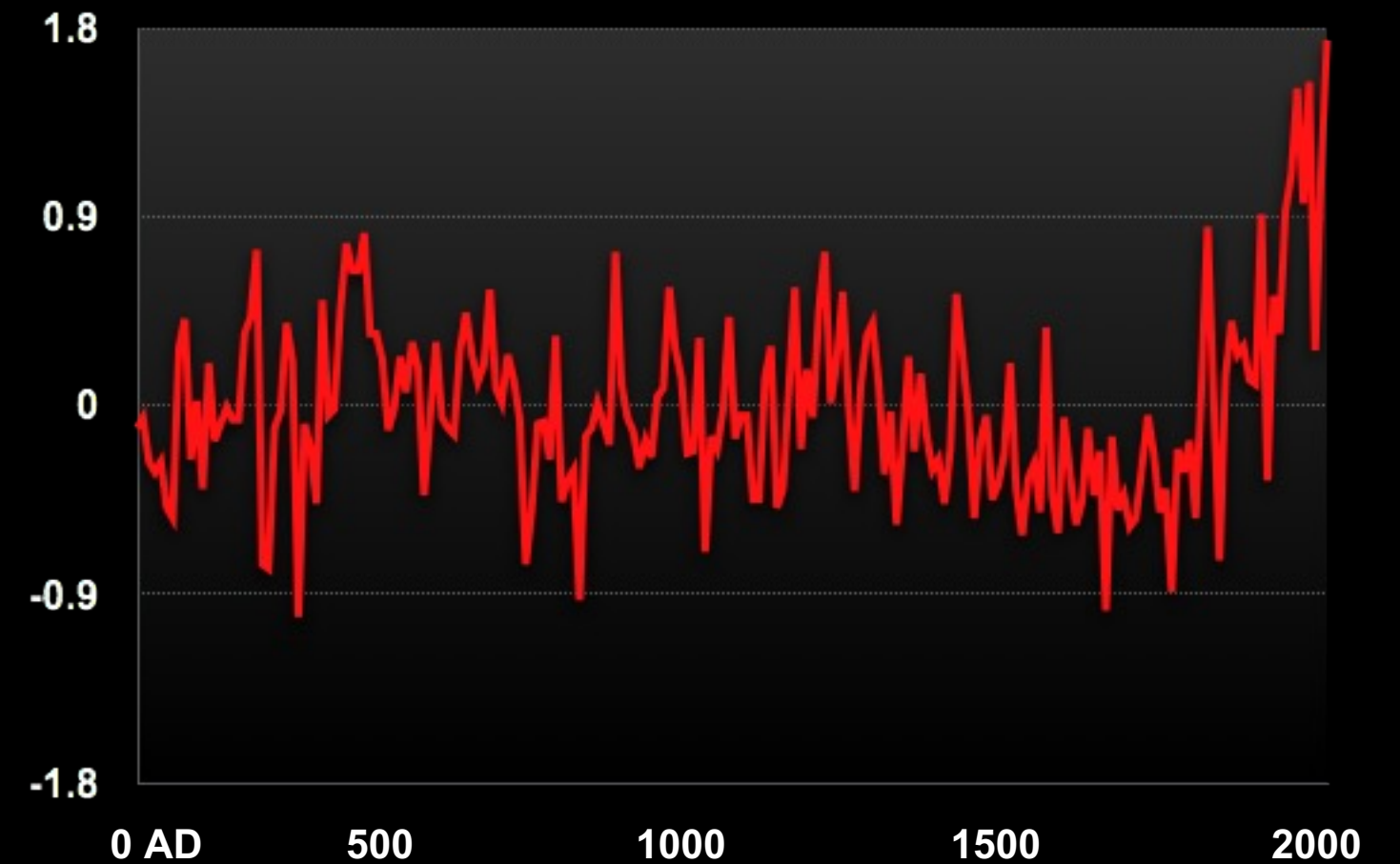
As CO₂ Increases, So Does the Temperature

2000 Years of CO₂ and Global Temperature

CO₂ Concentration

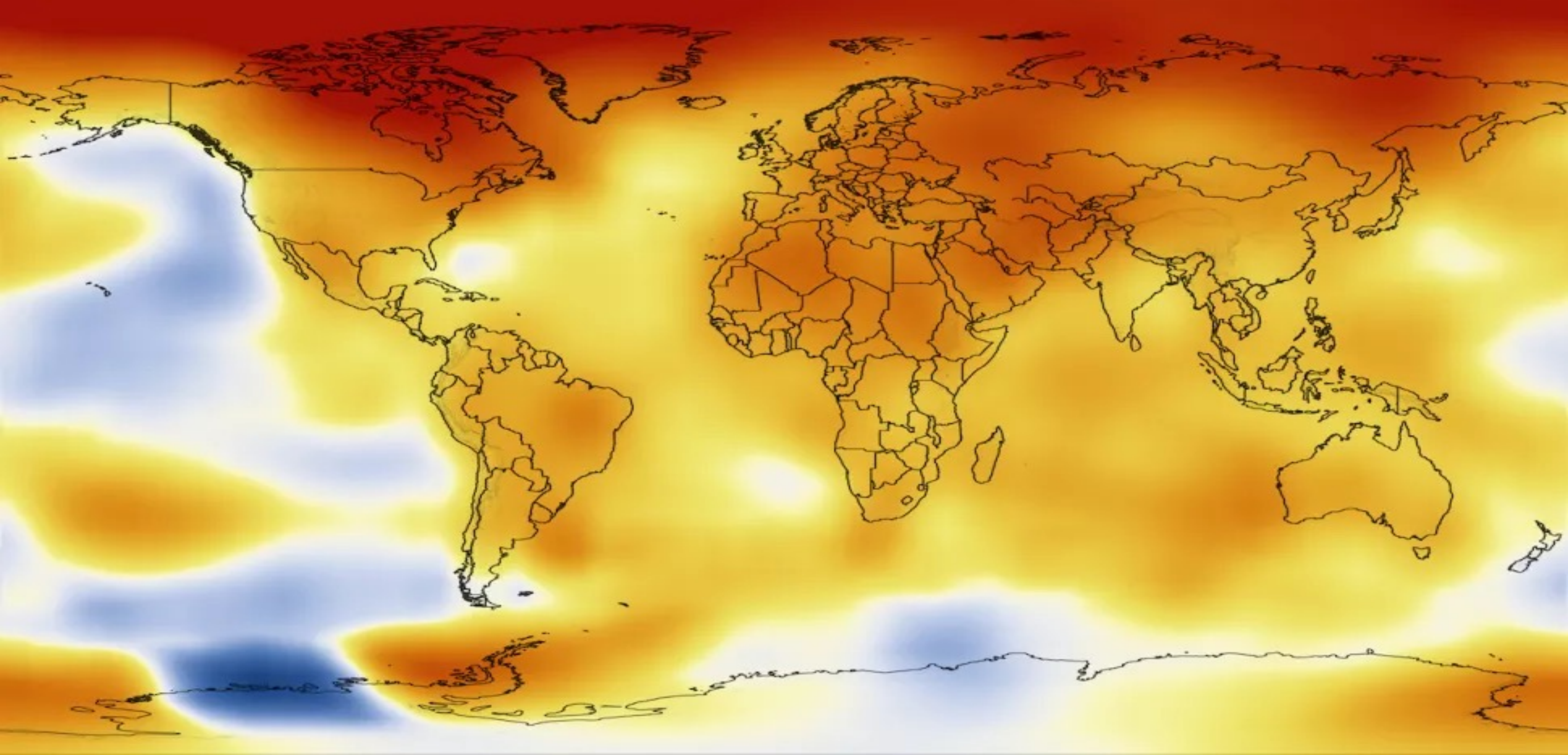


Temperature



Data: (Temperature) Thompson, et al., "Abrupt Tropical Climate Change: Past and Present," *Proc. Natl. Acad. Sci. USA*, vol. 103, no. 28:
(CO₂) Australian Academy of Science; Etheridge, et al., "Law Dome CO₂, CH₄ and N₂O ice core records extended to 2000 years BP," *Geophys. Res. Lett.* 33,
doi.10.1029/2006GL026152, 2006. © 2006 American Geophysical Union. Reproduced/modified by permission of American Geophysical Union.

The 10 warmest years across the entirety of recorded human history have all occurred since 2005.







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

2016

2017

2015

2018

2014

2010

2005

2007

2013

2009

2012

2006

1998

2002

2003

2011

2004

2001

**2021 was one of the hottest years
on record – and it could also be
the coldest we'll ever see again**

The same extra heat that evaporates more water from the ocean, causing bigger downpours and floods...



As Temperatures Increase, the Oceans Evaporate More Moisture into the Sky (Flying Rivers)





Source: Daily Monitor







Nametsi Landslide; 2010

More than 200 people died



FLOODED FARM LANDS



Destruction of Infrastructure



The same extra heat that evaporates water from the ocean pulls moisture even more quickly from the soil







BIODIVERSITY LOSS



Lake Victoria

Evaporation- Sedimentation- Species Extinction



The Cost of Carbon

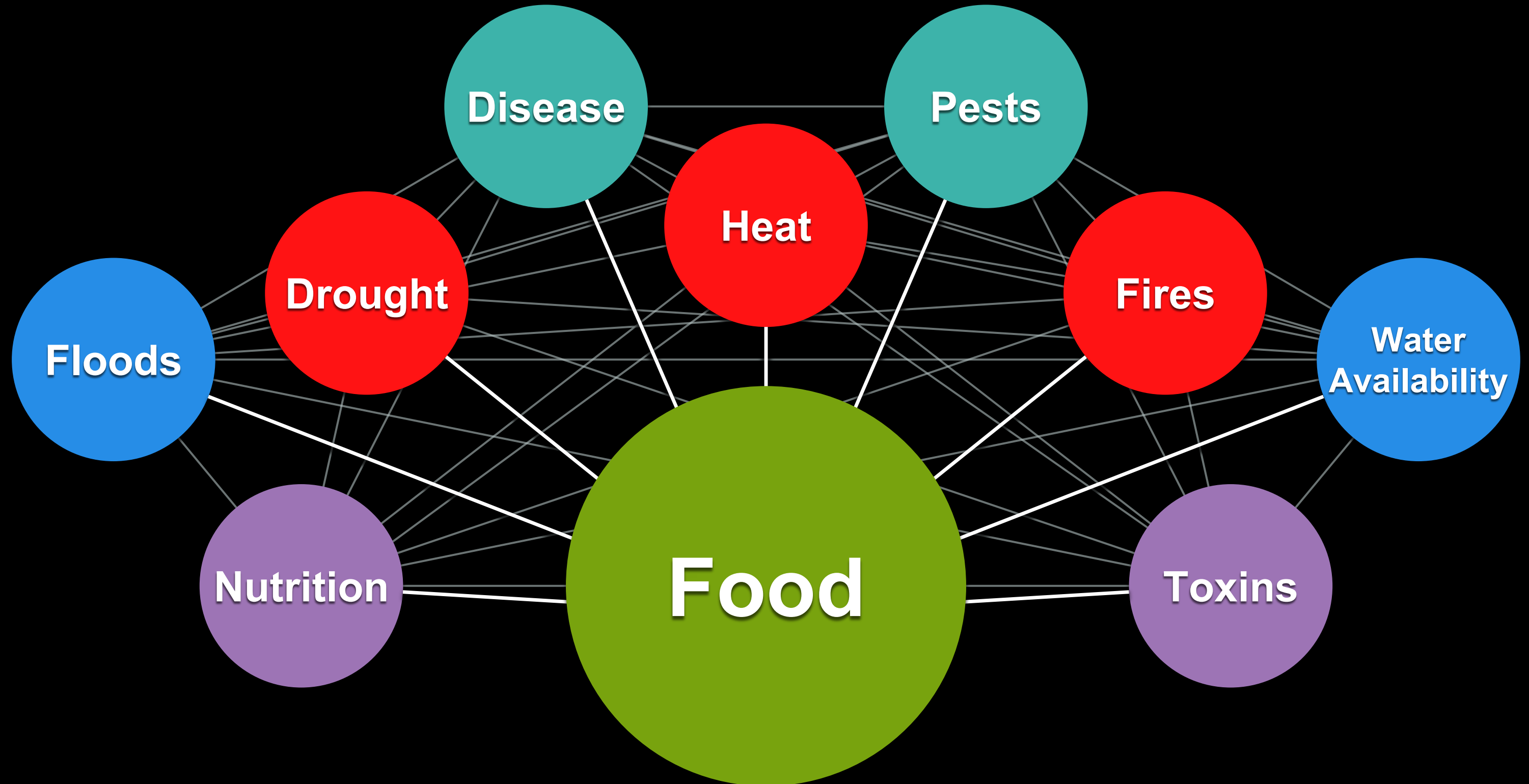


Global Systems Vulnerable to Climate

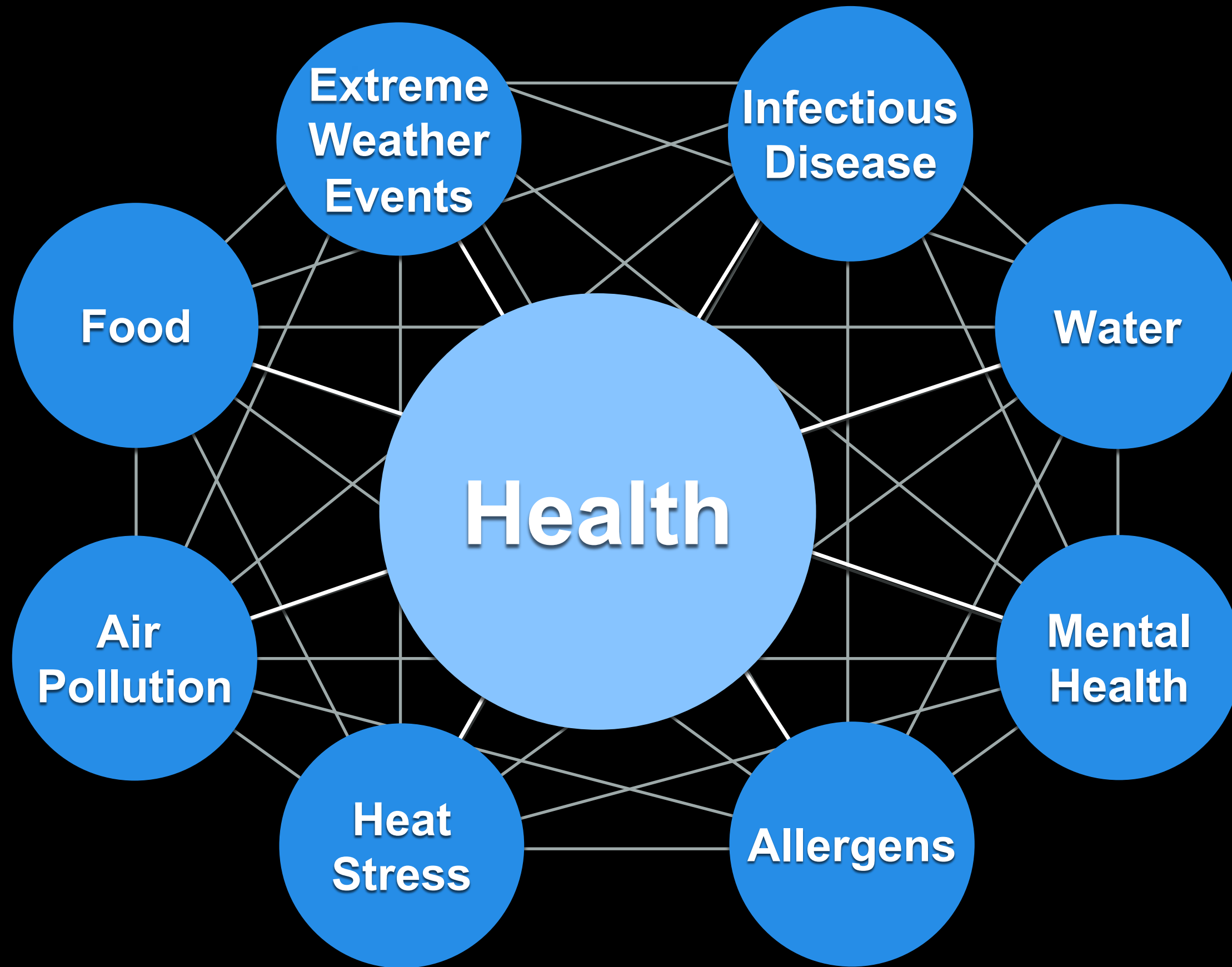
Disruptions May Lead to Political or Societal Instability



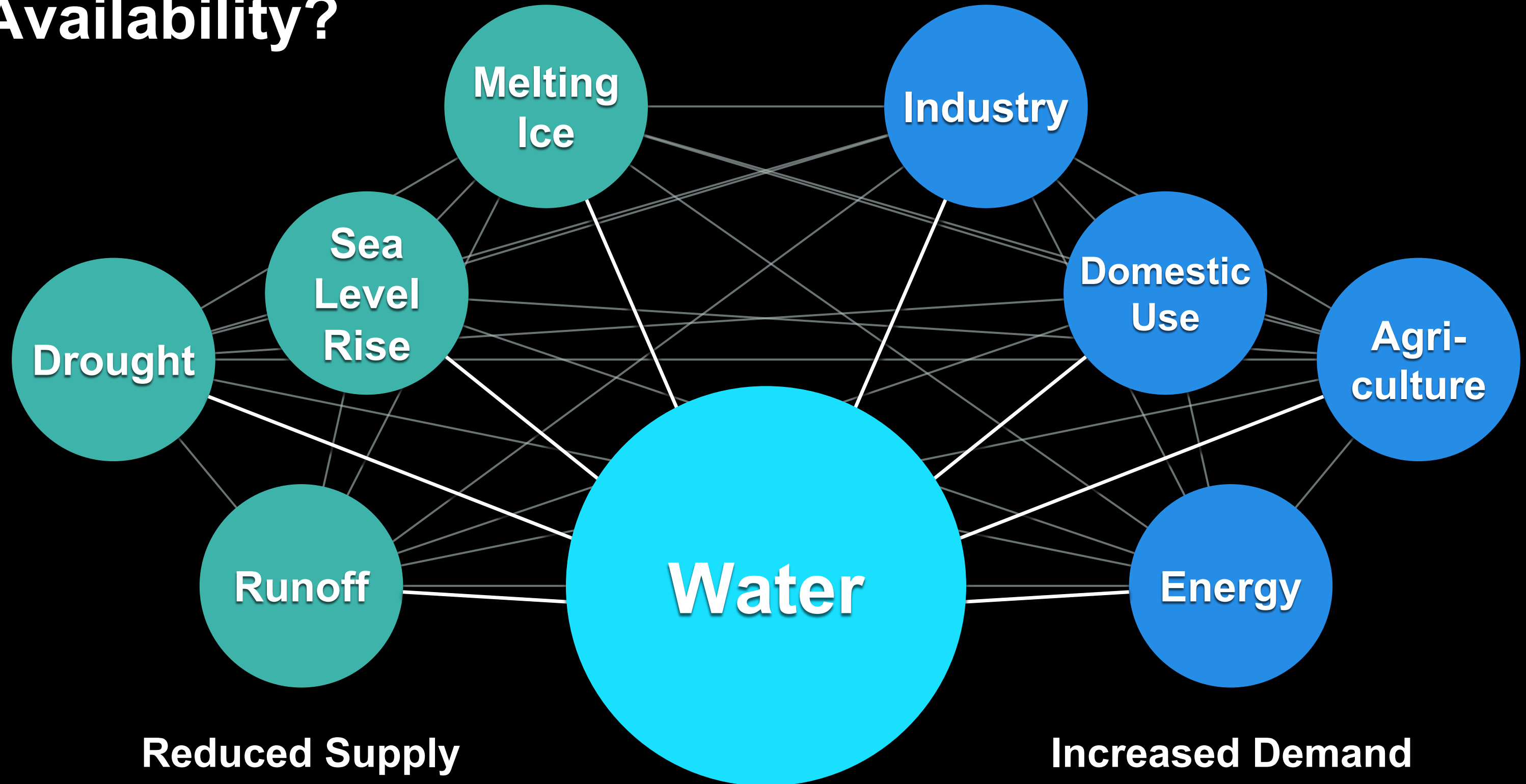
How Does Climate Change Affect Food Supply?



How Does Climate Change Affect Health?



How Does Climate Change Affect Water Availability?



It is not a Hopeless Situation

Because---

**We have
the solutions
at hand...**

Tomorrow's Earth is



Today's Responsibility

Thank You!

