

Illustration 2.1 - The greenhouse effect

CORE SERIES • EPISODE 2

SUNLIGHT IN. INFRARED HEAT OUT.

Numbers are simplified to 100 units of energy

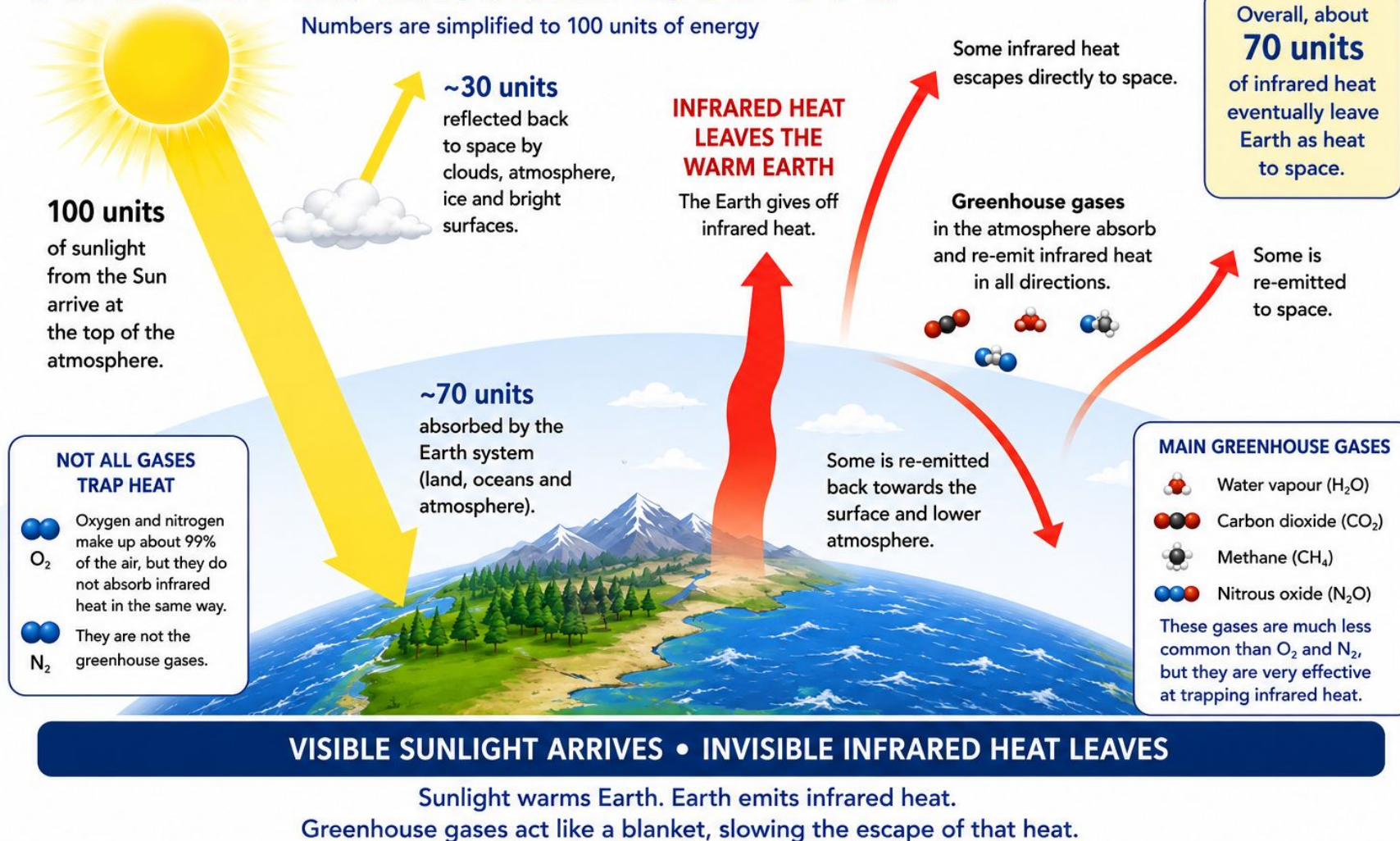


Illustration 2.2 - Gases in the atmosphere

What the atmosphere is mostly made of

Most of the air is not greenhouse gas

THE ATMOSPHERE BY VOLUME

Dry air near Earth's surface
(Water vapour varies by place and weather)



Nitrogen (N₂)
The biggest part of the air

78%



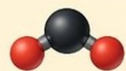
Oxygen (O₂)
Needed for breathing

21%



Argon (Ar)
A noble gas

0.9%

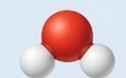


Carbon dioxide (CO₂)
A greenhouse gas

0.04%
(about 400 ppm)

Other trace gases
Neon, helium, krypton, hydrogen,
methane, nitrous oxide, ozone,
and others

**less than
0.06%**



Water vapour (H₂O)
A greenhouse gas
Varies a lot: about 0–4%

**variable
(0–4%)**

Percentages are approximate.
They can vary slightly with location and altitude.



THE KEY TAKEAWAY

Most of the atmosphere is nitrogen and oxygen.
But the greenhouse effect depends on **what gases do**, not just how much of the air they make up.

NOT ALL GASES TRAP HEAT IN THE SAME WAY

Main gases in the air
Do NOT absorb infrared
heat in the same way



Nitrogen (N₂)
78% of the air



Oxygen (O₂)
21% of the air

These gases make up about 99%
of the atmosphere, but they do
not interact with infrared heat in
the same way as greenhouse
gases do.

Infrared
heat from
Earth



Greenhouse gases
Can absorb and re-emit
infrared heat



Carbon dioxide (CO₂)
0.04% (about 400 ppm)



Methane (CH₄)
Trace amounts (about 2 ppm)



Water vapour (H₂O)
Variable (0–4%)



Nitrous oxide (N₂O)
Trace amounts (about 0.3 ppm)

Even though these gases are present
in small amounts, they are very
effective at absorbing and re-emitting
infrared heat.

Illustration 2.3 - Evidence for the greenhouse effect

How we know the greenhouse effect is real

Scientists have several independent lines of evidence.

Together they tell the same story.

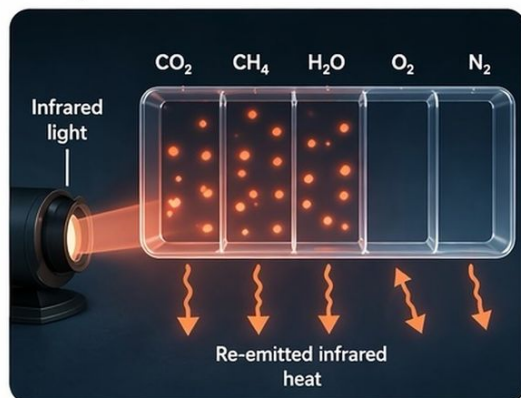
1

LABORATORY TESTS

The physics can be tested.

In the lab, scientists shine infrared light through different gases.

Greenhouse gases absorb some of it and re-emit it. Oxygen and nitrogen mostly do not.



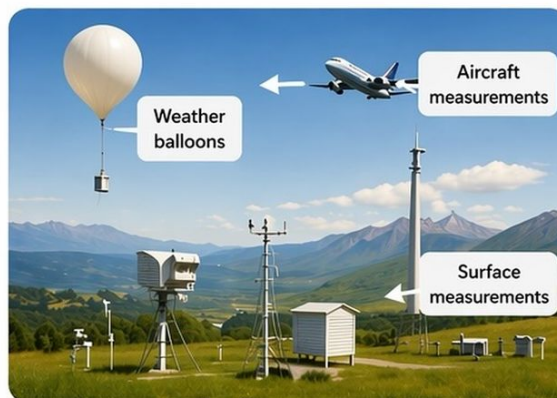
Many greenhouse gases absorb and re-emit infrared heat. Oxygen and nitrogen do not (or only extremely weakly).

2

MEASUREMENTS IN THE ATMOSPHERE

We can measure greenhouse gases.

Instruments on the ground, on balloons and on aircraft measure greenhouse gases directly. They also measure infrared radiation going up and down.



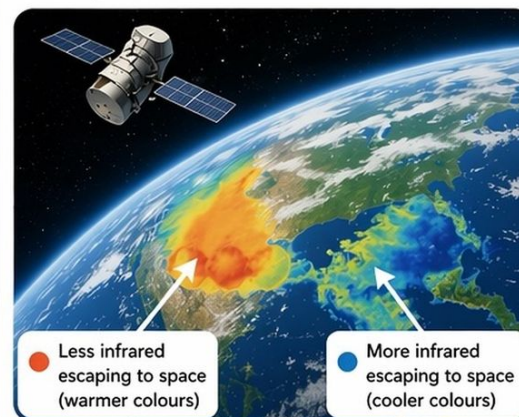
These measurements show that greenhouse gases are present, in the amounts we expect, and that they affect infrared radiation in the real atmosphere.

3

OBSERVATIONS FROM SPACE

Satellites see Earth's heat.

Satellites measure the infrared radiation leaving Earth. They see where more heat escapes to space and where less escapes. The pattern matches what the greenhouse effect predicts.



Satellites confirm that greenhouse gases are keeping some of Earth's heat from escaping to space.



THE BIG PICTURE

Lab physics, real-world measurements, and satellite observations are three independent lines of evidence. All three show the same thing: greenhouse gases absorb and re-emit infrared heat, which slows the loss of heat from Earth to space. **That is the greenhouse effect.**

Classroom illustration - Timber: building with less carbon

