





Lithosphere

(Rocky Sphere)

- Solid, rocky, outer layer of the Earth.
- Includes the crust and part of the upper mantle.

Thickness: Approximately 50 – 250 km

Minerals: Solid, inorganic substances that have a clearly defined composition and properties.



Rocks: Heterogeneous solids composed of minerals





Mining in Quebec

● Nickel

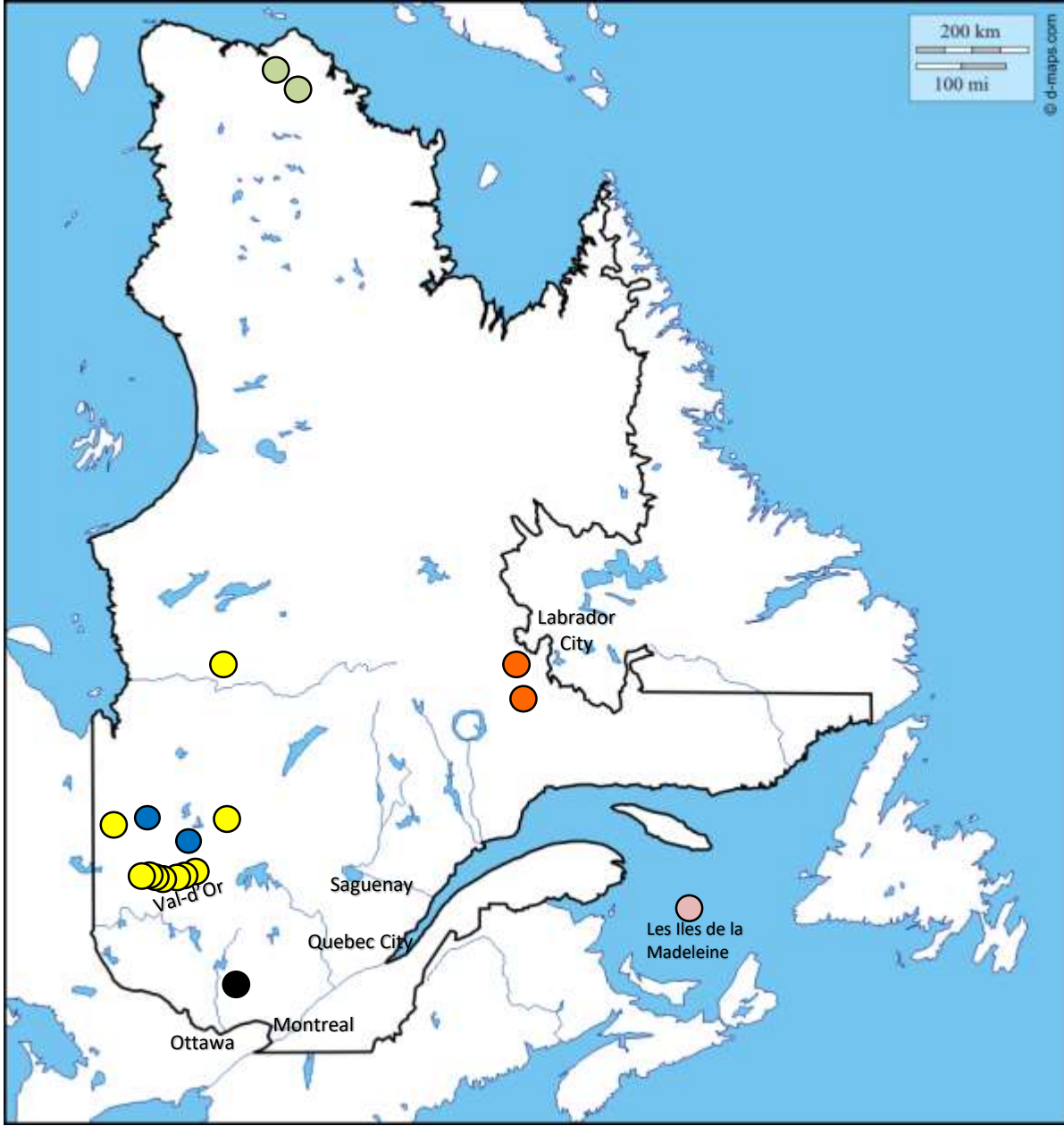
● Gold
Silver
Copper

● Zinc

● Graphite

● Iron

● Salt



Permafrost



Permafrost

Ground that is at a temperature of 0°C or below for more than 2 years.

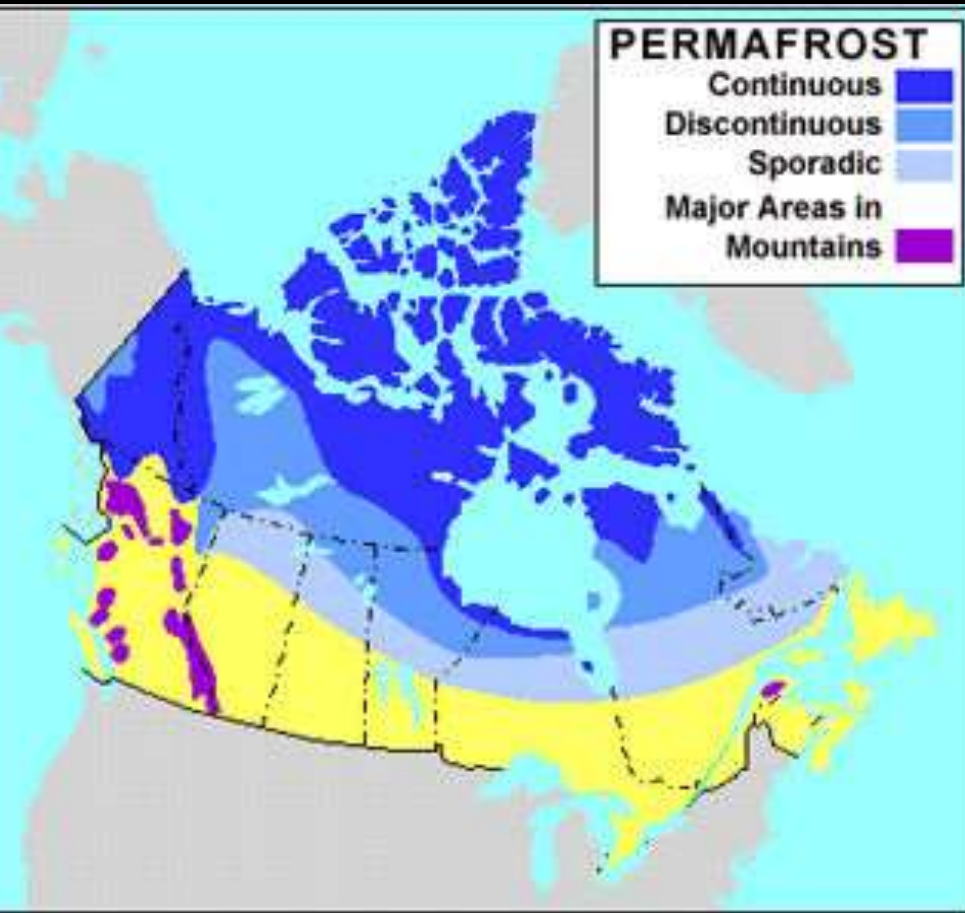


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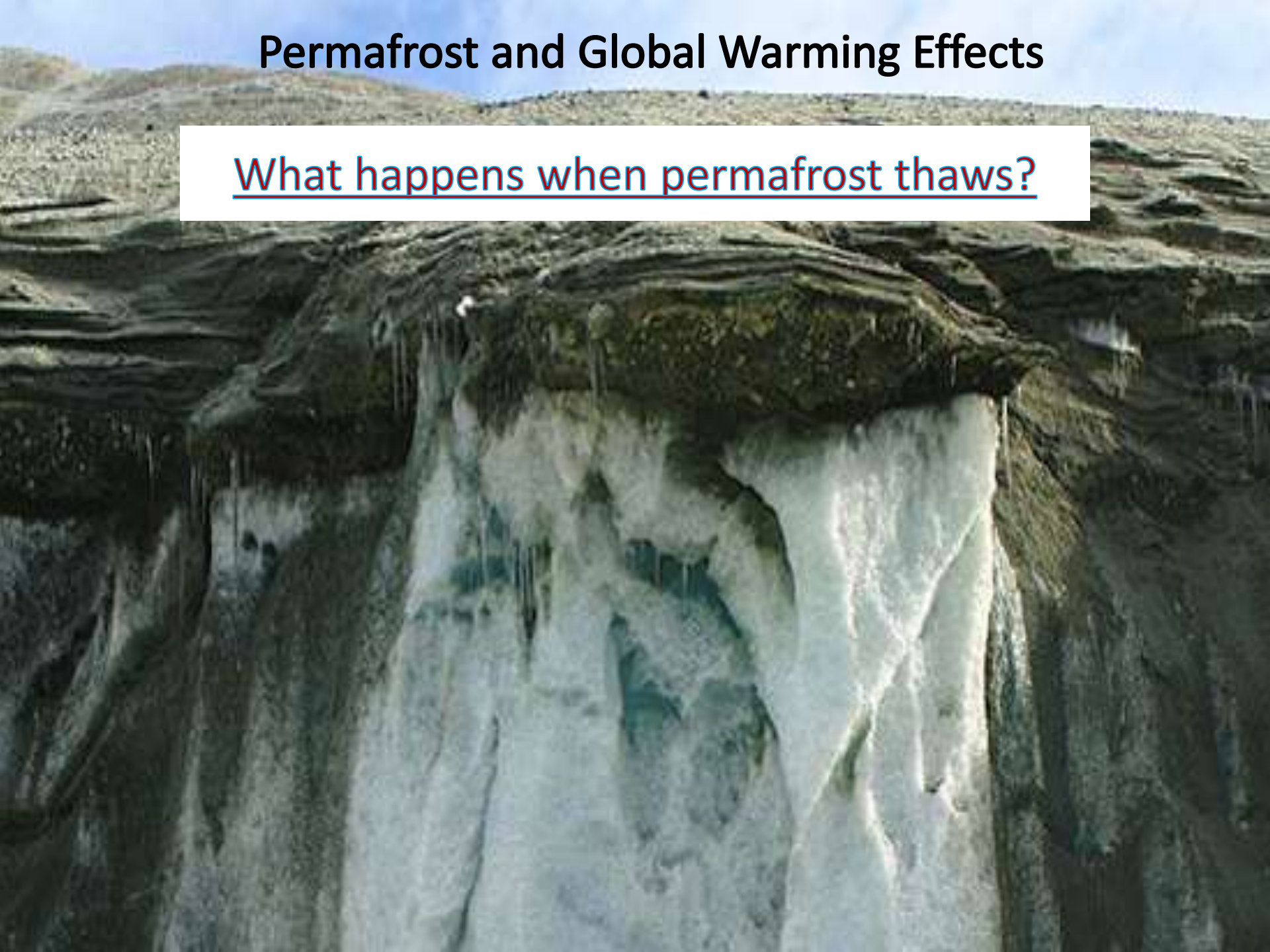


Permafrost Regions



Permafrost and Global Warming Effects

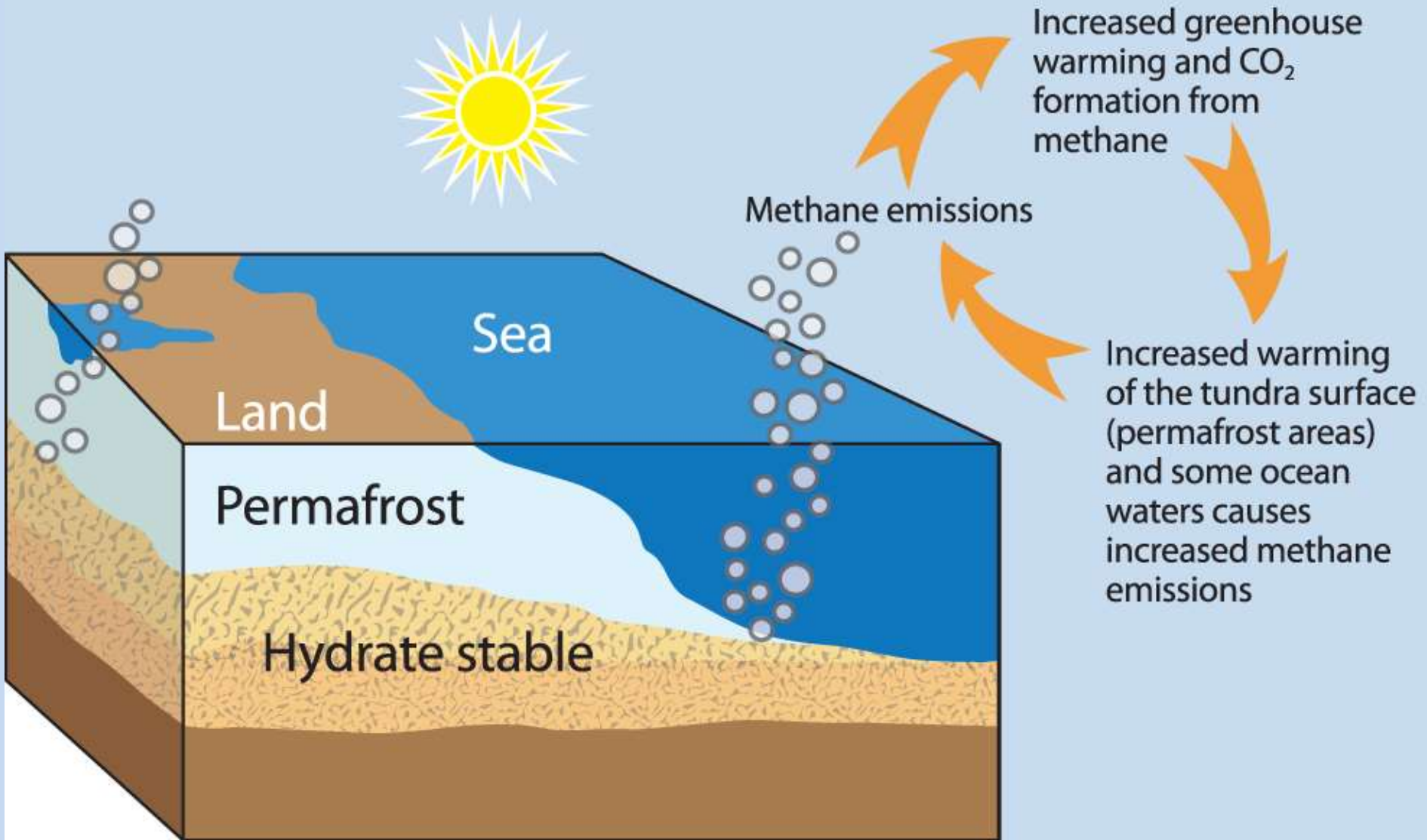
What happens when permafrost thaws?



- Permafrost contains massive amounts of frozen organic material.

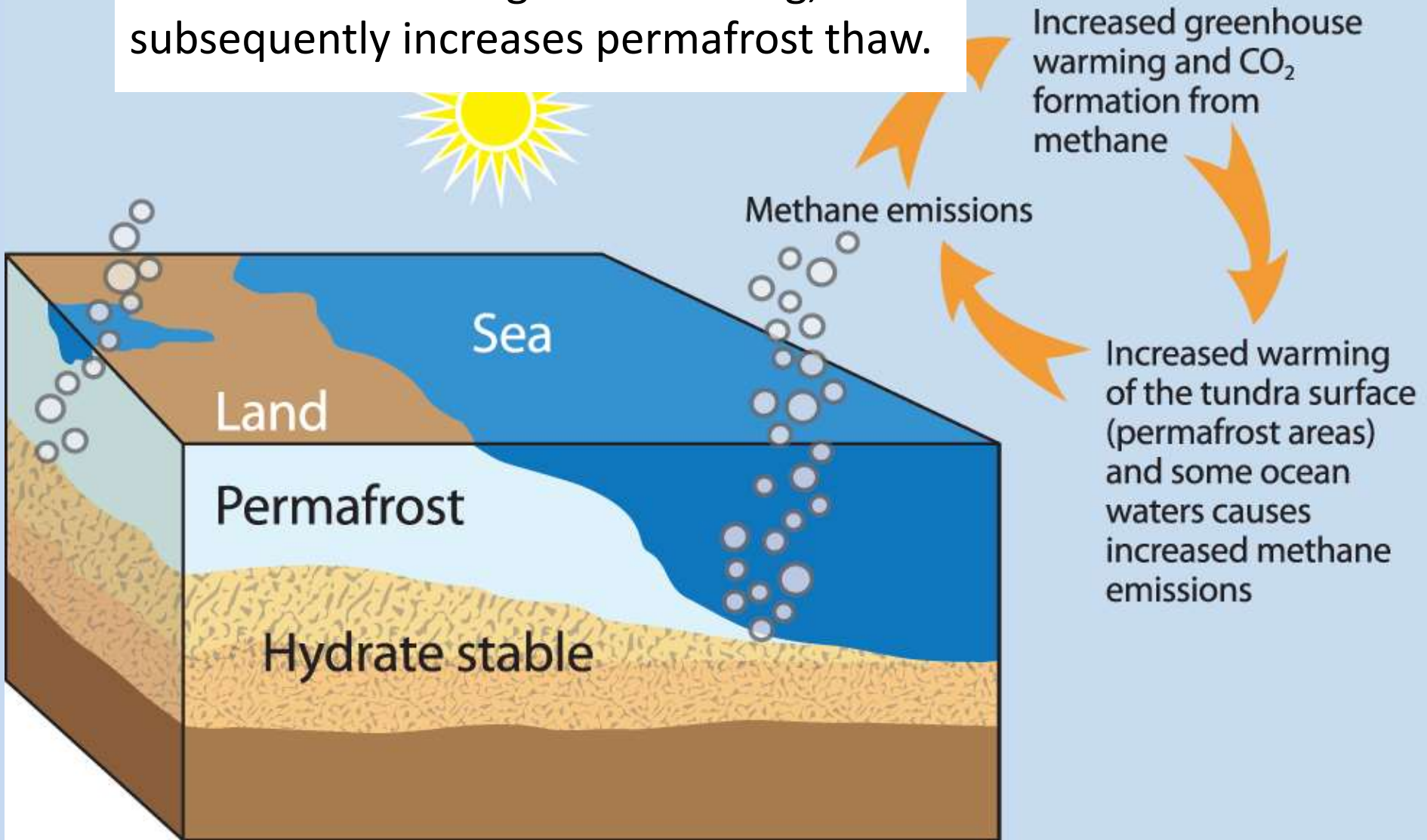


As permafrost thaws, large amounts of carbon/methane are released into the atmosphere.



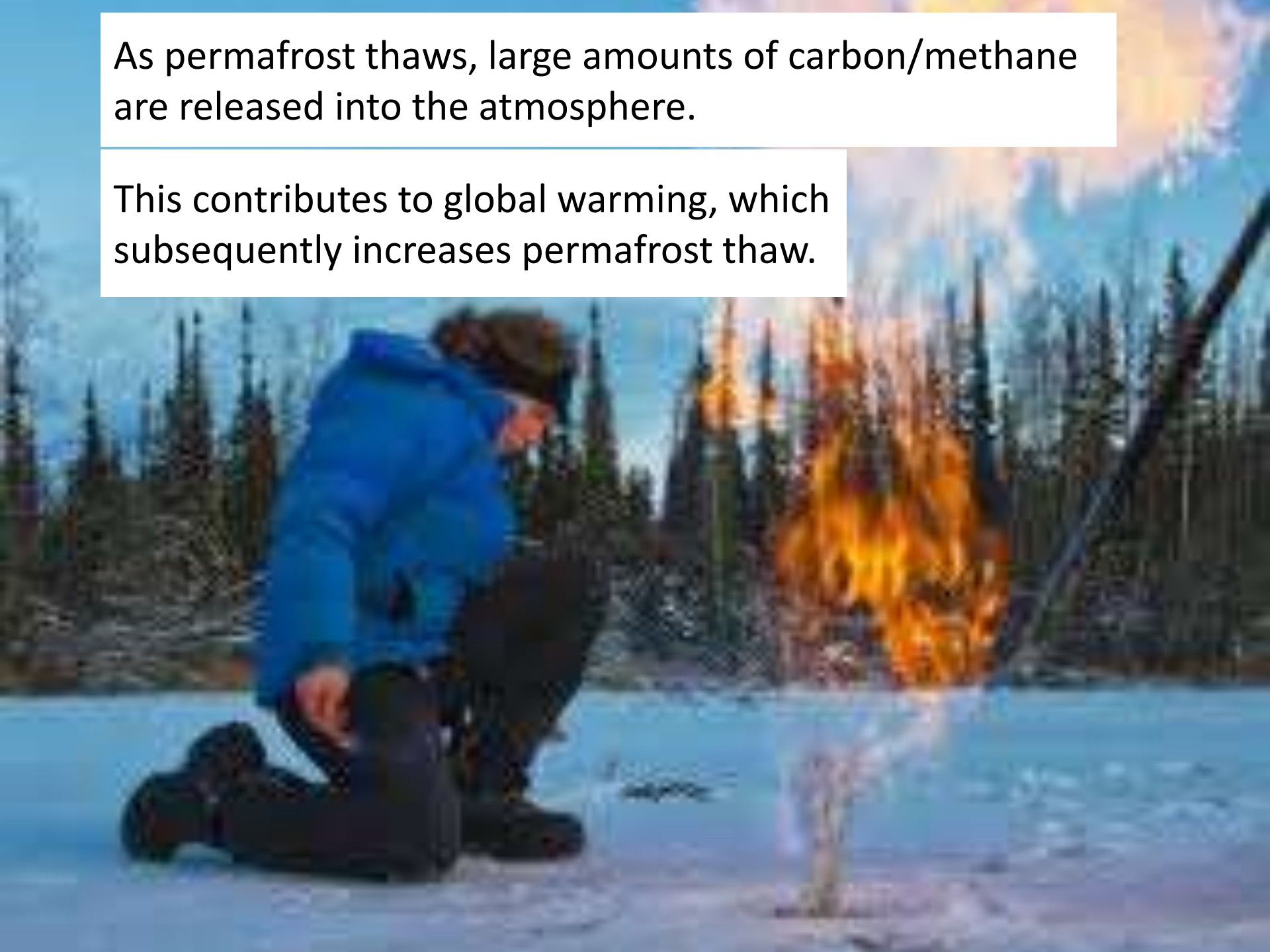
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- Permafrost stabilizes the ground in many mountain regions.



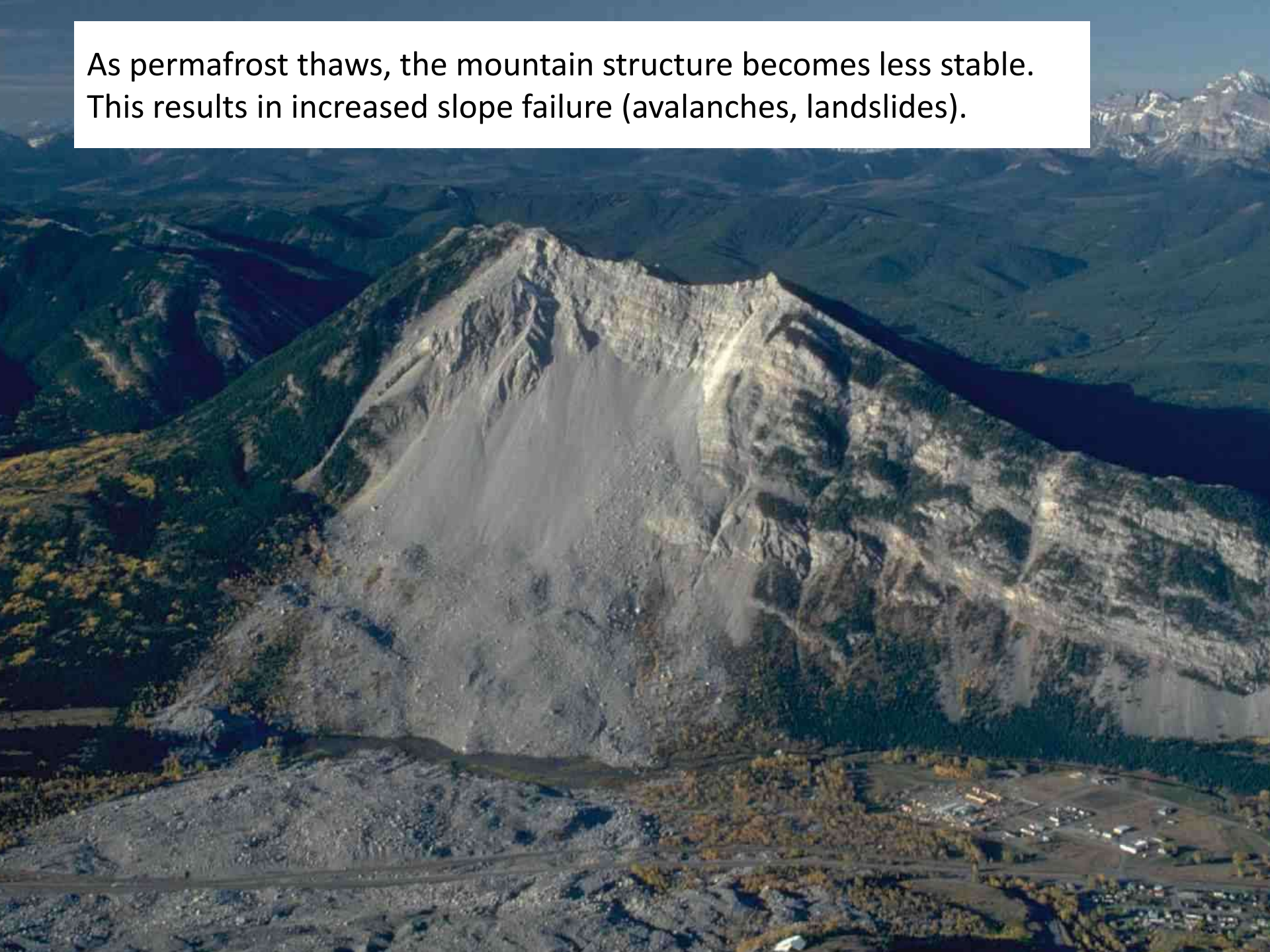
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- Permafrost stabilizes the ground under many man-made structures.



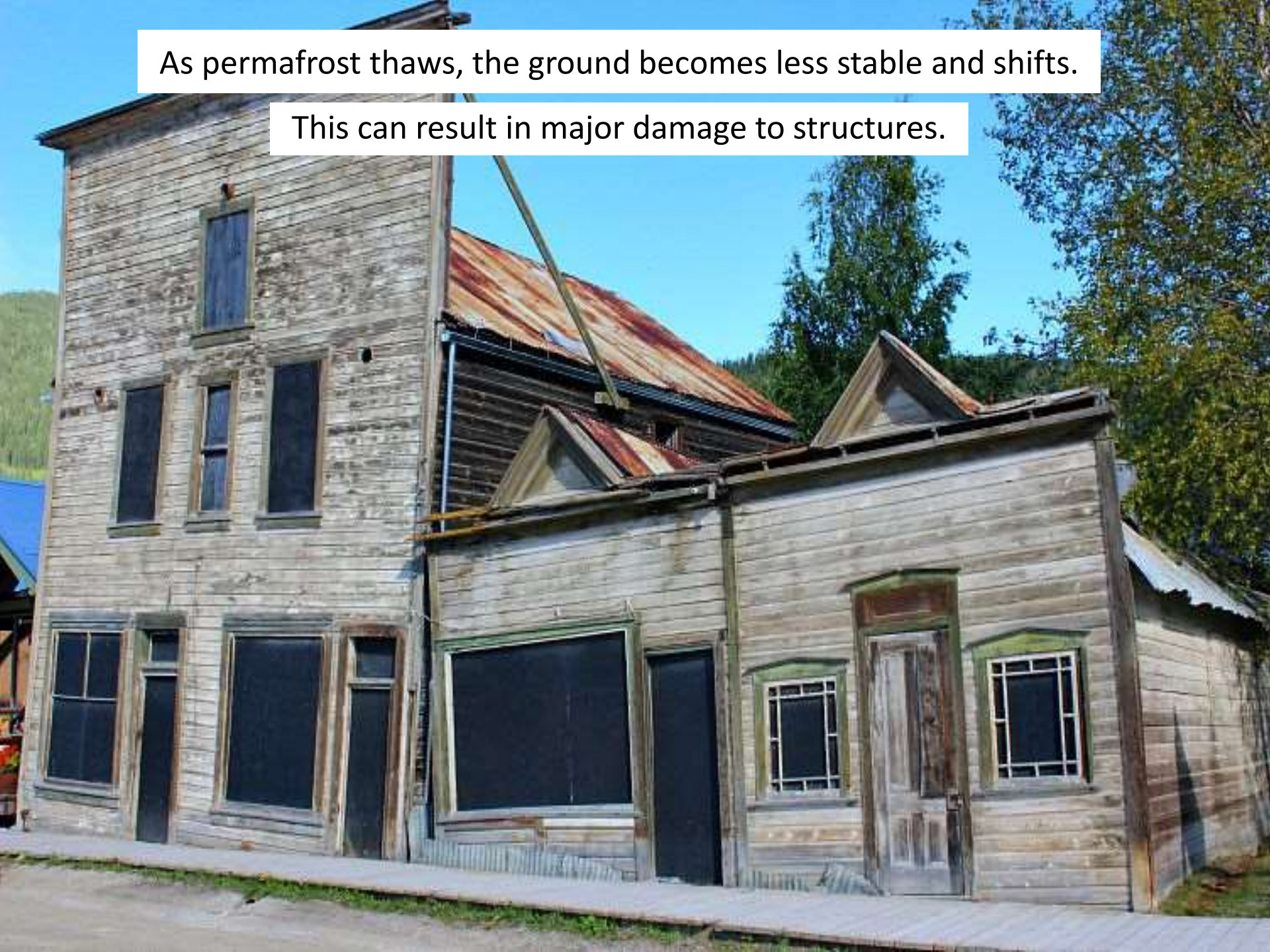
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This can result in major damage to structures.



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Energy Resources in the Lithosphere

- Fuel that results from the decay of plants and animals in the ground.



Energy Resources in the Lithosphere

Fossil Fuels

- Includes coal, oil and natural gas.
(a solid) (a liquid) (a gas)



Energy Resources in the Lithosphere

Fossil Fuels

Heat

Motion

Electricity

Chemical
Energy

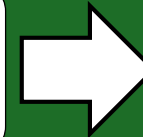


Burning

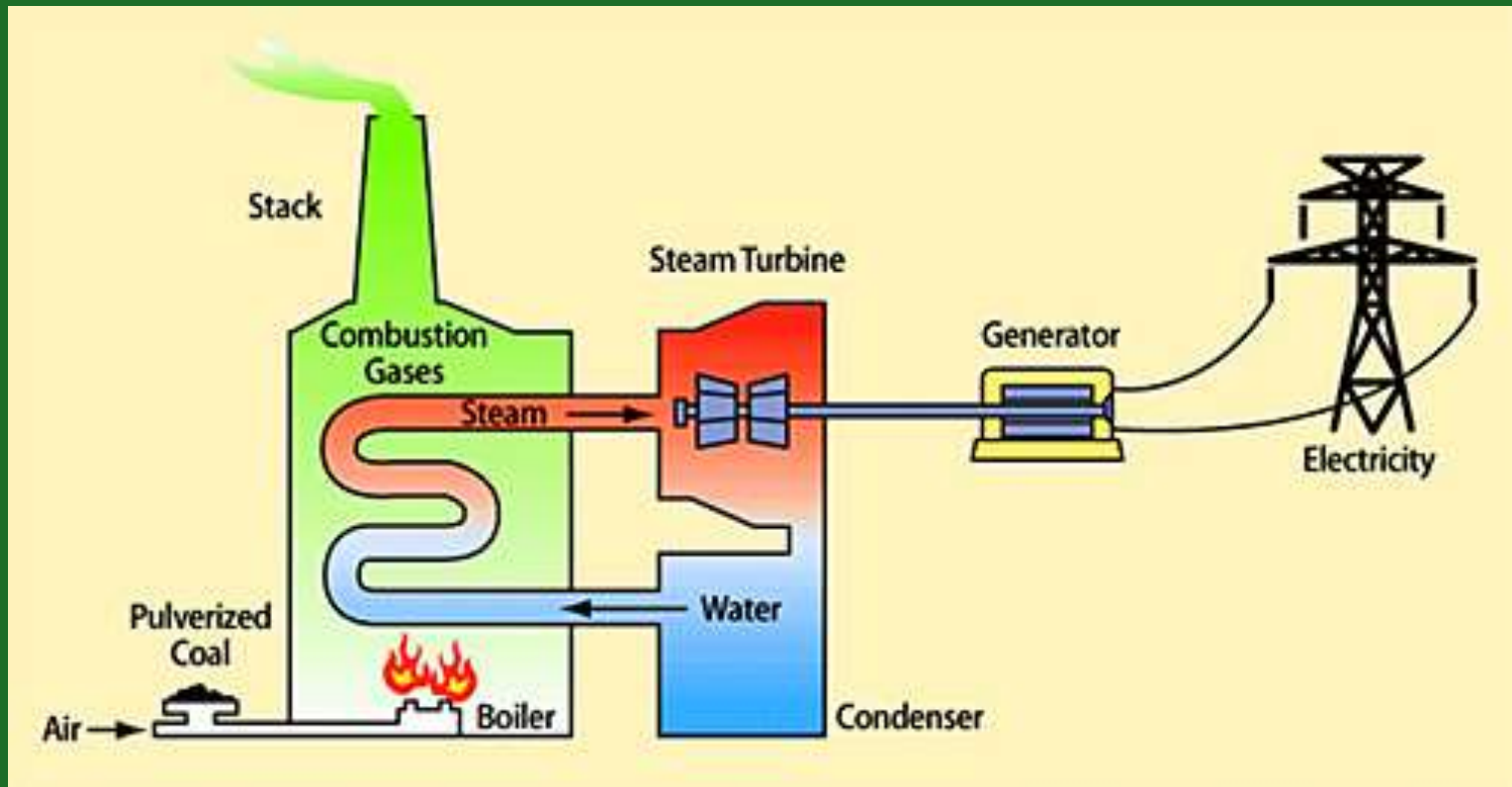
Thermal
Energy



Kinetic
Energy

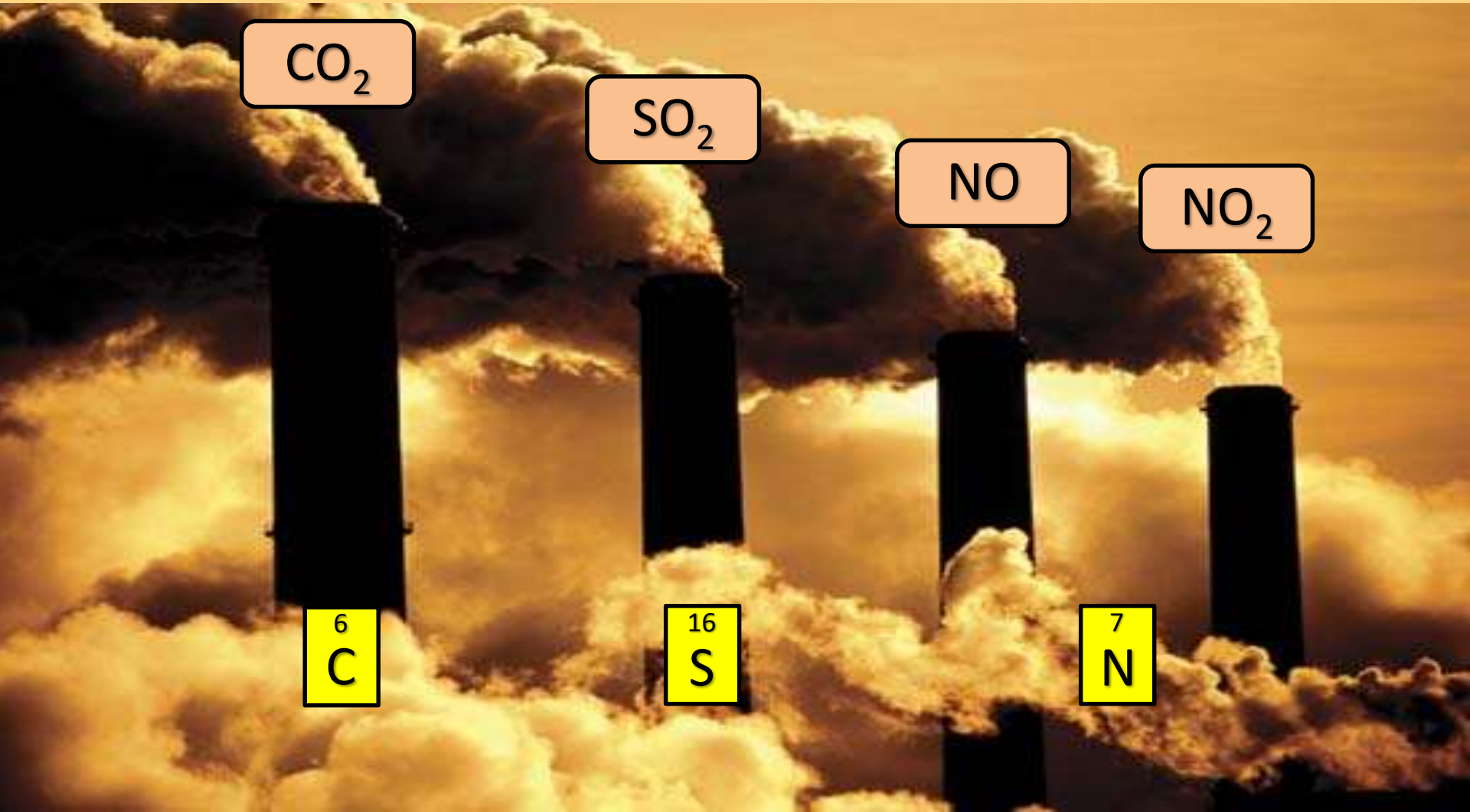


Electrical
Energy



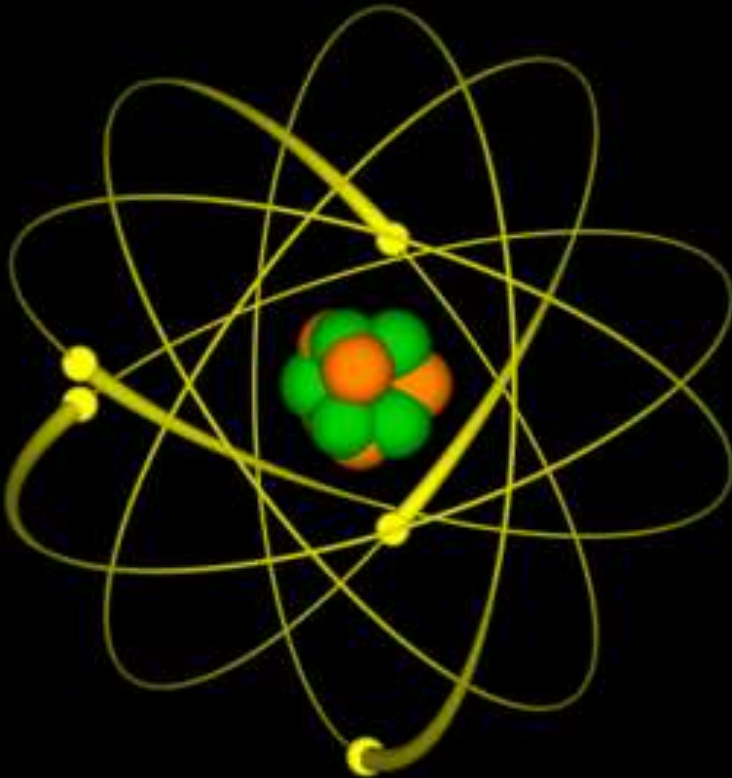
Gases released into the atmosphere by burning fossil fuels:

- Carbon dioxide, CO_2 ; major greenhouse gas.
- Sulphur dioxide, SO_2 and nitrogen oxides, NO_x ; cause acid rain.



Nuclear

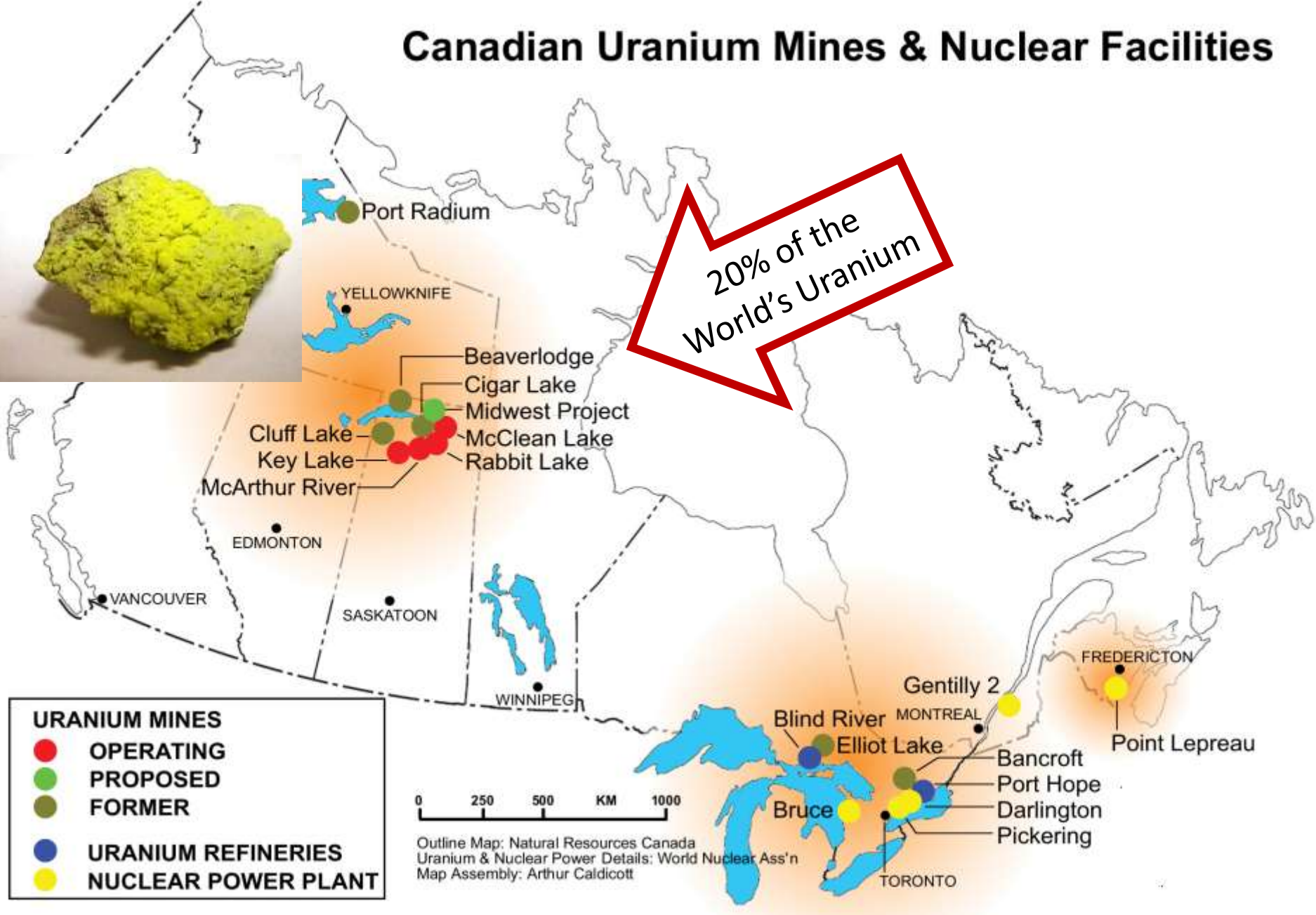
- Uranium, U, is a radioactive element that occurs naturally in the Earth's crust.



Canadian Uranium Mines & Nuclear Facilities



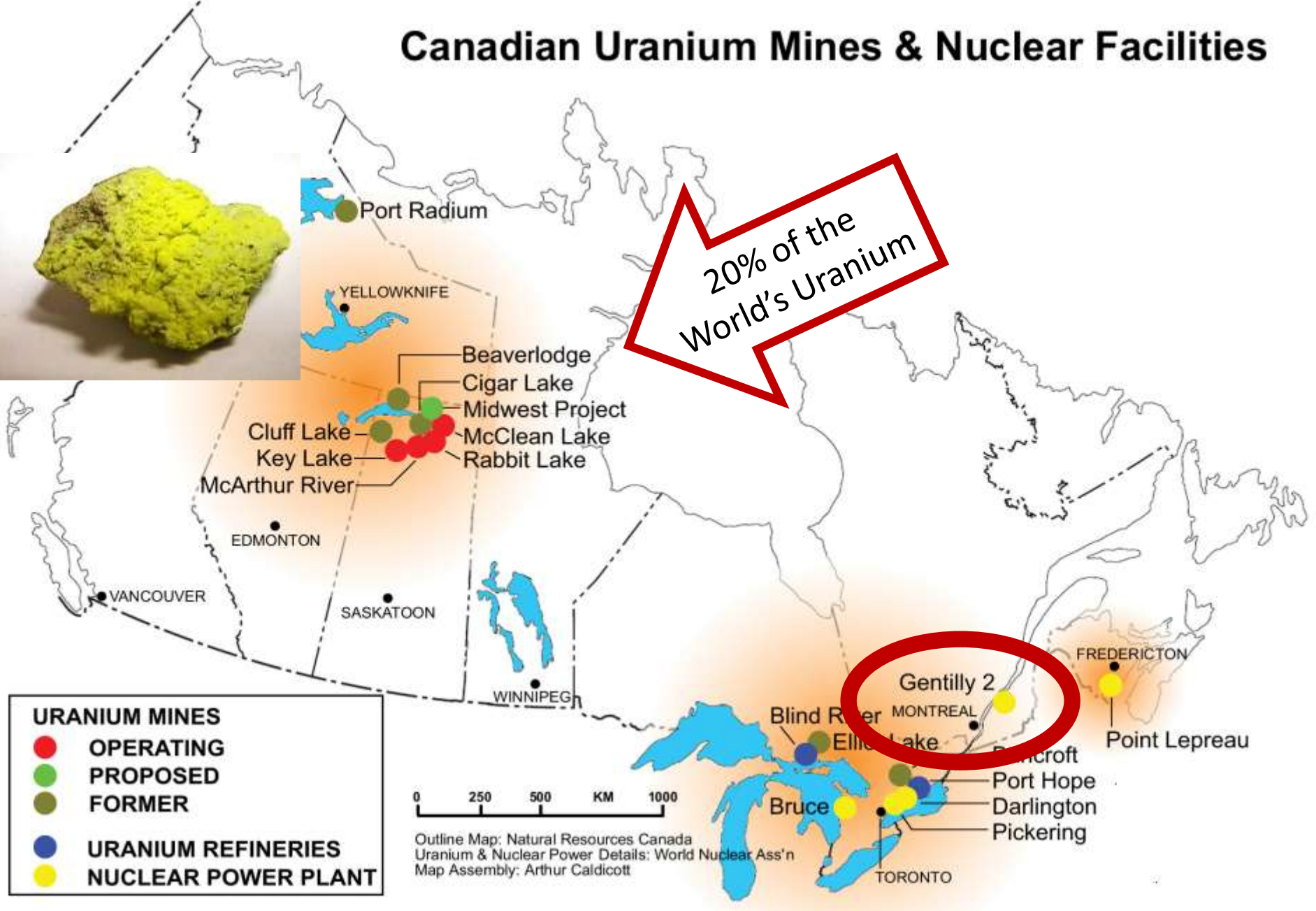
20% of the World's Uranium



Canadian Uranium Mines & Nuclear Facilities



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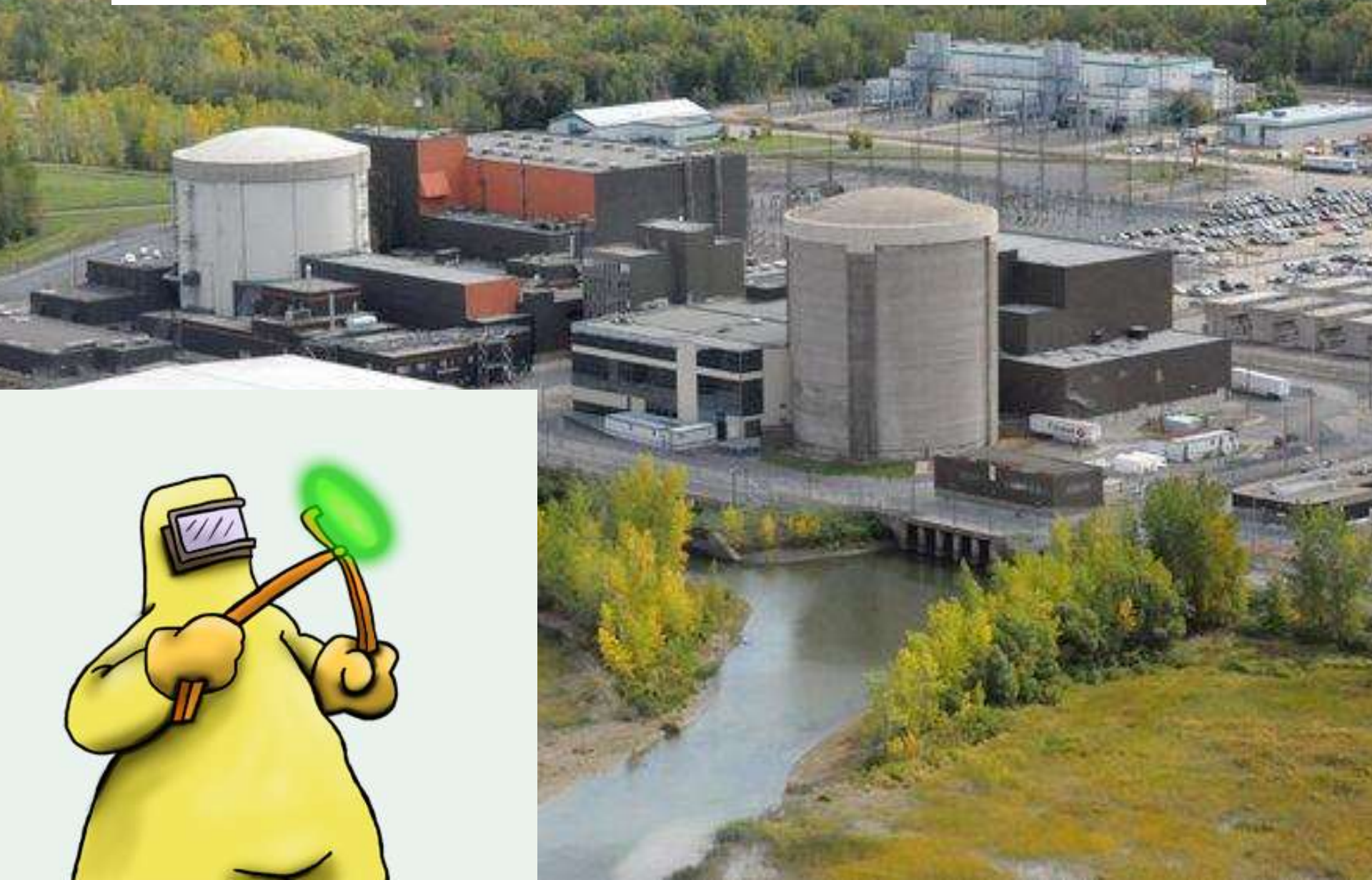
CENTRALE NUCLÉAIRE GENTILLY 2

4900 BOUL. BÉCAULIÈRE

CLOSED: 2012

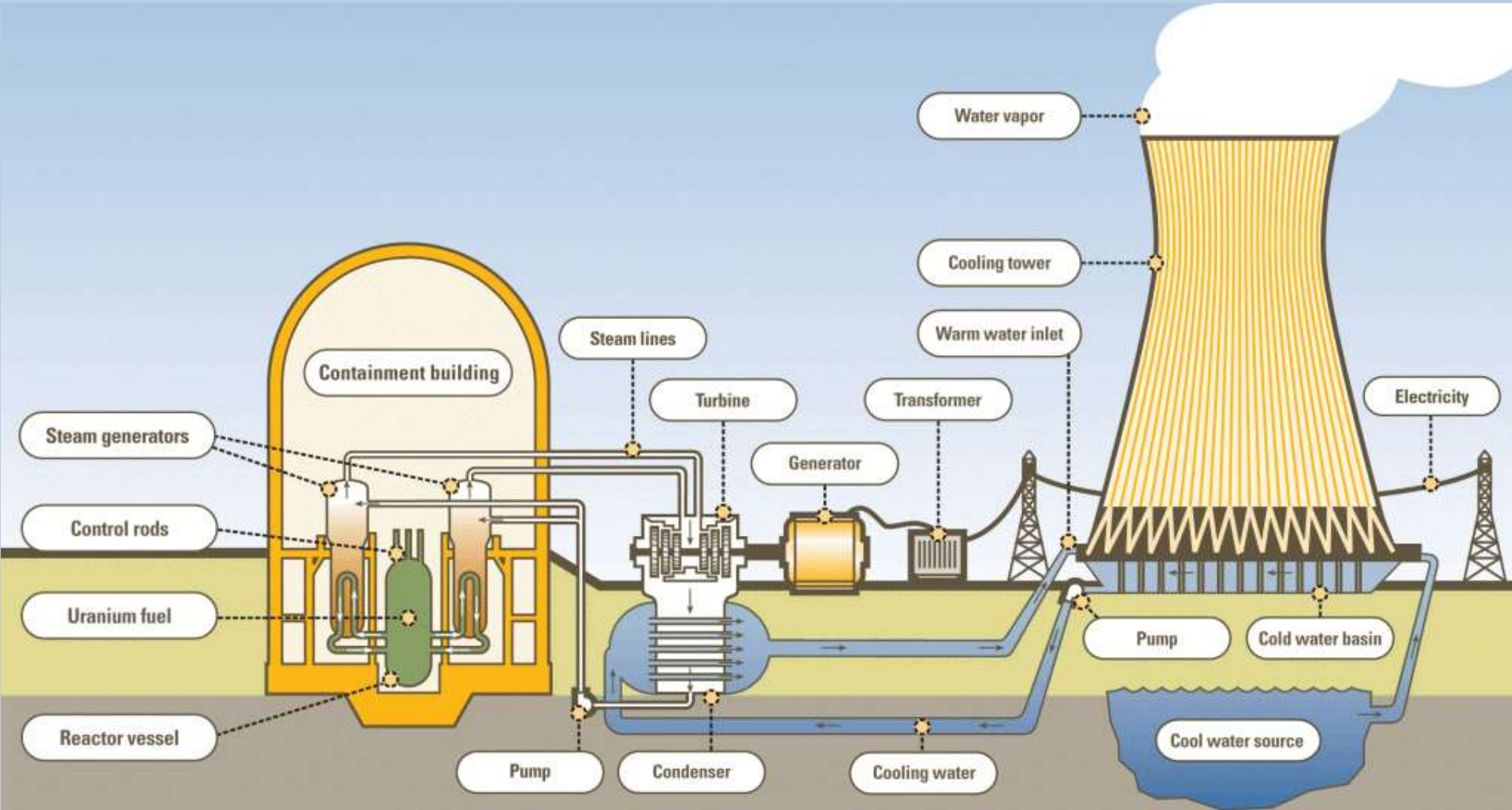
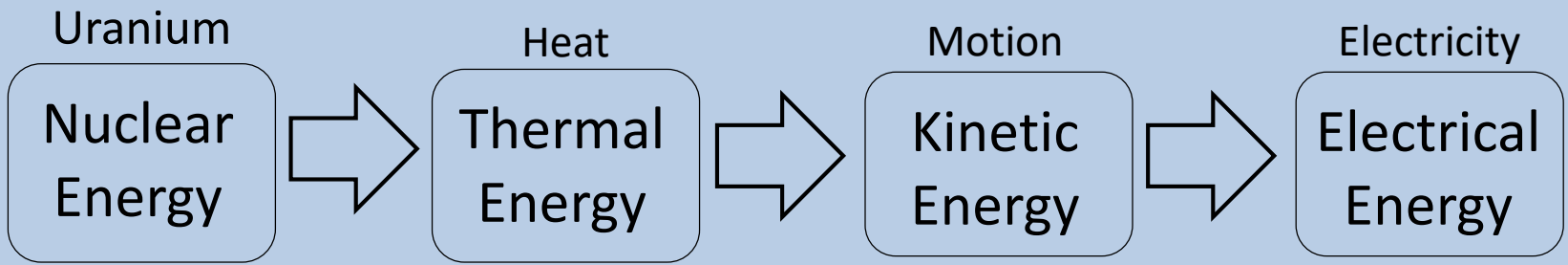
NE PAS D'ENTRER SANS
AUTORISATION

- Heat emitted during nuclear fission is converted (transformed) into electrical energy.



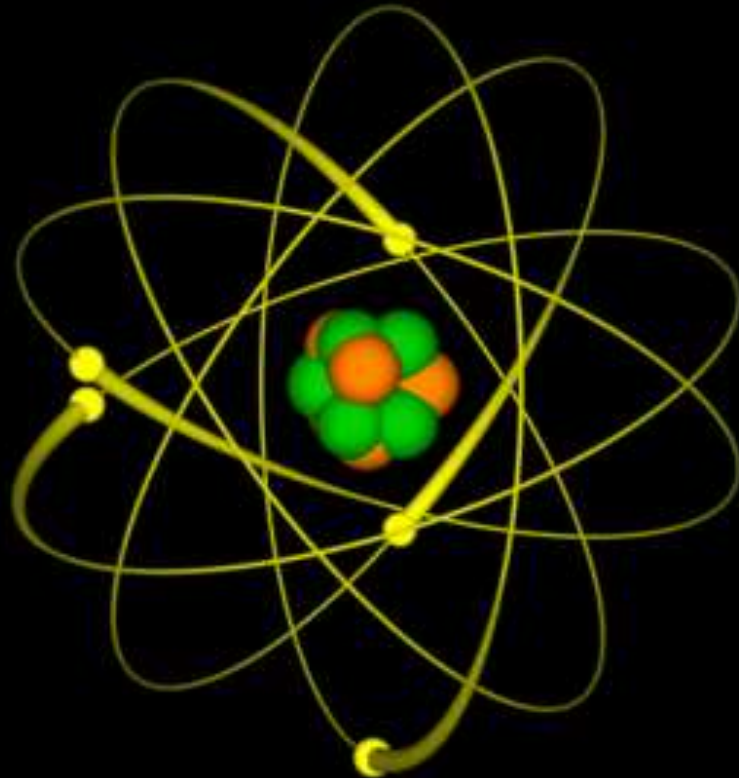
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Nuclear Energy

Advantage: Large amount of energy from a small amount of matter.



Nuclear Energy

Concerns: Radioactive waste and consequences of an accident.



Pripyat, Ukraine (before 1986)

Chernobyl Nuclear Power Plant



Abandoned city of Pripyat, Ukraine (After 1986)

Chernobyl Nuclear Power Plant



Where was affected?

While much of the nuclear fallout fell close to Chernobyl – mainly Russia, Ukraine and Belarus – after the disaster traces of radioactive deposits were found in most countries in the Northern Hemisphere. Fluctuating winds meant some areas were affected worse than others.

Dose = multiples of normal rate

10⁻²-1

1-5

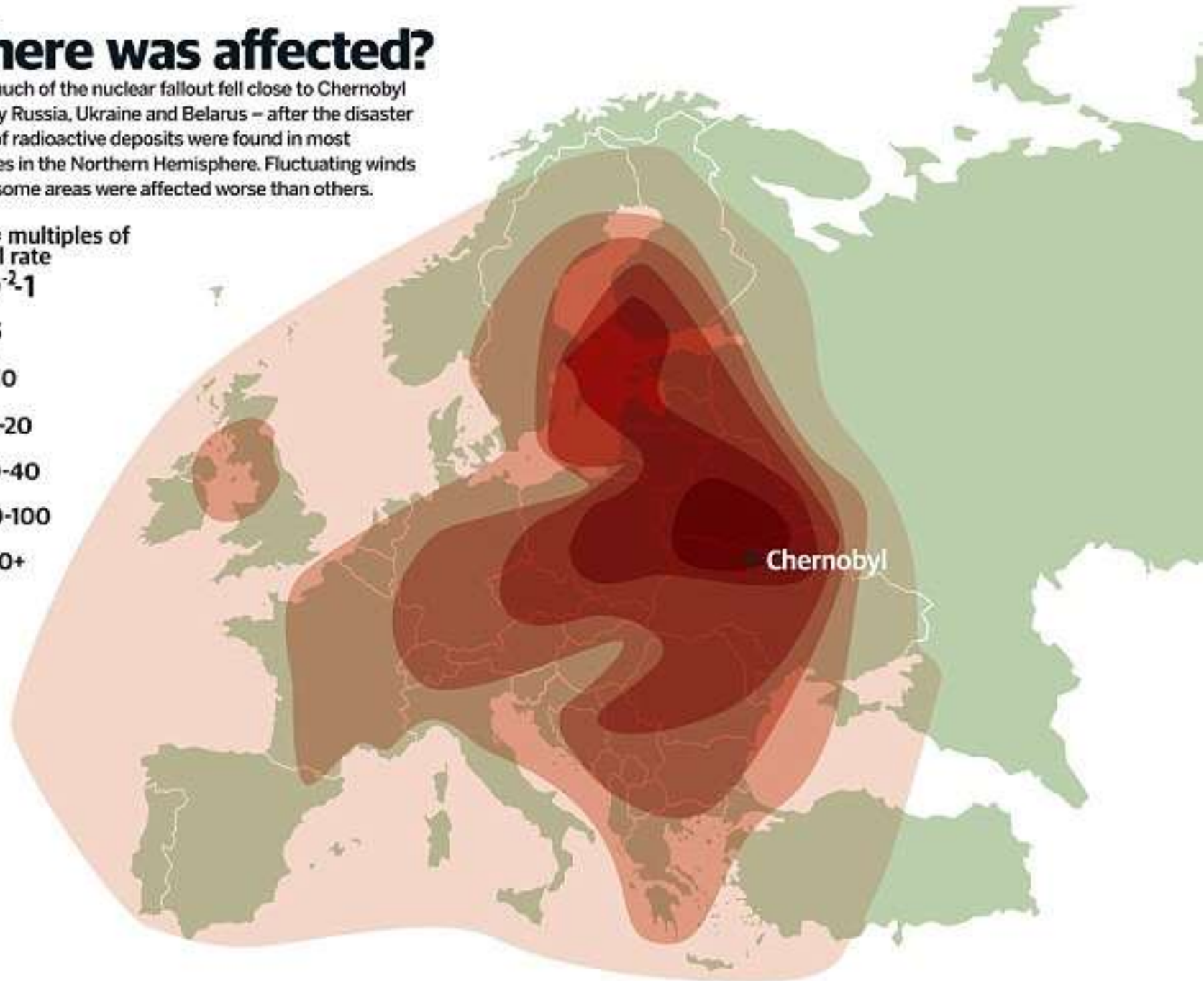
5-10

10-20

20-40

40-100

100+





March 2011

Earthquake
causes a
Tsunami



FUKUSHIMA





NUCLEAR FALLOUT MAP



One other energy resource from the lithosphere ...

One other energy resource from the lithosphere ...



Geothermal

Energy obtained from the internal heat of the Earth.



Geothermal

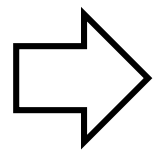
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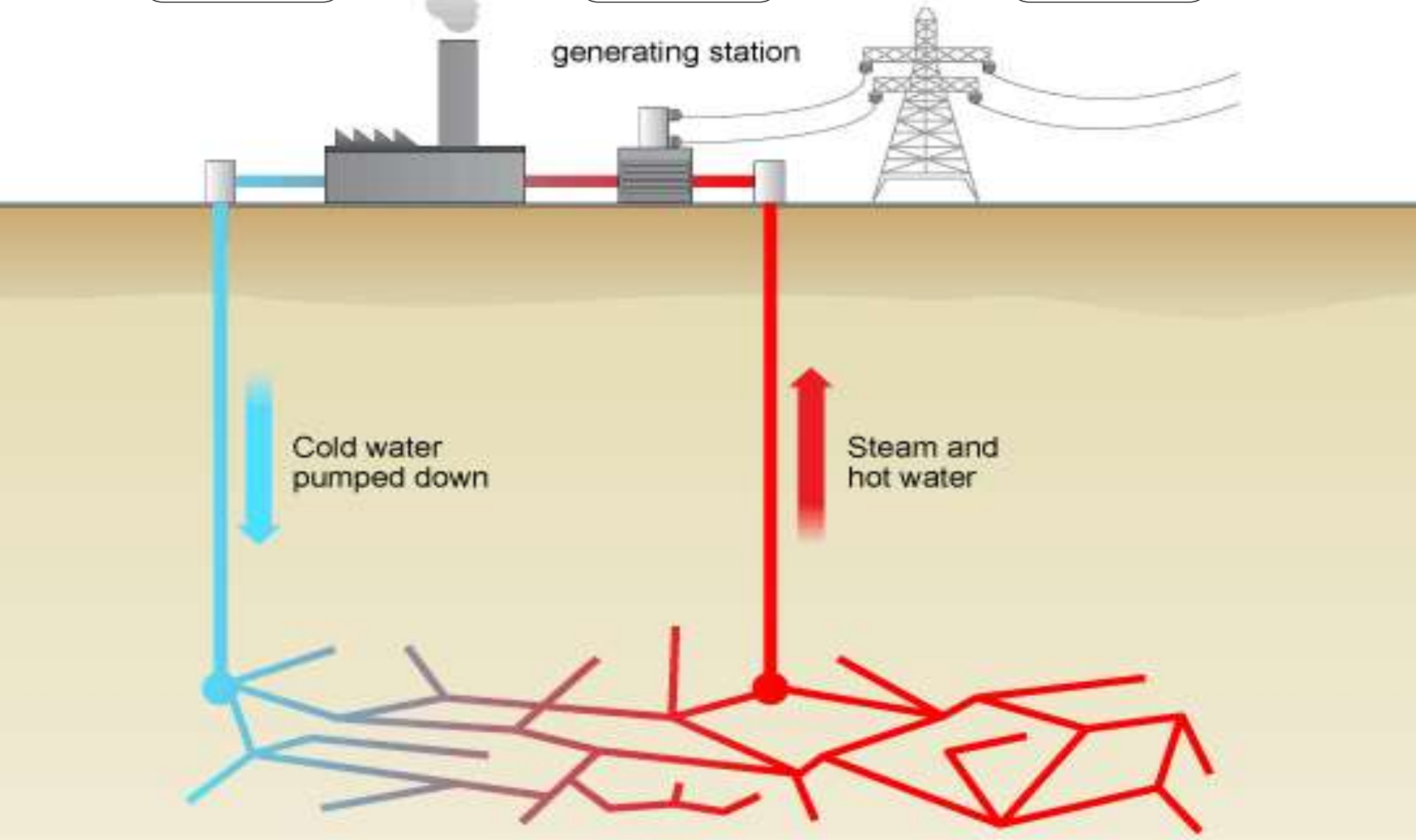
Heat
Thermal Energy



Motion
Kinetic Energy



Electricity
Electrical Energy



generating station

Cold water pumped down

Steam and hot water

Sun

**21% Absorbed by
Water Vapor & Dust**

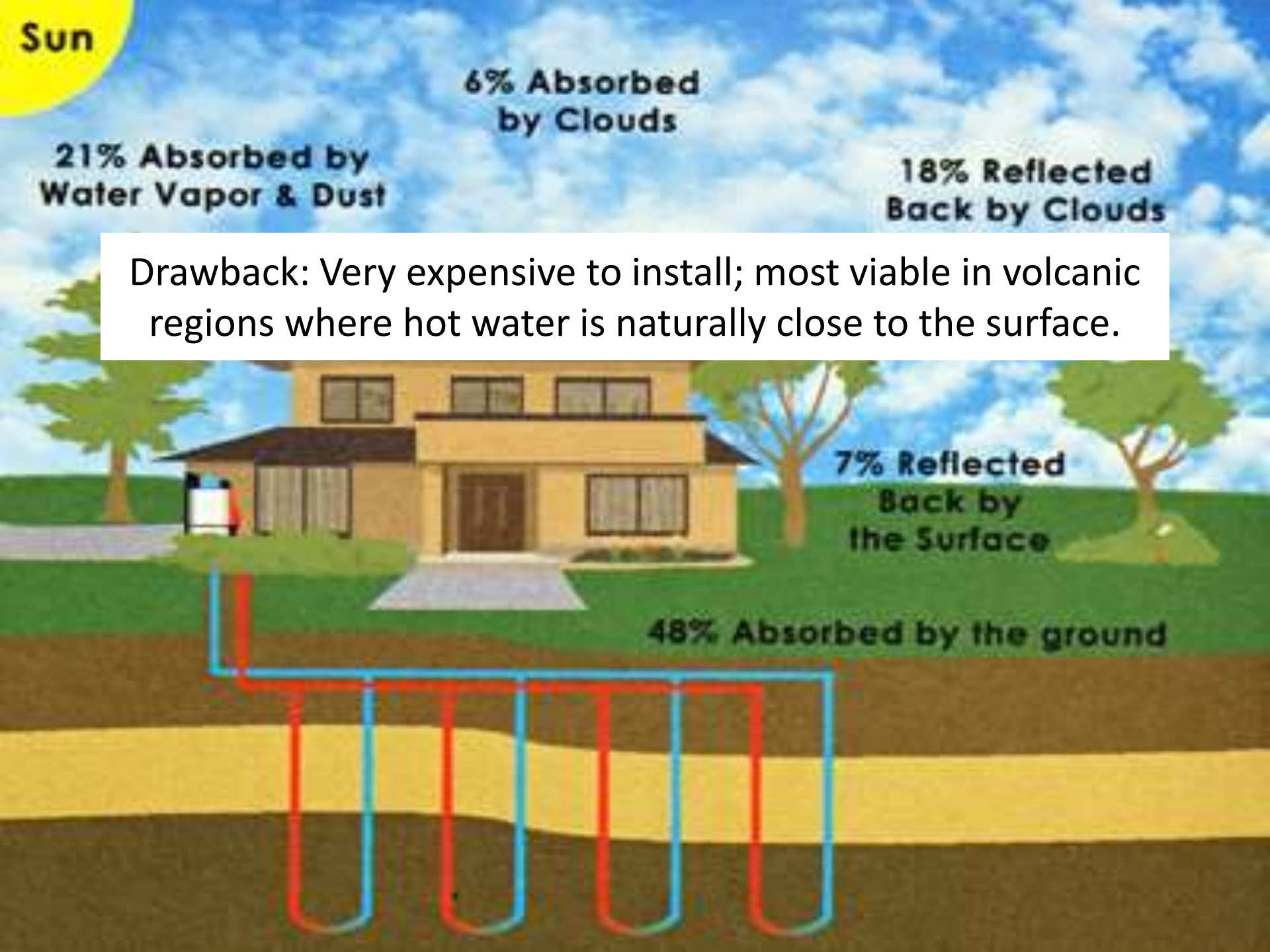
**6% Absorbed
by Clouds**

**18% Reflected
Back by Clouds**

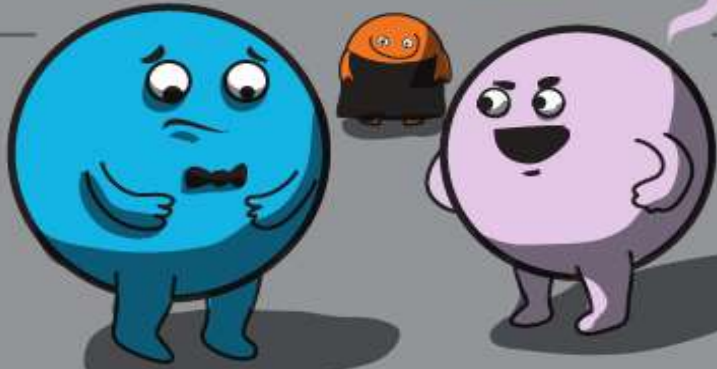
Drawback: Very expensive to install; most viable in volcanic regions where hot water is naturally close to the surface.

**7% Reflected
Back by
the Surface**

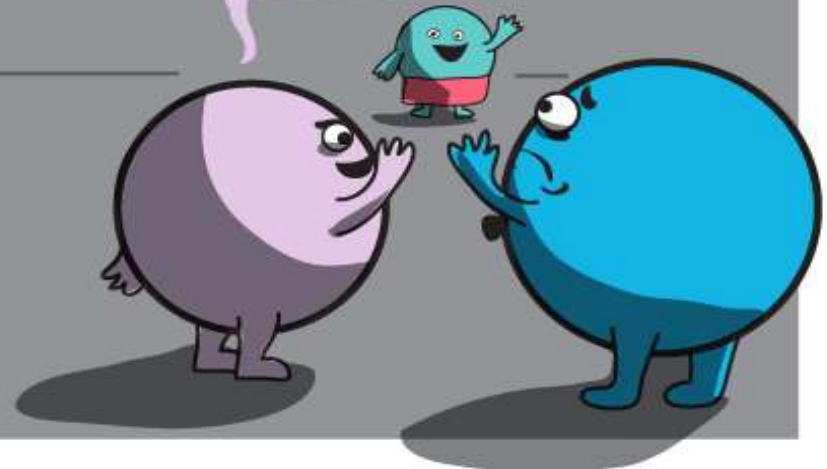
48% Absorbed by the ground



Man, Uranium, you really got yourself in a classic sitcom conundrum: two dates at the same dance.



Good luck getting out of this one!



If only you could split yourself in two, right?

