FOREST FIRES

Wildfires cause significant damage to both the environment and human settlements every year. The size of the forest lost due to fires can be significant, for example in 2023 in Canada: by September 5, more than 6,132 fires had burned a staggering 16.5 million hectares of land. To provide some context, this area is larger than Greece and more than double the previous record set in 1989. This makes 2023 a record-breaking year for wildfires in Canada and shows thatsuch firespose an ever growing danger. [1]

The Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Aqua satellite captured this view of smoke billowing from Quebec fires on June 3, 2023.

In 2023 in Canada alone, fires burnt 16.5 million hectares of forest. How many km² is that?

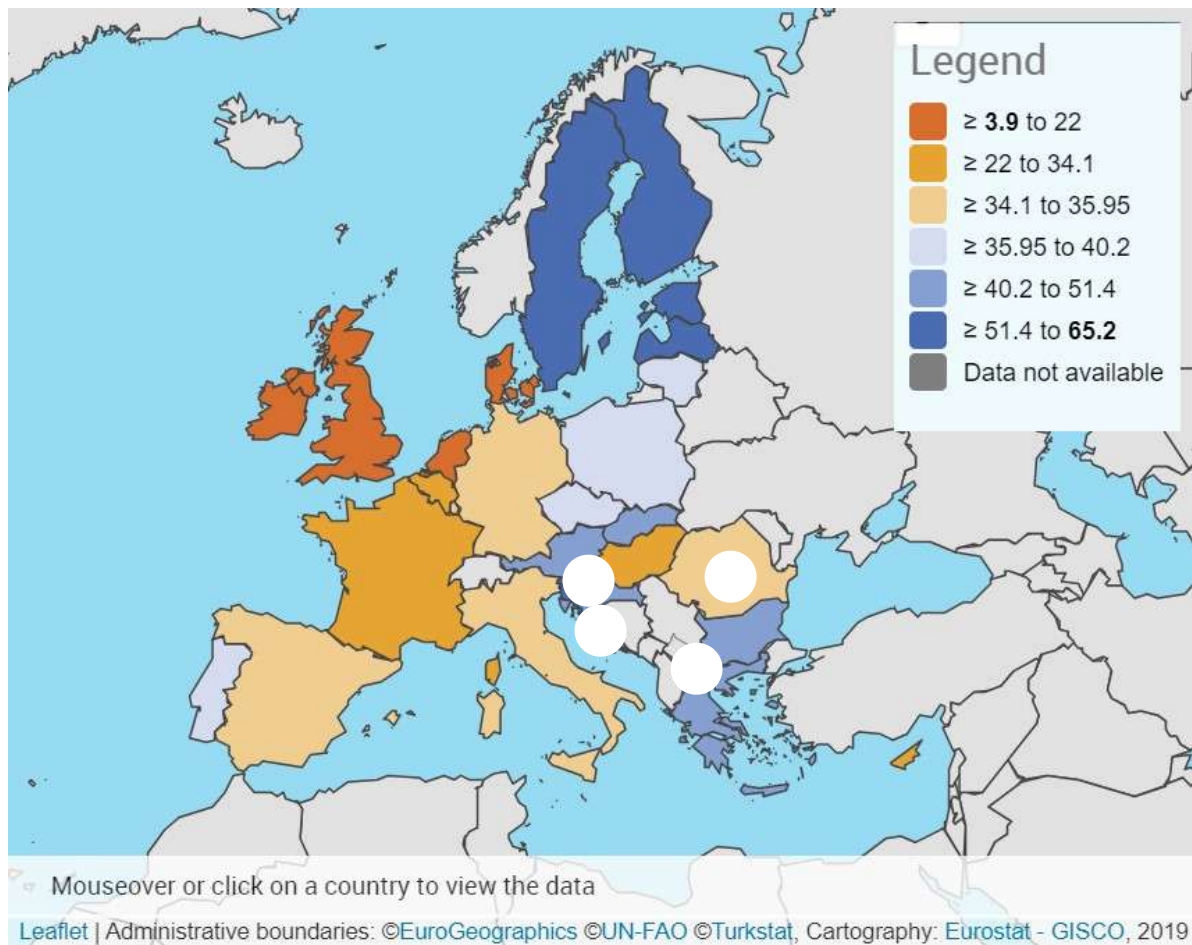| a	16,5 km2	b	165.000 km^2
c	1.650 km^2		

How does the burned area in Canada compare to the size of your country? Is it larger (👍) or smaller (👎) than your nation's total area?

If you're unsure about the size of your country, consider checking reliable sources for accurate data.

👎 👇 👍

Name the marked countries on the map. Map shows, how much area of each country is covered with forests.

Considering that nearly 40 % of North Macedonia's territory is forested, which of the marked countries has the highest percentage of its land area covered by forests?"

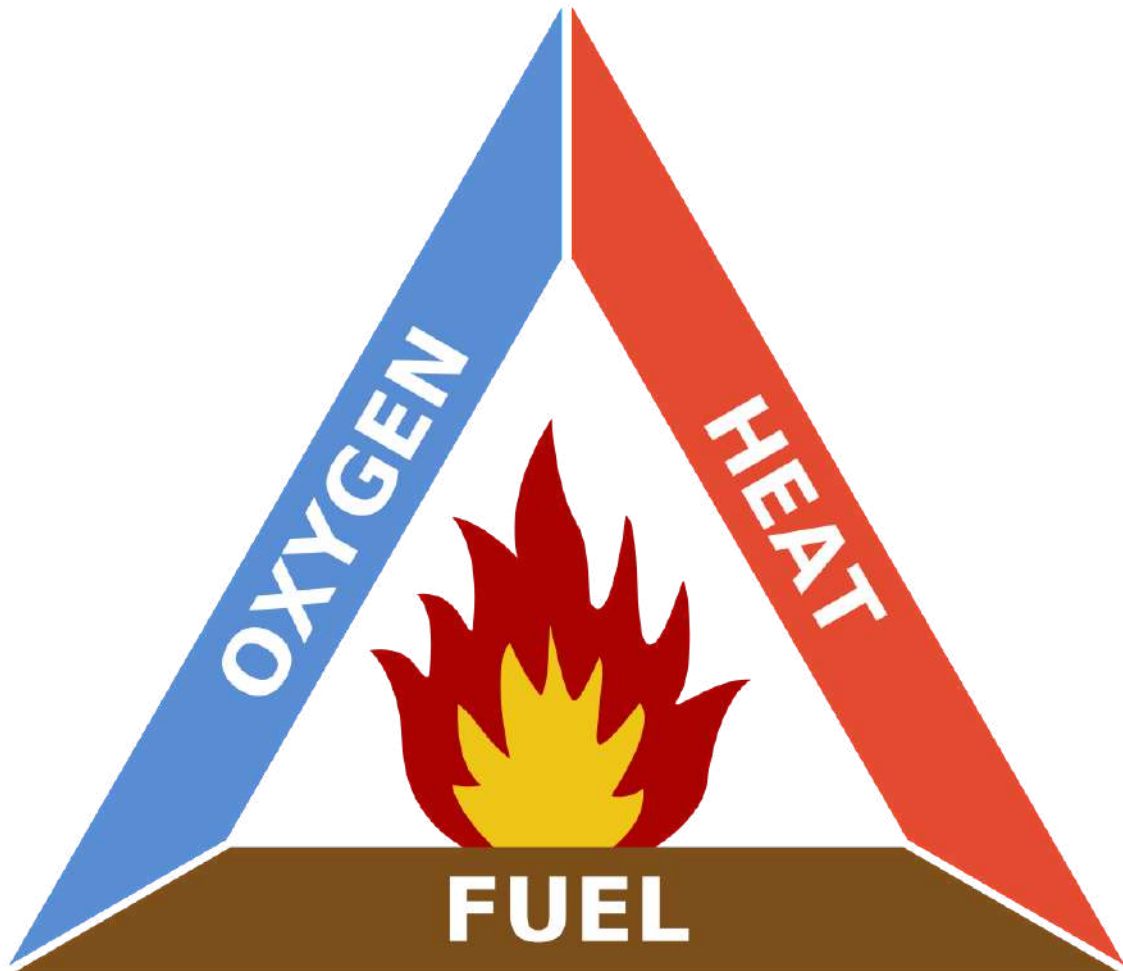|			
a	Slovenia	b	Croatia
c	Romania	d	Northern Macedonia

In countries with dense forests, there can be up to 300 m³ of wood per hectare. Given that the average price of firewood is 80 € per m³, what would be the estimated financial loss from the wildfires in Canada in 2023?

Fire requires high temperature, oxygen, and combustible material. If we remove any of the aforementioned, the fire will be extinguished. Connect these basic three necessities for combustion with the extinguishing methods on the right side - which basic element for combustion does each of the methods remove?

| combustible material | ◯ | ◯ | fire swatter |
| temperature | ◯ | ◯ | firebreak |

oxygen		pouring large quatities of water
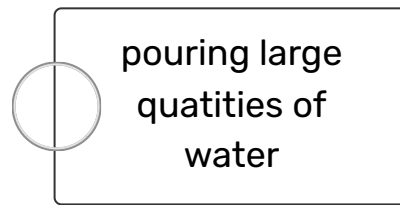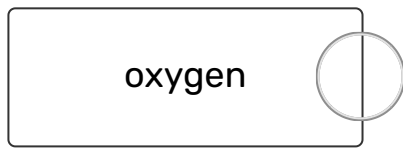
Due to the high combustion temperature (which can exceed 1000°C in a forest fire), the ground beneath the fire site also heats up. The temperature and the depth to which it will reach depend on the type of soil - whether it's clay, humus, compacted or loose soil, etc. The thermal conductivity tells us how well a substance will conduct heat.

Some substances conduct heat well, such as metals, which is why they have high thermal conductivity. Insulating materials, like styrofoam for example, conduct very poorly and therefore have low thermal conductivity. Some approximate thermal conductivities are listed below[3]:

iron   80 W/mK

marble   2,5 W/mK

humus   1,3 W/mK

clay soil   0,47 - 0,93 W/mK

soil   0,17 - 1,13 W/mK

wood   0,1 W/mK

air   0,03 W/mK

The heat flow through a substance is described by the equation $P = S \lambda \Delta T / l$, where P represents the heat flow, S the area, λ thermal conductivity, l the thickness of the substance (depth below the ground) and ΔT the temperature difference.

Using the data previously mentioned, estimate the heat flow that runs through each square meter of the earth to a depth of 10 cm.

a	100 W	b	1 kW

c   10 kW   d   1 MW

Sources:

[1] https://natural-resources.canada.ca/simply-science/canadas-record-breaking-wildfires-2023-fiery-wake-call/25303

[2] https://www.indexmundi.com/facts/north-macedonia/indicator/AG.LND.FRST.ZS

[3] https://sl.wikipedia.org/wiki/Toplotna_prevodnost