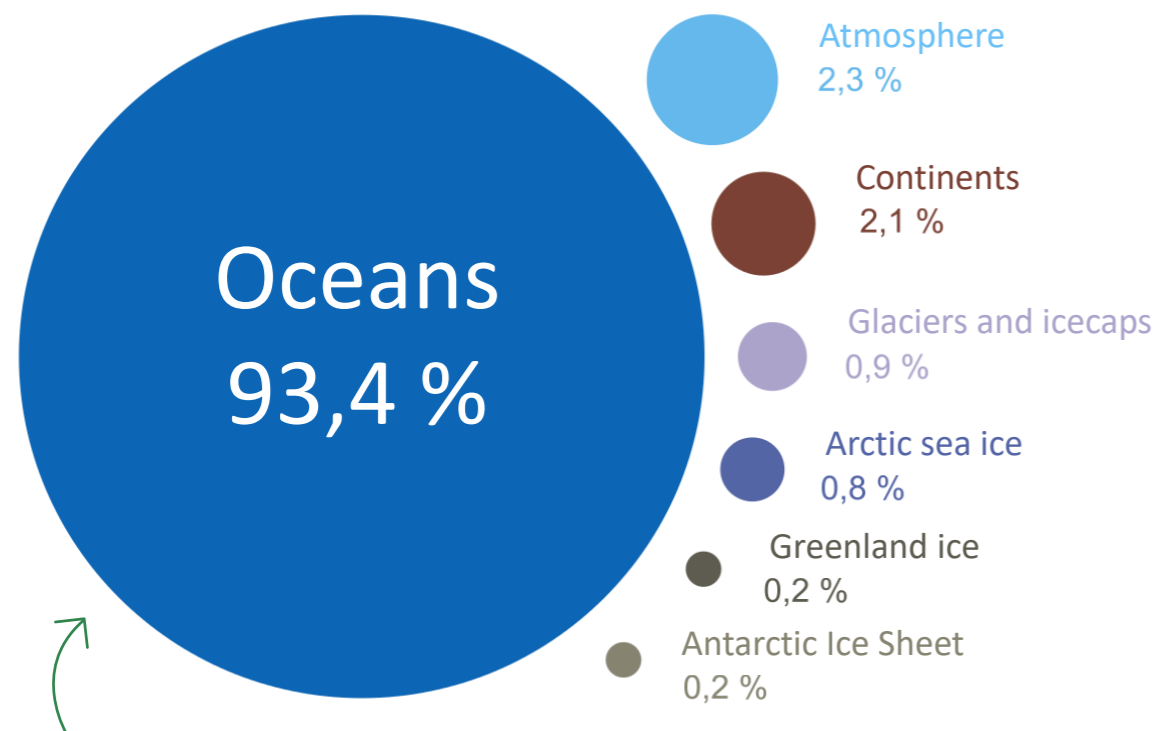


# 8. The Oceans as a Climate Buffer

How do the oceans protect us from even greater climate change?

Where is global warming directed to?



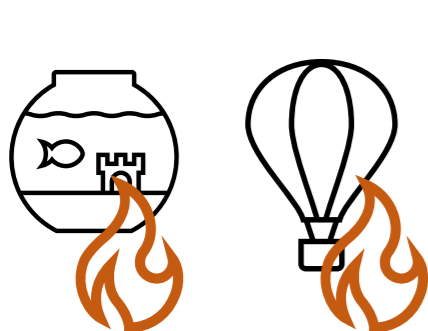
93% of the additional energy in the climate system due to the greenhouse effect goes into the oceans!

Background:

About 2/3 of the earth's surface is covered with liquid water, and this has an impact on the earth's climate. This is because water is a very effective heat accumulator: a certain mass of water can absorb significantly more energy per Kelvin increase in temperature than, for example, the same mass of air. For example, a kilogram of water heats up by 1 K with an energy increase of 4.2 kJ. Water therefore has a heat capacity of 4.2 kJ/kgK. Air and dry earth, on the other hand, have a heat capacity of about 1 kJ/kgK. It therefore takes about one kilojoule to heat one kilogram of these substances by 1 K.

The human-induced greenhouse effect adds energy to the earth's surface, and thus to the oceans.

Water is an extremely effective heat storage medium! It can absorb a lot of energy without heating up much.



If you add ten kilojoules of energy to a kilogram of air, it heats up by ten Kelvin, whereas 1 kg of water heats up by only 2.3 K!

However, the oceans do not only extract thermal energy from the atmosphere, but also CO<sub>2</sub>, which dissolves in the water. The oceans thus buffer the human-induced greenhouse effect twice - but with serious consequences!