The link between sea ice loss and showering

- Research by UCL showed that for each tonne of carbon dioxide that a person emits anywhere on this planet, 3m^2 (± 0.1m^2) of Arctic summer sea ice disappears. [1]
- When we shower in the UK we heat the water using gas (a fossil fuel) or electricity (which is produced from a combination of fossil fuels, nuclear and renewables).
- Gas and electricity both have a carbon footprint.
- To heat 1m^3 (1,000 litres) of water to 40 degrees C using gas produces 9.3 kg of CO_2.[2]
- To heat 1m^3 (1,000 litres) of water to 40 degrees C using electricity produces 15.2 kg of CO_2.
- A 30 minute shower a day with a flow rate of 7.5 litres/minute from a shower heated by gas is 2.3m^2 of ice gone every year
- A 30 minute shower a day with a flow rate of 5 litres/minute from an electric shower is 2.5m^2 of ice gone every year

Gas showers		
Shower length	CO_2 emitted tonnes	Summer sea ice lost m^2
4 minutes	0.1	0.3
5 minutes	0.1	0.4
10 minutes	0.3	0.8
15 minutes	0.4	1.1
20 minutes	0.5	1.5
25 minutes	0.6	1.9
30 minutes	0.8	2.3

Electric showers		
Shower length	CO_2 emitted tonnes	Summer sea ice lost m^2
4 minutes	0.1	0.3
5 minutes	0.1	0.4
10 minutes	0.3	0.8
15 minutes	0.4	1.2
20 minutes	0.6	1.7
25 minutes	0.7	2.1
30 minutes	0.8	2.5

The disappearance of summer sea ice in the Arctic [3]

- Each year the amount of Arctic sea ice changes with the seasons. In the winter, more ocean water freezes at the surface, and the total ice extent increases. During the warmer months, some of that ice melts away again, while some of it persists through the summer.

- Sea ice freezes from the bottom up, so every additional winter that it persists, it gets a little bit thicker. While first-year ice is often just a few feet thick, multi-year ice can grow to be nearly 15 feet deep. Thicker ice is generally more likely to survive the summer months, while, conversely, younger, thinner ice is at a greater risk of melting away entirely during the warm season.

- Since 1984, the percentage of multiyear ice cover has declined from 61% to just 34%, and the oldest sea ice—ice that's been frozen for at least five years—now accounts for just 2% of the ice cover. That means more and more of the total ice cover has only been frozen for one season.

- April 2018 and April 2016 saw the lowest amount of Arctic sea ice for the season on record.

Why is summer ice important?

- Ice-free summers are cause for concern. Year-round ice cover is important to animals like polar bears, which use it as their hunting grounds. As the thinner sea ice breaks up earlier and earlier polar bears get trapped on small areas of floating ice.

- Melting ice speeds up climate change. Ice reflects sunlight, while water absorbs it. When the Arctic ice melts, the oceans around it absorb more sunlight and heat up, making the world warmer as a result. [4]

- Algae and other forms of phytoplankton that grow in Arctic waters in the summer are very important as a food source. Algae usually grows when the summer sunlight is already strong; as a result, it grows rapidly, and a lot of it accumulates in the water at once. If algae starts to grow too early in the season because the ice is melting earlier, the weak spring sunlight may mean that the algae grows more slowly than before.

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[1] The authors examined the link between carbon dioxide emissions and the area of Arctic summer sea ice, and found that both are linearly related. http://buff.ly/2fmeM1f

[2] Energy consumption of 39kWh for gas to heat $1m^3$ of water. Energy consumption of 31 kWh of electricity to heat $1m^3$ of water. 0.21kg CO_2 per kWh gas in an efficient boiler. 0.45kg CO_2 per kWh of electricity. 1.2 kg CO_2/m^3 to supply and treat $1m^3$ of cold water. 9.3 kgCO_2/m^3 for a shower with gas boiler and 15.2 kgCO_2/m^3 for an electric immersion.

[3] https://www.scientificamerican.com/article/arctic-sea-ice-is-getting-younger-here-is-why-that-is-a-problem/

[4] As snow and ice melt, the ability of the Arctic to reflect heat back to space (the 'albedo effect') is reduced, accelerating the overall rate of global warming.