

# Most data lives in the cloud. What if it lived under the sea?

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Credit: Pixabay/CC0 Public Domain

Where is the text you're reading, right now? In one sense, it lives "on the internet" or "in the cloud," just like your favorite social media platform or the TV show you might stream tonight.

But in a physical sense, it's stored and transmitted somewhere in a network of [thousands of data centers](#) across the globe. Each of these centers is whirring, buzzing and beeping around the clock, to store, process and communicate vast amounts of data and provide services to

hungry consumers.

All this infrastructure is expensive to build and run, and has [a considerable environmental impact](#). In search of cost savings, greater sustainability and better service, data center providers are looking to get their feet wet.

Tech giant Microsoft and other companies want to relocate [data centers](#) into the world's oceans, submerging computers and networking equipment to take advantage of cheap real estate and cool waters. Is this a good thing? What about the [environmental impact](#)? Are we simply replacing one damaging practice with another?

## **Which companies are doing this?**

Microsoft's [Project Natick](#) has been pursuing the idea of data centers beneath the waves since 2014. The initial premise was that since many humans live near the coast, so should data centers.

An initial experiment in 2015 saw a [small-scale data center](#) deployed for three months in the Pacific Ocean.

[A two-year follow-up experiment](#) began in 2018. A total of 864 servers, in a 12 by 3 meter tubular structure, were sunk 35 meters deep off the Orkney Islands in Scotland.

Microsoft is not the only company experimenting with moving data underwater. [Subsea Cloud](#) is another American company doing so. China's Shenzhen HiCloud Data Center Technology Co Ltd has [deployed centers in tropical waters](#) off the coast of Hainan Island.

## **Why move data centers under the waves?**

Underwater data centers promise several advantages over their land-locked cousins.

## 1) Energy efficiency

The primary benefit is a significant cut in [electricity consumption](#). According to the International Energy Agency, data centers [consume around 1–1.5%](#) of global electricity use, of which some 40% is used for cooling.

Data centers in the ocean can dissipate heat in the surrounding water. Microsoft's center uses a small amount of electricity for cooling, while Subsea Cloud's design has an entirely passive cooling system.

## 2) Reliability

The Microsoft experiment also found the underwater center had a boost in reliability. When it was brought back to shore in 2020, the rate of server failures was less than 20% that of land-based data centers.

This was attributed to the stable temperature on the sea floor and the fact oxygen and humidity had been removed from the tube, which likely decreased corrosion of the components. The air inside the tube had also been replaced with nitrogen, making fires impossible.

Another reason for the increased reliability may have been the complete absence of humans, which prevents the possibility of human error impacting the equipment.

## 3) Latency

More than [one third](#) of the world's population lives within 100

kilometers of a coast. Locating data centers close to where people live reduces the time taken for data to reach them, known as "latency."

Offshore data centers can be close to coastal consumers, reducing latency, without having to pay the high real-estate prices often found in densely populated areas.

#### **4) Increased security and data sovereignty**

Moving data centers into the ocean makes them physically more difficult for hackers or saboteurs to access. It can also make it easier for companies to address "data sovereignty" concerns, in which certain countries require certain data to be stored within their borders rather than transmitted overseas.

#### **5) Cost**

Alongside savings due to reduced power bills, fewer hardware failures, and the low price of offshore real estate, the way underwater data centers are built may also cut costs.

The centers can be made in a modular, mass-produced fashion using standardized components, and shipped ready for deployment. There is also no need to consider the comfort or practicality for human operators to interact with the equipment.

### **What about the environmental impact?**

At present there is no evidence placing data centers in the world's oceans will have any significant negative impact. Microsoft's experiments showed [some localized warming](#), but "the water just meters downstream of a Natick vessel would get a few thousandths of a degree warmer at

most."

The Microsoft findings also showed the submerged data center provided habitat to [marine life](#), much like a shipwreck: "[...] crabs and fish began to gather around the vessel within 24 hours. We were delighted to have created a home for those creatures."

If underwater data centers go ahead, robust planning will be needed to ensure their placement follows best practice considering [cultural heritage](#) and environmental values. There are also opportunities to enhance the environmental benefits of underwater data centers by incorporating [nature-positive features](#) in the design to enhance marine biodiversity around these structures.

## What's next?

Several companies are actively exploring, or indeed constructing, underwater data centers. While the average end-user will have no real awareness of where their data are stored, organizations may soon have opportunities to select local, underwater cloud platforms and services.

Companies with a desire to shout about their environmental credentials may well seek out providers that offer greener data centers—a change that is likely to only accelerate the move to the ocean.

So far, it looks like this approach is practical and can be scaled up. Add in the environmental and economic savings and this may well be the future of data centers for a significant proportion of the planet.

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