Death by data: resource-and-energy-hungry boxes

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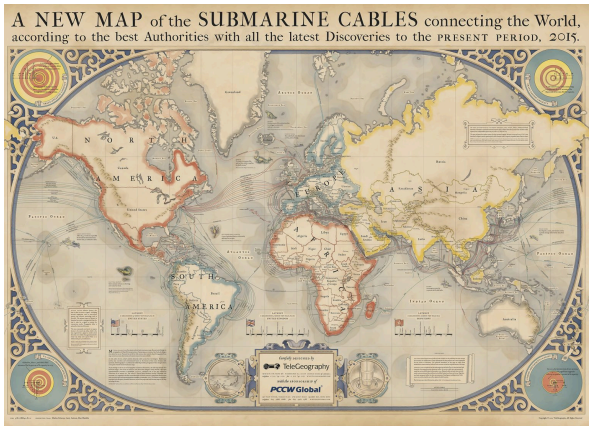

The proliferation of data centres, considered essential to technological progress, has detrimental ecological consequences

Data centre typologies are seemingly banal, even dull constructions. Commonly, they consist of a grid of computer server racks, data halls and high-density Performance Optimised Datacentres (PODs) linked to fibre-optic cables. Systems controlling temperature, humidity and dust ensure their continuous operation. In January 2022, the number of data centres reached 2,751 in the US, 484 in Germany, 458 in the UK, 447 in China, 324 in Canada, and 280 in the Netherlands – the countries with the largest number of facilities.

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Despite its proliferation, data centre architecture has not experienced significant transformations in the last decade. Except for a few vertical designs and some futile aesthetic experimentation in facades, most data centres are conceived as rectangular black boxes. Yet their excessive energy and water consumption, land occupation and carbon dioxide emissions have triggered growing popular backlash. Whereas we grew used to logistical infrastructures permeating every corner of urban and rural landscapes (warehouses, processing centres, dark stores, and so on), data centres, once an unassuming and ignored construction, have now achieved archvillain status. The fallout might be due to a broken promise: we were sold a cloud and ended up with a solid, resource-and-energy-hungry box.

The sea is also used to cool data centres: Google won a patent in 2009 for a floating data centre
Credit: Google

In 2015, Microsoft sunk a data centre into the sea near the Orkney Islands
Credit: Jonathan Banks / Microsoft

Data centres are at once a site of investment and controversy. Pressured by local communities, environmental movements and rising energy prices, governments have started to impose controls; several countries such as Singapore, and cities including Amsterdam and Dublin, have implemented temporary bans on data centre construction. Recently, a project by Meta in the town of Zeewolde, that would have become the Netherlands' largest data centre,

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was suspended in response to opposition from nearby residents and the Dutch Senate. The controversy prompted the Dutch government to announce a nine-month ban on new hyperscale data centres and to develop stricter regulations and licensing processes. ‘Our space is limited, so we have to make the right choices,’ said minister Hugo De Jonge in a letter to the House of Representatives.

> ‘We were sold a cloud and ended up with a solid, resource-and-energy box’

Singapore has just concluded a similar process. After a three-year moratorium on data centres, the government unveiled new design approaches earlier this year. Some of the resulting proposals include floating data centres using seawater for cooling and powered by solar farms, and data centres on liquefied natural gas plants. The images of the Tengeh Reservoir’s floating solar farm spanning 45 hectares give a clue of what is to come. The National University of Singapore’s Sustainable Tropical Data Centre Testbed is also developing cooling techniques involving seaborne data in collaboration with Pan-Asian data centre corporation Big Data Exchange and Sembcorp Marine, a Singapore-based shipbuilding company. Once a speculative proposal, subsea data centres powered by offshore renewable energy are now considered a viable alternative for reducing the cooling demand. Underwater data centres, first tested by Microsoft with Project Natick with prototypes in the US and the UK, are even included in several Chinese provinces’ five-year plans, among them Hainan and Guangdong.

Data centres are usually simple boxes, but some break this model, such as Kengo Kuma and DMP's Gak Chuncheon data centre in South Korea
Credit: NAVER

Some data centres are in cities, such as Telehouse North Two, 2018, by Nicholas Webb Architects
Credit: Imageplotter / Alamy

Meanwhile, the Nordic countries use their cold weather and supposedly 'sustainable green power' as a marketing tool for their booming data centre industry; investors are attracted by the possibility of facilities running on energy produced by wind farms and local geothermal and hydroelectric sources, and data centres are reimagined as thermal infrastructures by using the hot air emitted by servers to heat nearby residential and commercial premises. What many of these designs fuelled by sustainable energy hide, however, is that they come at the detriment of Indigenous communities. The mounting presence of wind turbines endangers the environment and culture of the Sámi people by displacing reindeer from their grazing lands. In what has been described as 'green colonialism', these projects embrace decarbonisation efforts while often risking the survival of these communities. In October 2021, the Norwegian Supreme Court ruled in favour of Sámi people, determining that the largest onshore windfarm in Europe violated Article 27 of the UN international covenant on civil and political rights.

Indigenous communities have also developed their own infrastructures, as is the case of the world's first Indigenous-operated data centre at Charles Darwin University, and the network of hyperscale and edge data centres that Indigenous-owned Kalinda IT Services and Trifalga DC are developing across Australia.

Grimshaw's Financial Times Printworks was first designed in 1988 but has since transformed into a data centre
Credit: Beata May

Apple's data centre in Arizona will require huge amounts of water in a drought-stricken area
Credit: Reuters

Despite the drawbacks, many of us use the services that increase data production and consumption, and feed the data centre proliferation. We celebrate advances in planning, climate science and healthcare, and developments in AI, the Internet of Things, and the Metaverse, which demand vast amounts of data storage. Consequently, we support the extraction of more resources, placing more submarine cables, constructing more data centres, and the production of more batteries. Even where innovations in data centres seem to reach a dead end, those in storage mediums keep the promises of infinite growth alive.

Grow Your Own Cloud is exploring the possibilities of using DNA to store data, with 'data as a material and nature as a technology'
Credit: Grow Your Own Cloud

Credit:Grow Your Own Cloud

In Cambridge, Massachusetts, the Whitesides Research Group is experimenting with fluorescent dye storage, while Microsoft's Optics for the Cloud group in the UK has launched Project HSD, focusing on hologram data storage, and Project Silica which studies the use of crystals to deliver long-term archival storage. In California, companies including Illumina, Microsoft and Twist have created the DNA Data Storage Alliance to develop DNA-based data storage solutions. They propose DNA data as a long-term, reliable and ecological alternative to tape drives or HDDs, requiring little to no power, land consumption or maintenance. There are also those who experiment with storing information within the DNA of plants and seeds, such as scientists Karin and Iztok Fister, biotech group Grow Your Own Cloud and artist Kyriaki Goni. They take a critical position on data infrastructures and suggest forests, gardens or interior plants as models for off-grid, living and ever-growing data centres.

Artist Kyriaki Goni's project The Aegean Datahaven, from 2017, proposes a network of data centres managed by inhabitants of the Aegean islands, creating an alternative to corporate digital clouds
Credit: Kyriaki Goni

Until these futures materialise, the functioning of phones, computers and electric cars, and the data centres supporting their operations, trigger the construction of more batteries and new infrastructures. Growth in battery production in particular is affecting communities around the world; lithium mines have a long-term impact on the quality of air, water and soil, as well as the lives of beings depending on them, far beyond the quarry. Covas do Barroso is one of those areas affected by our compulsive desires for more data and energy and, in particular, more batteries. Located in a beautiful mountainous region in the north of Portugal, a site of biodiversity and unique centuries-long cultural traditions, the community of Covas do Barroso has been rendered a sacrificial area. Its inhabitants – supported by a wide range of societal actors and communities affected by lithium extraction in Chile, Serbia and Spain – battle lithium mines planned in their territory. Lithium extraction endeavours are supported by the Portuguese government and the EU, which is pressuring countries to extract more resources and produce their own batteries to become energy independent; the environmental and social degradation of Covas do Barroso is