GUEST EDITORIAL

Tracing the 'cloud': Emergent political geographies of global data centres

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Between February and March 2020, close to half of the global population entered some form of isolation to stem the spread of Covid-19, and our work as researchers and educators fully entered the digital realm. As a lockdown emerged, internet usage surged. The number of users of Facebook Messenger and WhatsApp doubled in areas affected by Covid-19 (JPMorgan, 2020); Netflix gained 16 million new subscribers (BBC, 2020); and Zoom hosted 200 million online meeting participants in one day (Yuan, 2020).

This digital transition has prompted discussions about the consequences of new, online practices for workplaces, economies, and the environment (Schwarz et al., 2020). Many of these discussions intersect and overlap with existing academic analyses of the role of digital technologies in our everyday lives. Geographical scholarship, for instance, has paid significant attention to the design and use of digital technologies related to digital media (Ash, 2009) and smart cities (MacFarlane & Söderström, 2017), as well as to the links between digital technologies and new political, economic and energy futures (Michalec et al., 2019). Political geography research, more specifically, has explored how digital technologies, such as smart energy grids and autonomous vehicles, might alter human agency and citizenship (Bissell, 2018; Basu, 2019; Sadowski & Levenda, 2020). Yet, the sustained focus on the *use* of digital technologies, and on the implications of these technologies for end-users, overlooks the shifting materiality and spatial distribution of digital infrastructure, particularly in our current period of crisis (Kinsley, 2014; Furlong, 2020). The physical and material elements that underpin the accelerated digitisation of our lives have distinctive geographies that deserve more interrogation than they have received. Digital infrastructure reweaves the fabric of urban and rural settings, creates new economic imaginaries, and alters climate and energy politics. It is necessary to trace how these infrastructural geographies connect to, and transform, not only energy grids, but also local communities and their relationships to space and place.

Even before the Covid-19 pandemic, many elements of our everyday lives had become situated in the digital 'cloud'. The language of a 'cloud' hints at the intangibility of electronic data. Yet, the systems of data storage and retrieval that form the cloud encompass distinctive materialities and spatialities. These have become more visible with changing patterns of demand in recent months. In many countries, including the USA and UK, commercial internet demand before Covid-19 was clustered in certain areas, such as workplaces and educational institutions. The lockdown shifted internet traffic to the suburbs and caused demand on certain online services to skyrocket – placing new pressures on digital infrastructure.

A key component of this infrastructure is the data centre—a collection of computer servers that processes and stores enormous amounts of information. Data centres (or 'server farms') are the warehouses and factories of the internet age, storing our data, processing our orders, and supporting our communication. Yet, unlike other infrastructure, data centres do not necessarily need to be close to their users. Recent years have seen data centres becoming geographically centralised with the construction of 'hyperscale' centres that have replaced servers on business premises. Such centres typically house over 5,000 servers and extend over 10,000 square feet. As of July 2020, there were 541 hyperscale facilities globally (Judge, 2020) and dozens more planned or under construction. Zoom alone has opened two more data centres and expanded 17 others in response to rising demand in 2020 (Novet, 2020). This infrastructure is often found in areas with reliable, cheap (and reliably cheap) energy and accommodating business environments (Pickren, 2016).

The literature on the digital economy has given much attention 'smart cities' and flows of investment into urban-based digital initiatives, but it has paid much less attention to the rural spaces that host many data centres. Upload your holiday photos to Facebook or Instagram and they may end up stored on a 'server farm' in Clonee, Ireland (population 826) or Prineville, Oregon (10,329). Within these regions, server farms may reclaim and resurrect forgotten infrastructure, such as decommissioned airbases, abandoned nuclear bunkers or shuttered manufacturing plants. Server farms can also be found in sprawling, purpose-built hangars, displacing previous land uses, such as agriculture, that may be deemed unproductive or unprofitable (Glanz, 2012; Hogan, 2015).

Once data centres arrive, they can become key elements in (re)defining regional economic imaginaries. As in urban areas (Nathan et al., 2019), local officials in rural communities and small towns may hail data centres as a key to rejuvenating local economies that have witnessed the flight of manufacturing industries or that hold a marginal position in national economies. The siting of a Facebook data centre in the city of Luleå in the far north of Sweden, for instance, became enrolled within regional visions of economic rejuvenation. Local boosters positioned Luleå as a key hub in global digital flows, challenging the historical core-periphery relationship between northern and southern Sweden (Vonderau, 2019). It is difficult to find reliable data on how many people are employed at these facilities. Yet, the promise of jobs and economic rejuvenation provides a key point at which local communities interact in a direct and tangible way with the digital economy.

Data centres do not stand alone. Instead, they are linked to existing infrastructures – particularly energy grids. Digital infrastructures require a lot of energy, not only to power the servers themselves but also to keep them cool. These data centres – hyperscale or otherwise – are estimated to use 200 terawatt-hours of electricity (TWh) annually (Jones, 2018) – more than the total amount of electricity generated in Egypt (194.1 TWh in 2018) (International Energy Agency, nd.). Data centres, according to some estimates, may constitute around 1% of total global electricity use (IEA, 2019). Due to their energy demands, data centres represent a significant source of revenue for energy grids and regional economies, and many governments have offered incentives to attract them to their jurisdictions. Authorities in Sweden and France reduced taxes on electricity used by data centres by 97 percent and 46 percent respectively (Judge, 2016; Dawn-Hiscox, 2018). In both Argentina and Illinois, USA, data centres are exempt from sales or property taxes. In Loudon County, Virginia, which boasts of handling 70 percent of global internet traffic, local planners have fast-tracked data-centre construction (Loudon Virginia, n.d).

Upon arriving in a region, data centres – and their energy requirements - immediately *plug into* existing infrastructures of energy production, increasing demand and generation. Whilst shifts to new technologies have uncovered new efficiencies, the overall energy consumption of data centres has led to accusations that this infrastructure is playing a role in increasing greenhouse gas emissions (Greenpeace, 2019). The expansion of data centres in Loudon County, Virginia, for instance, increased demand for electricity derived from coal and natural gas, justifying renewed investment in fossil fuel infrastructure (Greenpeace, 2019). In response to criticism, some corporations have relocated data centres to cooler climates (where air can be pumped from outside to cool the facility); others have acquired or built renewable energy infrastructure, or have purchased from renewable suppliers. In 2019, Google announced a package of 18 energy deals that, taken together, represented the purchase of 1,600 MW from renewable sources. These energy requirements may reconfigure local socio-ecological relations, with new patterns of resource use, waste, and pollution. In Quincy, Washington, the energy used by the Microsoft data centre equals half of the town's total consumption, with residents frequently complaining about the use of diesel generators and resultant air pollution (Glanz, 2012). Elsewhere, benefits may be shared. In Mäntsälä, Finland, excess heat generated by a Yandex data centre is channelled into a district heating system (Mullan, 2018).

Whilst a 'digital turn' in geography may be assured (Ash et al., 2016; Kinsley et al., 2020), geographers should engage more fully with the question of *where* the 'cloud' is. Searching on Google might link you to a server in The Dalles, Oregon or Hamina, Finland. Logging into Zoom may connect you to an Equinix data centre in Culpeper, Virginia. The concept of the 'digital divide' highlights the inequalities between urban and rural communities in terms of access to the internet and its transformative potential (Philip, 2017). But rural areas and smaller towns are also home to the key sites that allow increased connectivity. A continued move online will accelerate the expansion of existing data centres into 'hyper-scale' campuses. It is likely that this expansion will not take place in the world's silicon valleys and corridors, but in rural areas and provincial towns. At each site, computer servers will whirr into action, making possible the innovation, commerce, and accumulation of wealth that we associate with digital connectivity.

As political geographers consider the promises and predicaments of 'smart' cities and other spaces of the digital economy, they must also give attention to the infrastructure that underpins these new spaces. The data centre is the physical site where the internet becomes a reality for billions of people. Here, the 'cloud' exists within, and produces, new political geographies of infrastructure, community, energy and economy. These new political geographies are tightly bound up with the intensified digitisation of our everyday lives. The 'cloud' is a real place – geographers need to find it.

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Acknowledgements: I would like to thank Benjamin Neimark and Chris Preist for their insightful comments on a previous manuscript, as well as Caroline Nagel for her encouragement of and assistance in its development.