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Chapter 3. Political Ecologies of Platform Urbanism: Digital labor and data infrastructures

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Towards a political ecology of platform urbanism

All that is solid melts into tweets (Wyly 2013, p. 391).

In the contemporary networked city, an integrated machinic complex of information and communication technologies (ICTs) represents a new moment in capitalist urbanization, a phenomenon exemplified by the proliferation of urban platforms (Graham and Marvin 2001, Amin and Thrift 2002). As urbanism and digital platforms become a way of life, the city and the platform become increasingly conjoined as the joint medium of capital accumulation and sociality (Zip *et al.* 2013). The co-evolution was not necessarily unforeseen. At the turn of the 21st century, broad changes in technology, social life, and urbanization led many scholars to theorize a shift towards a new phase of capitalism based on immaterial labor. Both Autonomist Marxists and economic geographers have argued that “cognitive” or “cognitive-cultural” capitalism is marked by an accumulation process centered on immaterial inputs, immaterial and digital labor processes, and the production of immaterial goods such as services, cultural products, knowledge or communication (Hardt and Negri 2004, Scott 2009, 2014, Peters and Bulut 2011). More recently, platform urbanism theorists have made similar arguments about the non-material digital processes that tap into existing circuits of urbanization (Artioli 2018, Rodgers and Moore 2018, Wyly *et al.* 2018). Yet these analyses

often take for granted the material networks and physical infrastructure required as inputs into this reconfiguration of space and daily life.

This widespread focus on the immaterial aspects of contemporary digital capitalism, particularly the framing of platforms from search engines to ride-hailing apps as "services" (Walker 1985, pp. 50–51), obfuscates the materiality and socio-environmental foundations of capital accumulation and circulation that are increasingly mediated through digital platforms. In this chapter, we argue that the labor associated with the production of digital platforms, the labor associated with their use as "machinery," and the data on whose circulation this work depends, are all quite material. Our goal is to highlight how the high-value work of the "tech" economy and the precarious work of the gig economy are digitally interlinked, not just through an app but also an entire apparatus of energy-intensive data transmission and storage stretching far beyond the "city."

Our approach builds from digital political ecology (DPE) to understand the physical infrastructures and digital components of platform urbanism. While there has been significant scholarship focused on the political ecologies of urban biophysical processes (water, vegetation, waste, etc.; cf. Meehan 2014), communication and information infrastructures have seen less attention, even though they likewise facilitate material flows and capital circulation. DPE scholarship materializes the immense hidden digital and energy infrastructures necessary for advanced computing, such as cryptocurrency mining (Lally *et al.* 2019) and e-waste processing (Pickren 2014). This chapter combines these insights to examine the infrastructures that undergird platform urbanism, with a focus on data centers in the Pacific Northwest of the United States, to understand how a new division of labor (re)inscribes social disparities in the uneven geographies of the city and landscapes beyond.

Platform urbanism and the restructuring of capitalism

Platform urbanism is an essential part of a broader shift in capitalist urbanization toward what Scott calls "cognitive-cultural capitalism," which has three defining features. First, calculation, communication, information storage, and process design are performed using digital methods, reducing communication times and transportation/storage costs and enabling new forms of production, business organization, and collective consumption (Castells 1983). Second, a new division of labor between two distinct class fragments—highly qualified "symbolic analysts," and a low-wage service underclass or precariat (Sassen 1988, Scott 2011)—has been spatially co-embedded by processes of urbanization. The former performs non-routine functions using knowledge, cognition, and symbols while the latter perform service functions as either deskilled manual labor or menial service labor. Lastly, these productive changes are also reflected in consumption patterns that have shifted toward "experiential" goods and services clustered in urban areas (Markusen and Schrock 2009, Currid-Halkett and Scott 2013). These trends have been marked by changes in the "urbanization of capital" (Harvey 1981, 1989).

Today, the temporal, spatial, and technological complexity of digital and industrial production necessitates technologically advanced cognitive-cultural labor to produce digital platforms that function as machinery for advanced production and logistics, complex targeted and individualized sales and advertising, and advanced consumer tracking and surveillance.

Platforms require deskilled operators involved in menial tasks working in deskilled distribution centers, deskilled transportation, nearly automated advertising, and so forth. The data produced through the operation of this digital machinery by deskilled labor, and the surveillance of the "consumer" is, in turn, used to generate a "behavioral surplus" (Zuboff 2019): data on users' activities is used to create new digital data commodities and/or apply to

logistics processes that further deskill menial labor. In short, the enormous superstructure shaping and shaped by digital capitalism continues to become more complex and more urban as the benefits of data production agglomerate in cities, creating a positive feedback cycle that encourages further digital urbanization. Platform urbanism represents the co-evolution of productive values in technology and urbanization.

Contemporary urban development logics create pressure to expand digital, cultural, and/or informational economies—the "cynosures of the so-called 'new' economy" (Scott 2011, p. 290)—and position cities as key nodes in the global "network society" (Castells 2000). As a result, the concentration of people and businesses create an agglomerative site of data production spanning social networks, informal labor platforms, ride-hailing, check-ins, geolocation-based advertising, and so on. These social, economic, cultural, and informational changes afforded by digital ICTs correspond to rearrangements in the primary, secondary and tertiary circuits of capital: commodity production, fixed capital (built environment for production, e.g. roads, rail, infrastructures) or a consumption fund (built environment for consumption), and long-term expenditures like health care or state-sponsored research and development that enhance labor's productivity, respectively. Platform urbanism speaks to a blurring of these circuits, as computational research in the tertiary circuit and secondary circuit elements like housing and transport infrastructure become, through platforms like Airbnb and Uber, drivers of *data* production that fuels the realization of value in the primary circuit.

Digital Labor and Platform Value Production

Theorists of digital capitalism like Wyly see the co-evolution of technological innovation and *urbanization* as the underpinning of a system of collection, surveillance, and value production based on

> […] billions of smartphones, RFID (radio frequency identification) chips and QR (Quick Response) codes, and trillions of social-media data trails on preferences and purchases of physical commodities, services and media content. Data flood in, and the pattern-recognition algorithms optimize and monetize attention, creativity and communication amidst the neoliberal wind that capitalizes, commodifies, classes, and marketizes everything. Social reality is ransacked, but not for theory: click-throughs, page views, eyeballs, and ad revenue are what matter (2013, p. 392).

Similarly, Terranova asserts that the technological innovation of the internet is "animated by cultural and technical labor through a continuous production of value that is completely immanent to the flows of the network society at large" (2000, pp. 33–34). This cultural and technical labor requires spatial structures in which "the physical conditions of exchange" (Marx 1993, 444–448, 472)—or the urbanization process—become ever more important as the infrastructure of production. Thus, technological developments are increasingly intertwined with "advancements" in urbanization, reproducing urban space as part of the affordances of the production system.

The shifts in processes of urbanization and capital accumulation corresponding to platform urbanism can be demonstrated using the example of Uber. The Uber app is developed by cognitive-cultural programmers to track the locations of cars and users, and the Uber server

back-end is programmed to make transportation calculations and store this data. When a user requests a ride, an Uber server makes the necessary calculation and communication to hail an available nearby driver operating their vehicle. The app computes the fastest route to the rider and the fastest route to the rider's destination, and calculates a fare in advance. The driver performs the menial labor of driving following turn-by-turn in-app directions—a deskilled version of a taxi driver that required the craft of finding potential riders, knowing when and where people in the city might need a ride, and knowing what routes are fastest and particular times of the day. Uber riders are encouraged in the app to splurge and upgrade, as an experiential service, to luxury Uber Black or Uber Black SUV services. These interactions, along with in-app ads, formal tie-ins to other apps, or other informal forms of digital footprint sleuthing, provide rich accounts of user behavior (Thatcher 2014, Thatcher *et al.* 2016, Couldry and Mejias 2019). These processes began as consumer-oriented services but are also increasingly part of corporate operations; as of 2018, Uber and Lyft accounted for 71 percent of the market share in ground transportation for business travelers, and Uber alone has expanded to over 75 countries (Kerr 2018). What looks like a service from the consumer's perspective is thus also a process of producing data as capital—digital machinery used in the production and realization of value (Sadowski, this volume).

Uber drivers are very aware of the value that their work generates in the form of data on both the user and the city, including location, times, traffic flows, and any corresponding significant events such as sporting events, concerts, or rallies that may affect demand for travel, and that this data may be used to deskill driving further or even replace drivers entirely with autonomous vehicles (Attoh *et al.* 2019). Further, the data collected is used to create a behavioral surplus, a form of value unique to digital platforms, and a necessary input into a new circuit of producing surplus value (Zuboff 2019). In this case, the behavioral surplus

stems from either using the data collected as an input into machine-learning algorithms that direct drivers to certain places at certain times (for either pickup or routes) or by connecting Uber accounts to social media accounts, which refines advertising profiles through data complementarity. For example, by connecting profiles across devices or browsers, Uber is in principle able to create profiles of all Uber users that have ever taken a Uber to the Moda Center in Portland, Oregon, which has a dedicated Uber Zone for dropoff and pickups (Uber.com 2020), within an hour of the start of a Portland Trail Blazers basketball game and have a Facebook account, from which age, relationship status, and recent restaurant check-ins might be used to identify single 25-34 year-old men who recently ate a Burger King and went to the game.

In this example, the Uber platform forms a hinge between the urban built environment and the physical infrastructure of data circulation on the one hand and between dead labor embedded in algorithm production and the living but deskilled labor of driving on the other. The output of this function is not just a mobility service but also increasingly valuable data "fumes" (Thatcher 2014). Scholars, therefore, must question how the data is being transmitted, where it is stored and copied, who has access to it, and how it is used to create or add to an advertising profile. Equally, they must ask about the division of labor involved in producing the platform itself: who uses this data to provide a service under what conditions of deskilling, automation, or punitive "reskilling" and who programmed the platform architecture that structures this labor process. Finally, scholars must ask how the infrastructure of the built environment *affords* the collection of data through situated platform services, its circulation through physical ICT infrastructure, and the materials and energy on which this process depends.

Thus, where platforms are typically framed as immaterial or as simple services, we see them as material parts of the process of producing value. Platform urbanism, as an exemplar of cognitive-cultural capitalism and the co-evolution of technological change and urbanization, reveals how the cognitive work of digital laborers and the manual labor of deskilled laborers is interlinked through the digital machinery of the platform. But this is made possible only by their necessary connection to massive data storage and processing centers, and the greater the data collected, transmitted, and processed, the greater the storage, transmission, and computing requirements. Fixed capital investment in data-related infrastructure is thus used to support these modes of production both in the reshaping of the urban environment and in the so-called hinterlands through data center expansion. This raises several questions: What are the socio-spatial characteristics and impacts of these digital infrastructures? Where are data centers located, and why in those specific locations? What are the socio-material impacts and benefits of data centers, and how are they distributed? To answer these questions requires theorizing the infrastructures of digital ICTs both beyond the screen and beyond the city.

The Geography of Data Centers

A DPE analysis of platform urbanism requires the examination of the material infrastructure and flows, much like that of UPE, that makes possible the expansion of surplus value through digitally mediated circulation as a moment of production. The on-going processes of urbanization, and vital connection to the circulation of capital, reaches beyond the bounds of the city, aiding the seemingly immaterial forms of labor associated with cognitive-cultural production and the mundanely material labors of the gig economy alike. Thus, a focus on "the screen"—a phone, tablet, computer, or other digital ICT device—experience of platforms misses their socio-environmental impacts, from the life cycle of the "smart" device from production to disposal, the fixed capital infrastructure that enables the networked

connectivity vital to user-screen interactions, and the material flows that mediate these two moments. As Marx and Engels explain in *The German Ideology*, "The greatest division of material and mental labor is the separation of town and country" (Marx and Engels 1978). The materiality of "mental labor"—or cognitive and cultural labor—reaches beyond the city, invades the lifeworlds of a planet of urban residents, and excretes concrete, silicon, bits, servers, and energy waste-producing an "urban landscape" or "second nature" beyond the city.

From this perspective, the critical infrastructure of platform urbanism is the data center. Some firms own data centers, while others outsource storage and computing power to "cloud services" providers like Amazon, Google, and Microsoft. For example, Facebook owns its servers, while Uber and Twitter rent from Amazon. Some firms, like Amazon, are both data infrastructure providers, through Amazon cloud services, and platforms themselves, with increasingly urban-oriented services like Amazon Fresh (food delivery), Amazon Ring (home security), and Amazon Prime Now (on-demand product delivery). In the era of "big data," where data is leveraged to solve all manner of social and environmental problems, data center capacity and growth are necessary requirements (boyd and Crawford 2012, Ash *et al.* 2016). And as the data accumulated by urban platforms grows, driven by location detection and the capacity to generate dynamically interlinked consumer data profiles, this storage and processing capacity is increasingly essential to the continued functioning of the platform-based city itself.

Data centers are far from cloud-like auras. They are massive structures housing thousands of servers for storing data, advanced mechanical cooling and ventilation equipment, batteries and diesel generators for backup power and redundancy, and (depending on the location and

owner) a highly securitized shell of fencing and walls with limited access areas and surveillance systems. By design, data centers are energy intensive. In 2012, a widely shared *New York Times* story drew attention to the energy requirements of these facilities, pointing to problems of overheating, space limitations, and memory limitations Facebook encountered with its 10 million users at the time (Babcock 2012, Glanz 2012). As the story reported, these "cloud factories" used about 30 billion watts of electricity worldwide, roughly the same as 30 medium-sized nuclear or coal-fired power plants. Some data centers required "more power than a medium-size town" (Glanz 2012), and for this reason, "data centers are among [electric] utilities' most prized customers." (Compared to Facebook's scale today, and the immensity of the data produced by one billion worldwide users requiring storage on its data servers, these quaint beginnings seem almost comically small.) While paling in comparison to "dirtier" industries like paper production, the polluting impacts of the immense, steady demand on predominately coal-fired power facilities, using two percent of all energy in the United States, exposed big data's "dark side" (Oremus 2012), and even worse, the *New York Times* investigation showed that up to 90 percent of the energy consumed was wasted.

The data center industry responded first by addressing minor numerical errors in the *New York Times* analysis (Wilhelm 2012), and second, by improving energy efficiency and investing in renewable energy sources, effectively, or at least discursively, "greening" their data center operations (cf. Amazon.com 2014, Google 2015a). These "modern" data centers have much-improved power usage effectiveness (PUE, or energy used overall divided by energy used for computing) from approximately 2.0 to near 1.07 (Babcock 2012). The high percentage of hydropower capacity in the Pacific Northwest aids in the purported environmental sustainability of data center industries. The technical characteristics of data centers, including their energy and land requirements, have shaped locational choices by data

center owners such as Facebook and Amazon: free air-cooling, low electricity rates, inexpensive land, and enterprise zones that limit taxation are key decision points. This poses further questions about the politics of development in places struggling to attract capital for economic development.

Non-governmental organizations have also stepped in to advocate for advancements in reducing polluting impacts and intensive energy consumption of data centers (McMillan 2014). Greenpeace, in particular, promoted "clicking clean" as an environmental strategy to influence companies like Amazon Web Services to use cleaner sources of energy. Despite attempts to increase the efficiency of data centers, however, the overall growth in data storage needs represents something of a Jevons's paradox: increased computing efficiency affords, and possibly spurs, additional computing needs, potentially fueling more consumption and production of data and energy.

The geography of data centers in the Pacific Northwest displays their locational logic. The state of Oregon hosts large data centers for Facebook, Google, and Amazon, mainly in rural areas. Facebook has a large data center, exemplary of modern, high-efficiency facilities, in Prineville, a town of roughly 10,000 in central Oregon. Apple does not disclose all of its locations but also has a data center next to Facebook's Prineville facility. Google has developed a data center just east of Portland in The Dalles, adjacent to hydro-power facilities in the Columbia River Gorge dividing Oregon and Washington. It is one of only a handful of data centers valued at over $1 billion USD (Miller 2013) and regularly featured by the company because of its aesthetically pleasing internal design (Google 2015b). Amazon does not disclose the specific locations of their data centers, but at least one is located in Boardman, Oregon (Rogoway 2011), and the company does confirm that it owns caching

centers—small collections of servers that store data in locations more proximate to its users—outside major metropolitan areas throughout the western coast of the US (Amazon.com 2015). Amazon and Apple continue to expand in rural Oregon (Rogoway 2015a). Finally, Quincy, Washington is home to one of the world's largest data centers, owned by Microsoft, as well as other large data facilities owned by Dell and Yahoo.

Cheap electricity is a major draw, with the Columbia River Basin providing over 40% of all US hydro-power electricity (Bonneville Power Administration 2014). In addition to access to inexpensive rural land and electricity, the Columbia River Basin has access to high-bandwidth fiber optic cables (Miller 2012a). The area provides access to numerous intra- and international long-haul cable connecting the region to other cable connections, providing high-bandwidth access to points across the globe. Regulatory changes have pushed these changes along as well. Rising interest in building data centers in Oregon led the state government to reduce or remove property taxes on "intangible" and "hard to quantify" assets like company branding and computer equipment in a clear nod to the tech industry later emulated by Washington (Miller 2012b). During state legislative hearings, Google and Amazon representatives testified that the previous tax regime had prevented the companies from expanding their technical infrastructure. Google claimed that without the tax break, it could not develop its Google Fiber internet infrastructure in the city of Portland (Rogoway 2015b). Shortly after the change in tax code, Amazon announced plans to build eleven more data centers in the region (Rogoway 2015a).

The tax breaks also made it possible to build data centers closer to cities. Hillsboro, within the Portland metropolitan region, is the future site of a reasonably sized 18,500 square meter data center (Rogoway 2015c). Hillsboro is the terminus of three major long-haul cable submarine

lines (Tyco Global Network Pacific, Southern Cross, and Trans-Pacific Express) connected to sites in Northern California, Japan and other places in Southeast Asia. Each cable line is over 20,000 km long (Submarine Cable Networks 2015). Within the Portland region, there are numerous land-based high-capacity long-haul cable connections to: Seattle and Tacoma in Washington; Boise, Idaho; Palo Alto, San Jose and Santa Clara in California; Cheyenne, Wyoming; and Kansas City, Missouri (TR 2014). A loop system connects the Oregon coast and central Oregon's data center's runs through a connection in Medford, Oregon (TR 2014).

The digital machinery of platform urbanism is not necessarily beneficial for local communities. These massive data centers do not provide superior service to the populations of the small municipalities in which they are located, nor are they designed to serve *consumers* in the nearest large metropolitan area, such as the "second-tier" tech hub Portland, Oregon (Mayer 2012). Instead, the regional digital labor and global reach of digital products produced necessitate data centers near, but not at, the site of digital *workers*. Urban high-tech and information technology firms, as well as consumers, benefit from tight links to these data centers located in the "hinterland" that have little or no direct benefit to rural municipalities or their residents (Glanz 2013). On the basis of this infrastructural capacity, Portland is home to the annual Open Source Software Conference, the inventors of Linux and the "wiki," Intel's largest manufacturing site and patents, and a growing software and technology scene (Rogoway 2014). Despite discursive appeals to local development made by large tech firms, the reality is that the benefits are not seen locally nor is their location driven by local demand.

Conclusion

In this chapter, we have highlighted how platform urbanism brings together the cognitive-cultural economy and the precarious service economy through underlying data and energy

infrastructure that stretches far into the urban hinterland. We argue that an examination of platform urbanism necessitates the materialization of the digital infrastructure in the form of the urban built environment and its linkages to primarily rural data centers. We show that the clustering of the data centers of Amazon, Facebook, and Google in rural Oregon and the broader Pacific Northwest—powering other platform urbanism firms, like Uber, through their data centres—contrasts sharply with the image of these firms, both popular and academic, as constitutively "urban," just as their mobilization of precarious labor in the gig economy contrasts with the notion that they herald an age of "immaterial" work. Of interest for questions of platform urbanism is not the way in which labor is replaced by ICT infrastructures, but instead how these infrastructures *deploy* labor on an ever-expanding scale and an increasingly precarious basis.

This deployment is the key to connection between urban and rural. To return to the example of Uber, assessing the environmental impact of an Uber ride in Portland requires understanding the impacts of Uber's back-end computation and storage on an Amazon server in rural Oregon. Activities facilitated by platforms such as Uber implicate any number of other rural Oregon data centers or subcontracted digital platform companies. For example, verifying an Uber account using Facebook allows for data sharing between Uber and Facebook, connecting trips with social media profiles. Paying for Uber, or Uber Eats, with Google Pay or Apple Pay connects trips or restaurant orders to respective user accounts at Google and Apple. A seemingly isolated platform action might involve an entire ecosystem of digital platforms and numerous separate data centers.

Further, we show how urban platforms rely on a growing class divide. On the one hand, agglomerations of cognitive-cultural workers concentrate in urban areas. Amazon, Facebook,

and Google are, again, emblematic of cognitive-cultural capitalist production and the underpinning of the proliferation of digital platforms. At the same time, the deskilled laborers who rely on this new digital machinery must also concentrate in these areas because of the density of demand and the availability of gig labor. In other words, cognitive-cultural workers are employed to create the digital machinery that increases the rate that capital is realized, while deskilled platform labor in the gig economy actually realizes physical tasks that generate essential data about consumer desires (Attoh *et al.* 2019, Payne and O'Sullivan 2020).

Platform urbanism combines sophisticated manipulations of nature and intensification of urbanization processes that link together both cognitive-cultural labor with deskilled platform labor, and the data production of the city with the computation and storage of rural data centers. Borrowing from DPE, we suggest that platform urbanism, as an appendage of the growing complexity of third-phase digital capitalist industry and urbanization, masks these types of labor and the necessary material infrastructure that enables them. This massive infrastructure both makes digitally mediated labor possible and positions rural localities as the bearers of new energy-intensive industries with little in the way of local benefits like employment growth, environmental improvement, or digital inclusion. Platform urbanism embodies the dialectic and material representation of both dead labor and the general intellect—shaping new, and uneven, socio-material natures and futures.

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