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RETHINKING THE SMART CITY

Democratizing Urban Technology

By Evgeny Morozov and Francesca Bria

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Another Kind of Smart

Following the celebration of the “creative city” (as described by Richard Florida), the “smart city” has become the new flavor of the month—and a brand. It makes clever use of resources, and it attracts money, corporate power, and private industries. Offering us cheap, effective solutions to social and political problems, the smart city is functional, optimized, and safe rather than participatory, sustainable, and fair.

As Evgeny Morozov and Francesca Bria point out, however, the problem is not merely the regulatory impulse of smart technologies. Coming from a political-economic rather than a purely technical perspective, the authors argue that the smart city can only be understood within the context of neoliberalism. In order to remain competitive in the era of austerity politics, cities hand over the management of public infrastructure and services to private companies, both de-centralizing and de-personalizing the political sphere.

How can cities regain control not only over technology, data, and infrastructure, but also over the services that are mediated by smart technologies—such as utilities, transportation, education, and health? Offering a wealth of examples and case studies from across the globe, the authors discuss alternative smart city models, which rely on democratic data ownership regimes, grassroots innovation, and cooperative service provision models.

Evgeny Morozov is a prominent critic of digital capitalism, dealing with questions of how major technology companies are transforming society and democracy. The author of several books, he also writes for various newspapers, including *The New York Times*, *The Economist*, *The Guardian*, and *Frankfurter Allgemeine Zeitung*. With a background in social science and innovation economics, Francesca Bria is an expert in digital strategy, technology, and information policy, who is active in various innovation movements advocating for open access, open technologies, and digital rights. She is currently Chief Technology and Digital Innovation Officer at the Barcelona City Council.

Laying out what works and what doesn't in the smart city of today, the authors do not simply advocate for a high-tech version of socialism in the fifth publication of our “City Series.” By carefully assessing what is at stake and for whom, this timely study offers practical solutions for how cities can be smart while retaining their technological sovereignty.

*Stefanie Ehmsen and Albert Scharenberg
Co-Directors of New York Office, January 2018*

Rethinking the Smart City

Democratizing Urban Technology

By Evgeny Morozov and Francesca Bria

Section I

Any contemporary attempt to update *Keywords*, Raymond Williams’s classic vocabulary of the terms outlining the cultural contours of the present, ought to reserve a prominent place for the word “smart”—that quintessential adjective of our digital age, which promised so much yet delivers so little. “Smart” is everywhere these days, from “smart toothbrushes” to “smart growth” to “smart homes,” seeking to capture a rapidly expanding yet nevertheless elusive and ambiguous constellation of meanings. It is often used as a sexy, innovation-friendly synonym for “flexible,” “wise,” “self-adjusting,” “intelligent,” “autonomous,” “resourceful,” “lean,” even “ecologically friendly”—positive, bright terms hinting at emancipation, promising sustainability, assuring us that no waste is left behind. Who could possibly be opposed?

Surely, the “smart city” is one of the most prominent of the “smart” concepts which have conquered the public imagination in the last decade. It is also one of the most consequential and politically significant of the lot, informing and shaping the work of urban planners, architects, infrastructure operators and real-estate developers, transportation officials, as well as mayors and entire industries. Like most things smart, the “smart city” is not reducible to a single meaning—a factor which surely helps to account for the rapid adoption and proliferation of this buzzword among professional elites. What to some refers primarily to the judicious

and ecologically-friendly use of city resources, signifies to others the deployment of clever, real-time devices—such as smart traffic lights installed in Rotterdam which privilege bicyclists over drivers in rainy weather¹—promising a hassle-free urban experience, and helping to make cities even more attractive to what urban cheerleaders like Richard Florida have described as the “creative class.”² Smart cities attract smart citizens, and smart citizens attract smart money. What more needs to be said?

The very concept of the smart city—tirelessly promoted by an entire industry of consulting firms, city fairs, and smart city expos—has already attracted its fair share of criticism. Though not particularly numerous, critics are vocal nonetheless—attacking the utopian visions behind the smart city for their unrealistic abstractions, lack of connection to the real-world problems of real people, technocratic quest for domination over our everyday urban existence (this time by means of sensors rather than zoning requirements), their almost pornographic obsession with surveillance and control, and their inability to think in ways that put citizens—rather than corporations or urban planners—at the centre of the development process.³

- 1 See <http://popupcity.net/rotterdam-traffic-light-prioritizes-cyclists-when-it-rains>.
- 2 Florida, Richard. *The Rise of the Creative Class—Revisited: Revised and Expanded*. Basic books, 2014.
- 3 For some examples see Greenfield, Adam. *Against the Smart City: A Pamphlet*. Do Projects, 2013. Sennett, Rich-

It is perhaps a testament to the intellectual force and clarity of this critique that many technology companies have already begun to think twice about associating their products and services which, only five years ago, would have been uncontroversially presented as part of the “smart city” package, with this brand. Google, which recently entered the field, shies away from the term altogether, with the head of its city unit explicitly stating that he rejects the term “smart city,” as cities have always been smart.⁴

To be sure, many of the earlier critiques of the smart city are valid and help connect the critique of the smart city to previous campaigns against the excesses of technocratic urbanism led by the likes of Jane Jacobs. Nevertheless, most of these critiques fail to recognize that cities are also motors of capitalist accumulation, that they are economic as well as social actors, and that most processes occurring in cities are propelled by economic and political forces which have been in the making for a very long time—long before many of the current players on the “smart city” market even appeared on the scene.

The reality is that the most important formative context for most cities—at least in North America and much of Western Europe—has been that of neoliberalism or, to be more precise, that of the transition from the post-war Fordist-Keynesian compromise to the highly entrepreneurial and financialized urbanism which emerged and expanded from the late 1970s onwards.⁵ Consequently, any inquiry into the

dominance of the “smart” ideology—as well as any attempt to think beyond it—ought to begin with an investigation into how it fits into the broader set of neoliberal precepts which have constrained cities’ autonomy, along with the kinds of political and economic choices they have made over the last thirty years.

Unfortunately, most smart city critiques offer few reflections on the geopolitics of the smart city agenda—representing another serious oversight. How, for example, are we to explain the appearance of “smart cities” on the official policy priority list of the US Department of Commerce’s Mission to Europe—listed alongside TTIP and the “Digital Single Market”?⁶ And what are we to make of the fact that major German, Chinese, and American technology firms find themselves pitted against each other—with political leaders from all three countries seeking to mediate the conflict—in a market like India, which has promised to raise one trillion dollars to develop over one hundred smart cities in the next few years?

This essay seeks to address some of the gaps mentioned above by investigating the connections between digital infrastructures—i.e., sensors, screens, algorithms, routers, mobile phones, cameras, and many other ingredients which put the “smart” into “smart city”—that have reshaped the technological landscape of cities and the political and economic programs that cities have either already embarked upon, or may embark upon soon.

The essay makes no strong causal claims concerning the interaction between technological infrastructures and political agendas, taking it

ard. “No one likes a city that’s too smart.” *The Guardian* 4 (2012). Townsend, Anthony M. *Smart cities: Big Data, Civic Hackers, and the Quest For A New Utopia*. WW Norton & Company, 2013. Fernández, Manu. *Descifrar las smart cities: ¿Qué queremos decir cuando hablamos de smart cities?*. Megustaescribir, 2016.

4 Interview with Dan Doctoroff, <https://charlierose.com/videos/25929>.

5 For several seminal texts documenting this shift, see Harvey, David. “From managerialism to entrepreneurialism: the transformation in urban governance in late capitalism.” *Geografiska Annaler. Series B. Human Geography* (1989): 3-17; Jessop, Bob. “Liberalism, neoliberalism, and urban governance: A state-theoretical per-

spective.” *Antipode* 34.3 (2002): 452-472; Peck, Jamie, Nik Theodore, and Neil Brenner. “Neoliberal urbanism: Models, moments, mutations.” *SAIS Review of International Affairs* 29.1 (2009): 49-66; Weber, Rachel. “Selling city futures: The financialization of urban redevelopment policy.” *Economic Geography* 86.3 (2010): 251-274.

6 <http://2016.export.gov/europe/cseuropepriorities/index.asp>.

for granted that they affect each other in numerous, overlapping, and mutually constitutive ways, thereby providing observers no easy way to deduce or postulate linear, direct, sound bite-friendly effects between the two. That said, it seems to be the case that technological infrastructures configured in a fashion more in line with the dogmas of neoliberalism—e.g., which treat data gathered in the city as a commodity to be bought and sold on secondary markets, delegating a greater share of public transportation to firms like Uber and taking a more hands-off approach towards the likes of Airbnb—will make it rather difficult for cities to experiment with non-neoliberal political and economic agendas. Fortunately, the inverse is true as well: Technological infrastructures designed along principles which depart from neoliberalism's key tenets (privatization, the celebration of entrepreneurship above all other forms of social and economic activity, the rejection of social justice as a legitimate goal of public policy, etc.) will help to amplify and consolidate the efforts of cities seeking to leave the neoliberal model behind in non-technological spheres.

As already noted, the term “smart”—capacious as it may be—exhibits tremendous semiotic flexibility. For example, with charges of technocracy and accountability looming on the horizon, the smart city industry wasted no time in championing the needs of “smart citizens” and emphasizing the need to promote “smart participation” (which, needless to say, proved easy to reconcile with the rest of the neoliberal package). Accordingly, we take a similarly flexible approach to defining the subject matter itself.

In the context of this essay, “smart” refers to any advanced technology deployed in cities with the intent of optimizing the use of resources, producing new resources, changing user behavior, or promising other kinds of gains in terms of, for example, flexibility, security, and sustainability. These gains accrue primarily due to feedback loops inherent in the deployment and use of

intelligent devices featuring connectivity, sensors, and/or screens.

Such a capacious definition helps us to avoid the artificial limits imposed by the industry itself, making it possible to consider services offered to and in cities by firms from Google to Uber, which otherwise would not be present alongside the numerous self-described “smart city” products and solutions offered by the likes of Cisco or IBM.

There is little point in building a non-neoliberal smart city liberated from the likes of Cisco and IBM only to find that it has already surrendered to the machinations of Google and Uber. Obviously, the point of contention here is not a specific interpretation of “smartness,” but rather the political and economic consequences thereof—which by and large remain the same regardless of whether the service in question bears the adjective “smart,” or merely “intelligent” or “real-time.”

The “city” component of the “smart city” concept has so far attracted far less attention than the “smart” half, but nevertheless calls for an equally critical analytical approach. After all, cities have always occupied a particularly important place in the neoliberal imagination. The work of Edward Glaeser, backed by the prominent conservative think tank the Manhattan Institute, is a case in point: As Jamie Peck has pointed out in his extensive recent critique,⁷ “urbanism” in Glaeser’s work becomes yet another tool to rationalize the superiority of the market form to all others, irrespective of whatever minimum concessions Glaeser may make to global warming or income inequality. Likewise, many libertarians warm to the idea of the “voluntary city,”⁸ where all key services—from

7 Peck, Jamie. “Economic rationality meets celebrity urbanology: Exploring Edward Glaeser’s city.” *International Journal of Urban and Regional Research* (2016).

8 See Beito, David T., Peter Gordon, and Alexander Tabarrok. *The Voluntary City: Choice, Community, and Civil Society*. University of Michigan Press, 2002 and Goldsmith,

emergency assistance to schooling and police—are provided by the market (or, the second-best option, by “civil society”) and regulated by private contracting. In this case, concepts like “the voluntary city” are regularly raised to show that even though neoliberal dogmas may not work in theory, they do in fact work in practice.

In other words, it may actually be the “city” rather than the “smart” component which

holds such a capacious and ambiguous term together: Insofar as cities play an important role in promoting particular neoliberal interventions, a term like the “smart city” helps to consolidate what are otherwise rather disparate efforts (which may have originally pursued quite different rationales) into a coherent whole, creating an almost unassailable case for the superiority of the market form above all others.

1. The Smart City: A Counter-History

The weakness of the corporate case for the smart city becomes increasingly clear once one notices that its history is usually allocated only several brief sentences in the already thin advertising brochures pitching various corporate services (such brochures have become the primary and almost exclusive literary medium of this industry). Contemporary histories of smart cities are, as one academic article colourfully put it,⁹ perfect examples of corporate storytelling: Stripped of all politics and accounts of contestation, these narratives inevitably celebrate the unstoppable march of progress and innovation, greatly accelerated by the ingenuity and inventiveness of the private sector.

Thus, smart cities are invariably presented as logical high-points in cities’ technology- and information-driven evolution, their growth and ubiquity checked only by the rate of civilization’s inventiveness rather than external political or economic factors. Previous instantiations of this same idea—the media city, the information city, the telematic city, the city of bits—almost never receive a mention. In the rare cases when they

do, it is mostly to signal the inability of those earlier concepts to live up—in technological terms—to the utopian visions invested in them. Rarely is context provided for the sudden explosion of “smart” as the moniker *du jour*, as if the notion simply dropped from the sky and immediately found like-minded allies in city after city.

Academics who have looked into the term’s genealogy point out that its origins (as well as its phenomenal global reception) are to be found in the reorientation of major firms like IBM away from their traditional business model of hardware and software sales to selling services, including consulting.¹⁰ As IBM embarked upon its “smarter planet” strategy, seeking to orient itself towards various optimization needs in both the private and public sectors (eventually culminating in the production of yet another buzzword—“cognitive computing”—of which IBM Watson is allegedly king), it was fortunate enough to stumble upon the term “smart” in relation to cities, putting the term into wider circulation among the business

Stephen. *Putting Faith in Neighbourhoods: Making Cities Work Through Grassroots Citizenship*. Hudson Institute, 2002.

9 Söderström, Ola, Till Paasche, and Francisco Klausner. “Smart cities as corporate storytelling.” *City* 18.3 (2014): 307-320.

10 See Paroutis, Sotirios, Mark Bennett, and Loizos Heracleous. “A strategic view on smart city technology: The case of IBM Smarter Cities during a recession.” *Technological Forecasting and Social Change* 89 (2014): 262-272; Anthopoulos, Leonidas G. “Understanding the smart city domain: A literature review.” *Transforming City Governments for Successful Smart Cities*. Springer International Publishing, 2015: 9-21.

community¹¹ (IBM initially trademarked the term “smarter cities,” but eventually settled on “smart cities” instead).

The many predecessors which emphasized the ecological over the technological dimension of smartness—the green city, the eco-friendly city, the sustainable city, the zero-carbon city—are also rarely evoked, even if the need to cut emissions and energy costs was one of the primary drivers pushing cities to experiment with smart technologies and continues to be the factor helping to humanize the corporate smart city agenda. In the absence of other immediately available and affordable ways to fight climate change, cities will continue to reach for corporate digital solutions—while opposing this process in any meaningful way would also mean to risk drawing the ire of environmentalists.

From the perspective of cities, the motivations behind opting for smart city solutions can be roughly classified into two types: normative and pragmatic. The former refers to long-running efforts to deploy technology to achieve ambitious and universally accepted political goals like promoting political participation among ordinary citizens, helping to personalize public services and de-bureaucratize national and local governments, creating a more enjoyable and less discriminatory urban environment to stimulate economic growth, reduce tension, and promote creativity and serendipitous discovery.

The second type of motivation, that of the pragmatic variety, spans a much broader and more heterogeneous set of objectives. Some cities want smart technologies because they promise immense savings on the provision of slightly similar or even better type of services during a period of budget cuts and harsh austerity. Others desire them because they want more security and policing, particularly on the eve or during so-called mega events like the Olympics, which have come to provide an economic lifeline to many cities compelled to replace their manufacturing base with tourism. Smart CCTV cameras, along with sensors present in much of the built environment and new techniques of predictive policing, allow cities to exercise targeted, effective controls over areas previously hard to reach and govern.

Combined with ever-improving drones and a new generation of policing robots, smart technologies foster a context of heavily militarized urbanism previously restricted to hotspots like Fallujah.¹²

Finally, some cities opt for smart technologies because they promise to pragmatically resolve a problem which may be specific to that particular city: congestion caused by crumbling road infrastructure and lack of repairs, a lack of jobs which (with some luck) can disappear as smart money follows smart citizens into the smart and creative

Box 1. The “Smart City” Market and Related Technologies

According to major business consultancies, the smart city market is expected to reach \$3 trillion by 2025—exceeding the size of all traditional business sectors. The McKinsey Global Institute, for example, estimates the potential economic impact of new Internet of Things (IoT) applications and products to be as much as US\$3.9–\$11.1 trillion by 2025 (IoT is a critical component of the many technologies constituting the “smart city”). Below are some examples of key “smart city” products offered by multinationals currently shaping this market.

¹¹ McNeill, Donald. “Global firms and smart technologies: IBM and the reduction of cities.” *Transactions of the Institute of British Geographers* 40.4 (2015): 562-574.

¹² Graham, Stephen. *Cities Under Siege: The New Military Urbanism*. Verso Books, 2011.

Siemens: Infrastructure Business and Asset Analytic Services for Predictive Maintenance

Siemens's smart business model as system integrator focuses on "building integrated intelligence into infrastructures," and on leveraging smart asset management, smart grids, and building management systems in particular. Siemens Building Management platforms such as Desigo CC integrate fire safety, security, building automation, heating, ventilation, lighting, and air conditioning as well as energy management products and services. Siemens also focuses on promoting Industry 4.0 models for manufacturing, and advising on transformation roadmaps for companies to digitalize their factories.

IBM: Intelligent Operations Centre for Public Safety and Law Enforcement

IBM has promoted its "smarter planet" strategy to centralize analysis of the interconnected bits of information coming from cities and embed them in systems and infrastructures to better control operations, capture, and optimize the use of resources. In support of this vision, IBM has established an Intelligent Operations Centre (IOC) enabling the optimization of critical information stored in disparate systems across multiple departments for the benefit of the city's population, economy, and greater ecosystem. The IOC was implemented in Rio de Janeiro, Brazil in 2010 to facilitate flood prevention and transportation management, as well as in Miami to manage football stadium operations, facilitate data-driven decision-making, and predict crowd problems to minimize disruptions. IBM solutions generally focus on law enforcement, predictive policing, and crime prevention, leading to the establishment of "Intelligent Law Enforcement Centers" and "Real Time Crime Centers." In Atlanta and Chicago, for instance, IBM uses facial recognition, advanced video monitoring, and other pervasive surveillance technologies to provide police with accurate information allowing them to detect crime patterns based on Big Data analytics.

Cisco: "Internet of Everything"

Cisco is one of the leading companies promoting smart solutions for cities, under its Smart+Connected Communities programmes. Many cities have implemented Cisco systems to integrate data from a variety of sensors, solutions, applications, platforms, and analytics to manage urban services. Cisco's Command and Control Centre has already been implemented in Dubai, Kansas City, Adelaide, Hamburg, and Bangalore to manage a variety of urban services in various sectors such as energy, e-government, and logistics. Cisco is currently promoting its latest Internet of Things platforms such as their fog computing solution, capable of gathering, processing, and conducting analysis on the periphery of a network where it can be acted upon more immediately.

Phillips: Smart Connected LED Lighting

Phillips entered the smart city market through the development of connected LED lighting solutions for cities, promising energy efficiency and maintenance cost savings, combined with intelligent lighting control systems and sensors targeting security and safety in public spaces, inside buildings and at home. Its CityTouch city lighting management system and control platform also puts forward a new model for cities' infrastructural investments, whereby new lighting functionalities can be continuously added to outdated urban systems. Phillips has worked with governments to introduce new policy and management accounting frameworks that would favour these new models based on selling lighting infrastructures as a service. Phillips has also developed the "Pay per lux" model, an intermediary platform that treats products as resource banks, facilitating resource management between manufacturer, supplier, and end-user. Examples have been implemented in Buenos Aires, Los Angeles, Holbaek, Denmark, and Tenerife, Spain, among others.

urban districts, or an ineffective garbage disposal system that clogs the streets and frustrates citizens who feel that garbage trucks have excessive capacity when little garbage is around and always seem to be overstretched when needed the most. Just imagine: Re-

al-time, immediate feedback loops with the capacity to learn, listen, and adjust thanks to clever sensors inserted into “smart trash-cans” which can tell passing trucks they need to be emptied—has there ever been a cleverer solution to the problem of garbage disposal?

Box 2. Smart Cities and Surveillance

One of the most high-profile uses of smart city technology remains IBM’s Operations Room in Rio de Janeiro, which received the lion’s share of media attention particularly in the run-up to the 2014 World Cup. Much of the value added of these technologies resides in system integration: Specifically, they take existing data feeds emanating from municipal departments and private suppliers and integrate them into an easily manageable and highly visible interface promising swift and immediate problem-solving at the turn of a knob, or—more likely—the click of a mouse. The data on display is often of a rather mundane and administrative nature: rainfall levels, the state of garbage collection, traffic congestion, etc. However, a high degree of system integration, particularly when combined with live CCTV feeds and advanced facial recognition software, raises numerous concerns about privacy and excessive surveillance. Furthermore, the current wave of “smart” euphoria has resulted in many products traditionally classified as tools of surveillance and predictive policing being rebranded as essential components of the “smart city” package. For example, Microsoft’s CityNext program, which offers “public safety and justice solutions,” specifically targets its products and services at municipal police departments. CityNext also includes several products which go far beyond the problems of a city: Its “prison and offender management” initiative, for example, promises to “track and manage offenders throughout the entire corrections system.” Many of these solutions are hardly new and have received widespread criticism from criminology scholars (predictive policing often reinforces existing social inequalities, as it feeds on biased data), yet these shortcomings often recede from view as programs are rebranded and sold as part of a broader “smart city” package.

2. Smartness and Neoliberalism

The dynamics and concurrent imperatives of the three aforementioned rationales can be grasped without recourse to any advanced analytical or historical frameworks. Once we factor in the additional consideration that most cities embarking on smart city experiments also happen to be caught up in the regulatory apparatuses of neoliberalism, however, several additional considerations come to the fore.

First of all, if neoliberalism—as many scholars have argued over the years—is characterized by the transition from a form of rule enacted by a centralized government to one underpinned by decentralized governance, then we must also account for the precise mechanisms (and technological enablers) of this newer, softer, less obvious form of rule. One such mechanism identified in the burgeon-

Box 3. Smart Cities Beyond the Global North

Unlike Western Europe, North America and parts of South America, where the smart city revolves primarily around infrastructural improvements to existing cities, in Asia, India, and, to a lesser extent, China, we find numerous examples of “smart cities” being built from scratch. Thus, whereas the dominant smart city discourse in the Global North is often synonymous with that of privatization of (existing) municipal services, in the Global South the discussion is often driven by imperatives of state-led urbanization and the formalization of previously informal industries and services, often overlapping with discourses of financial inclusion and entrepreneurship (as in India) or ecology and sustainability (as in China). In both cases, the term “smart” seems to emerge as the least problematic moniker for a set of rather conventional neoliberal policies and prescriptions which can now be reactivated against considerably less political resistance.

India’s Smart Cities Mission is one of the most ambitious government-led programs to develop more than 100 smart cities across the country. This has predictably generated a great deal of interest among consultants and garnered attention from foreign players, many of them viewing the smart city business as yet another opportunity to regroup and retool their flagging services for the digital age. Thus, firms from China, Russia, Japan, the US, Germany, and France have all signed up to participate in the building of India’s smart cities. Predictably, the program has triggered a backlash, with many activists and academics pointing out that it fits all too well with Narendra Modi’s overall plans to make India more attractive for foreign capital, even if this entails greater inequality, deregulation (particularly in the interests of designating some of those cities as special economic zones), discrimination, and misappropriation of public funds to cater to the needs and interests of the well-off elites most likely to populate India’s “smart cities” (which, needless to say, are also imagined as “global” cities). India is a country where billionaires and corporations already build their own, completely privatized cities (e.g., Lavasa or Gurgaon), ensuring that the shock value of 100+ smart cities arising over just several years is not as great as one might expect.

ing literature on neoliberalism in general¹³ as well as in the some-what smaller literature on neoliberalism and cities¹⁴ is the growing importance of rankings, competitive tables, and comparative scores. City indebtedness rankings by credit agencies like Moody’s or

Standard & Poor’s represent the root of this trend, with cities vying for a favourable rating which determines their costs of borrowing. Today, this function is further exercised by various rankings—measuring innovation, creativity, or even smartness itself—compiled by the emerging urban-philanthrocapitalist complex of think-tanks, foundations, and allegedly neutral NGOs, determining the broader constraints and parameters within which cities now compete.

How cities perform on those secondary indicators in turn feeds into how investors view their competitiveness, which ultimately flows into

13 See Giannone, Diego. “Neoliberalization by evaluation: Explaining the making of neoliberal evaluative state.” *Partecipazione e conflitto* 9.2 (2016): 495-516.

14 See Greene, Francis J., Paul Tracey, and Marc Cowling. “Recasting the city into city-regions: Place promotion, competitiveness benchmarking and the quest for urban supremacy.” *Growth and Change* 38.1 (2007): 1-22 and Hackworth, Jason. *The Neoliberal City: Governance, Ideology, and Development in American Urbanism*. Cornell University Press, 2007.

the ratings assigned by credit agencies, thus affecting their borrowing costs. Most cities have little choice but to borrow as a result of their budgets being cut by national governments; the worsening economic conditions in many of them—most visible in the looming public sector pension crises—produce additional financial strain. Consequently, a city need not harbor any strong, rational desire to be smart in order to embark on a smart city agenda of some kind—doing otherwise would mean risking one’s standing on the international bond markets.

Related to this is the pressure facing many cities to quantify the performance of their various constituent parts in order to render them more accountable, competitive, and manageable—another phenomenon commonly associated with the ascendance of neoliberalism and its “audit society” or “logic of discipline,”¹⁵ depending on one’s theoretical predilections. While this drive to quantification—led by cities like Boston, which has its own “city score”—is rarely linked to the smart city phenomenon (at least not in popular discourse), it is nevertheless rather obvious that the ranking-of-everything mentality upon which it rests is only possible in a city capable of collecting, analysing, and processing vast amounts of data. Thus, willingly or not, the smart city agenda along with the infrastructure of sensors and connectivity it promotes also opens the door to the kind of audit-obsessed quantification celebrated by neoliberalism.

An analytical lens well-trained on the methods, techniques, and aspirations of neoliberalism can help us to reveal several other dimensions of the smart city problematique which usually escape those analyzing it from a purely technical perspective. In the last three decades,

as the logic of corporatism and embedded liberalism dominating the political landscape of Western Europe and North America gave way to the logic of highly globalized and liquid capital elevating the interests of finance over those of any other sector of society (including the productive economy), cities, like all other units of society, have found themselves subjected to immense pressure to both roll back some institutions of the welfare state, as well as roll out some policy innovations of their own.¹⁶

Two such processes are of particular importance to our discussion: the delegation and subcontracting of responsibilities previously re-served to public institutions to private players, along with the enlistment of private financial capital—mostly from pension funds, insurance firms, various alternative asset management funds—into the management, maintenance, and construction of infrastructure, most of which operates at a local level. Both exhibit significant, albeit underexplored connections to the smart city agenda, as both require an extensive infrastructure of gathering, analyzing, and acting upon data to succeed and proliferate.

Subcontracting can, of course, be described as a further privatization of public services—indeed, such a description would be entirely correct. While the exact service providers and distribution of responsibility between them and public institutions vary from country to country, we can nonetheless identify several similarities. First, much of this subcontracting is facilitated by the so-called Big Four accounting and consulting firms (Ernst & Young, Deloitte, PwC, KPMG), many of which now double as technology providers, investing heavily in technologies like blockchain and Big Data.

Some speak of the “solutions economy” (Deloitte), while others promise an “outcome

15 Power, Michael. *The Audit Society: Rituals of Verification*. OUP Oxford, 1997, and Roberts, Alasdair. *The Logic Of Discipline: Global Capitalism and the Architecture of Government*. OUP USA, 2011.

16 Jamie Peck and Adam Tickell. “Neoliberalizing space.” *Antipode* 34.3 (2002): 380-404.

economy" (Accenture). The end result, however, is the same: This model rests on the commodification of solutions to social and political problems, the enlistment of actors (like banks and other financial institutions) which would traditionally not be part of the "solution," and the intensive deployment of data analytics and measurement to assess whether specific targets or outcomes are being delivered, coupled with timely interventions to steer the process

towards said outcomes. None of this would be possible without an extensive infrastructure for tracking and controlling both physical and human resources, with quantification of performance paving the way for all sorts of other, even more advanced experiments to be constructed on this foundation.

The rapid proliferation of social impact bonds illustrates the operative logic of the hybrid

Box 4. Handmaidens of Smart City Neoliberalism: Expos, Foundations, Consulting Firms

While often situated on the periphery of smart city discourse, a set of players that are neither municipalities nor technology firms have exercised a considerable amount of influence on the tone of discussion, supporting continuous media coverage of smart cities and creating a panoply of rankings of various dimensions of "smartness" to encourage cities to compete with each other. Not all of these players have an explicit interest in smart cities—some were attracted to it indirectly by pursuing other policy objectives ("resilience" in the case of the Rockefeller Foundation, a major funder of initiatives—including journalistic ones—focusing on resilience; "transparency" and "good governance" in the case of major development institutions like the World Bank). Most major consulting firms, sensing lucrative opportunities in the ongoing restructuring of municipalities, have established their own departments and institutes to deal with problems of the city. Numerous high-profile conferences and expos—typically combining product demonstrations with conference sessions aimed at filling the somewhat empty subject of the "smart city" with content—have also emerged, initially in Europe and North America but increasingly across Latin America and Asia, as well. To the extent that smart city discourse is hegemonic in discussions of problems facing modern cities, these intermediary institutions—from foundations to expos to consulting firms—are responsible for giving the discussion a particular neoliberal hue.

"solutions" or "outcome" economy at play here. Such bonds are issued by governments as they delegate responsibility for a particular sector—such as prisons or schools—to financial firms like Goldman Sachs. The latter pledges to meet a particular target such as of repeated offenses in the case of prisons or literacy rates in the case of schools, and is only paid for its services if that target is met. To encourage financial firms to participate in such endeavours, their risks are often underwritten by foundations, who, caught up in their own philanthrocapitalist bliss, would like to see the social sector become subservient to the logic of financialization.

The practice is extremely controversial and several such experiments have already failed, but that should not detract us from grasping one important feature of what a successful social investment bond entails from the perspective of, say, Goldman Sachs: It requires the ability to monitor and extract the maximum amount of value from resources under management, which entails perpetual surveillance coupled with nudging and other forms of producing desired behavior. Moreover, should monitoring capacity prove insufficient, it would be advantageous to have the means to produce statistics so obscure and impenetrable that the op-

erating entity—in this case, Goldman Sachs—can claim that it has in fact met its target and should be paid the amount due (as regularly happens in actual projects financed through social investment bonds). Surrendering control over such statistical and computation capabilities—an inevitable consequence of the privatized smart city—is a sure way to be swindled by private service providers on a regular basis.

The enlistment of financial capital into the provision of infrastructure operates according to a rather similar logic. Most industry players from asset management funds to private equity firms do not intend to hold the infrastructure they invest in for a long period of time; usually, they hope to make a large enough speculative

gain and exit within a decade (although even if the speculative gain is not large enough, most such firms earn their money from transaction and management fees independent of returns).

The model's obvious downside is chronic underinvestment into long-term facilities and planning of the infrastructure in question, as investors adopting a short-term perspective are not motivated to undertake expensive infrastructural upgrades. This is only part of the problem, however, as investors also seek to extract as much value from the asset under management in the short period of time they own it as possible, often degrading it much faster than a longer-term operator or owner would.

Box 5. Infrastructure's Emergence as an Alternative Asset Class

The stagnant global economy and low interest rates it spawned are responsible for a growing interest among many investors—from pension funds to boutique asset management firms—in infrastructure. As one of several alternative assets, it still occupies a minor role compared to investments in private equity, hedge funds, or venture capital. Nonetheless, certain features of this particular asset class make infrastructure—from toll-operated roads to airports to sewers—highly appealing to investors, as it offers a stable, long-term return and is well-protected from inflation and economic fluctuations. Infrastructural investments are generally of two types: “greenfield” (where the infrastructures in question are built from scratch, yielding higher risks but also higher payoffs) and “brownfield” (investments in already existing infrastructures, sparing investors the higher risks associated with construction but also lowering expected returns). Both types usually involve governments and municipalities, as much infrastructure is financed through public-private partnerships whereby the local authorities often grant private operators concessions to operate certain infrastructures in exchange for a significant upfront payment calculated against expected returns. Such models typically incentivize the operator to cut costs (e.g., by eliminating maintenance) and extract maximum rents (e.g., by charging users different rates depending on how much of the resource they consume or, say, their ability to pay). The ubiquity of “smart” and always-on sensory infrastructures allows investors to pursue both of these strategies at once: costs can be minimized and completely pushed onto users, while the ability to recognize the user and link any act of consumption with their entire life history facilitates a price that the user is unlikely to turn down. Thus, the proliferation of sensors, connectivity, and data analytics into the built environment is likely to entrench today's highly financialized model of infrastructure provision. The same is true of real estate to some extent, where the ability to retrofit buildings with sensors and engage in sophisticated forms of asset management allegedly adds value to the property in question.

This is known as “sweating the asset” in industry parlance—a typical practice among infrastructure investors.

This occurs in several ways. One method is to charge users the highest bearable price, usually a rather high figure with infrastructure as most of these goods and assets are almost by definition scarce and do not have easy alternatives. Another method is to use the assets more heavily, ensuring they never lie dormant and increasing capacity utilization almost to the maximum. This may have been a difficult undertaking twenty or thirty years ago, but with today’s sensors and ubiquitous capability, finding alternative users for dormant infrastructure is as easy as finding tenants for an empty apartment on Airbnb.

In other words, “sweating the asset” presupposes the same smart infrastructure of sensors, connectivity, and basic computing as the outcome and solutions economy: Neoliberal techniques appear far less effective in the absence of technological infrastructure to acti-

vate and profit from them. The need to charge people different prices based on their ability and eagerness to pay also points to the importance of personal and reputational data in this model’s proliferation: As long as differentiated pricing remains the best way to maximize one’s revenue stream from an asset, we can rest assured that sensors—including highly advanced biometric sensors capable of identifying us and linking our faces to our social media accounts—will continue to invade our cities.

To even try to explain the proliferation of assets and connectivity in the built environment without looking at the underlying political and economic drivers is thus a rather futile exercise. One can, of course, go on hoping that these sensors and routers will be deployed to humanize and personalize national and local bureaucracy—yet this seems like a rather naïve aspiration given that bureaucracy itself is increasingly being taken out of the government’s hands. Once privatized, this humanizing rationale disappears as if it never existed: A

Box 6. Financializing Infrastructure: The Brazilian Example

Various innovative financial tools and strategies have been tried in Latin America over the last decade. The strategies consisted of raising large amounts of public funds to pay for infrastructure projects spearheaded by private developers. In Brazil, this soon became a widespread practice. The model is as follows: The Bank of Brazil issues bonds to be auctioned off to developers to regenerate part of the city. The bonds (“CEPACs,” short for “certificates for additional construction potential”) provide legal and fiscal incentives entitling developers to build additional density in the area, while revenues from bond sales are invested back into housing, roads and other infrastructure in the same redevelopment zone. Cities have been using these strategies to unlock land value for private investors, while capturing some of this value back.

CEPACs were widely traded and became a solid investment vehicle for pension funds and real estate, resulting in a huge increase in land prices and gentrification which slowly expelled the local population from their neighbourhoods. Overall, CEPACs have led to large amounts of public spending favouring large iconic infrastructure investments ensuring big corporate returns, rather than prioritizing social policies, public services (such as transport and affordable housing), and real urban and developmental needs.

privatized toll road—the quintessential example of smart infrastructure built to “sweat the asset”—has no need for humanism.

Surprisingly, most traditional accounts of the rise of smart city ideology downplay the role of the most powerful sector in our cities, real estate and construction companies—if they mention it at all. In a way, their interest in “smartness” is similar to that of infrastructure investors: Sensors and connectivity allow for more hands-on management of their resources, including buildings, the structural faults, problems, and inefficiencies of which can now be identified, fixed, and predicted in real time. This transition to “smart buildings” and “smart assets” allows real estate firms to charge a “smartness” premium, thus driving up the already prohibitive costs of real estate.¹⁷

Once such buildings and assets proliferate, cities can market entire “smart districts”, accelerating the process of gentrification and driving rents even higher—especially if one can also demonstrate that the area is popular among local entrepreneurs and start-ups. Tellingly,

Richard Florida, the proselytizer-in-chief of the “creative class” and the requisite “start-up cities,” has now become the main cheerleader for “start-up districts,”¹⁸ drawing up (as one would expect) rankings of districts based on their “smartness” and “startuppiness.”

Moreover, the proliferation of secondary data on tenants permits a more effective form of renter screening, reducing the risks of delayed payment and other costs associated with problematic tenants. Not surprisingly, several start-ups already offer such screening services, promising landlords and real estate firms risk profiles of potential tenants based on careful analysis of their online activity. In this instance, the logic of the gated community is applied not only to the outside but increasingly within: Credit scores and letters of reference no longer suffice, one must now work and produce the requisite online reputation to qualify to live in a particular “building.” This production of the complacent entrepreneurial ethos is very much in line with the overall project of reengineering the soul as advanced by neoliberalism.

3. Cities of Privatized Keynesianism

Despite the incessant celebration of cities as the most important actors in our global system, with celebrity mayors rising to rule the world (and soon, perhaps, the universe), the reality looks quite different. After all, contemporary cities are not isolated entities, and much of what occurs in them is still very much determined by transformations at the national and global level. Armed with useful concepts such as “urban entrepreneurialia-

lism”¹⁹ or “austerity urbanism”²⁰—both of which are linked to the global rise of neoliberal ideology—one might be tempted to think that we are somehow dealing with purely local processes, perhaps merely logical consequences of local technocrats imbibing neoliberal ideology and embarking on a transformation of their

¹⁷ See Rogers, Dallas. *The Geopolitics of Real Estate: Reconfiguring Property, Capital and Rights*. Rowman & Littlefield International, 2016.

¹⁸ See <http://martinprosperity.org/content/rise-of-the-urban-startup-neighborhood>.

¹⁹ David Harvey, 1989, *From Managerialism to Entrepreneurialism: The Transformation in Urban Governance in Late Capitalism*, <https://www.jstor.org/stable/490503>.

²⁰ Jamie Peck, 2015, *Austerity Urbanism: The Neoliberal Crisis of American Cities (City Series, No. 1)*, RLS-NYC, rosalux-nyc.org/austerity_urbanism.

cities in accordance with neoliberal guidelines. This is too simplistic of a picture, however, which treats neoliberalism as merely a cluster of ideas and prescriptions to be accepted or rejected on a local level, and ignores the structural constraints—the products of economic and political transformations unleashed by neoliberalism as process, not just neoliberalism as ideology—which make such ideas and prescriptions either more or less likely to hold fast and gain currency.

In practical terms, the appeal of quick technological fixes to city bureaucrats cannot be explained by their ideological confusion or technocratic faith alone, for there are actual structural factors which make the enlistment of technology firms in the business of running the city as well as generating income for some of its inhabitants such an attractive choice. Understanding these structural factors should, at the very least, make us aware that articulating and executing a vision for a truly non-neoliberal smart city is much more difficult than it first appears, for it is not merely a matter of building different technologies or alternative property regimes around data generated in the city. These are necessary, but not sufficient conditions.

To understand the scale of the challenge of building non-neoliberal cities, one must come to grips with the fact that many technology firms, often located in Silicon Valley, operate a fully privatized shadow welfare state parallel to the actual, rapidly shrinking welfare states of many OECD countries. The presence of this privatized welfare state is most visible in the United States, where the core functions of the actual welfare state such as health care have traditionally been delegated to private providers, with the government picking up some of the bill. That said, this model is likely to spread to cash-strapped European cities in the near future.

There are two sides to this regime of privatized welfare: One draws on advanced technology to deliver significant savings to consumers, thus

concealing their rapidly falling real incomes, while another draws on the same set of technologies to produce either short-term, extremely flexible (even if highly precarious) employment opportunities in the gig economy, or quick speculative gains in the sharing economy, mostly by turning one's house—should one be lucky enough to own one—into a permanent hotel that also doubles as an ATM.

Before reflecting on this model in detail, one ought to mention that though most critical economists and sociologists are still unaware of it, Silicon Valley constitutes the latest frontier of what Colin Crouch calls “privatized Keynesianism,” or what Robert Brenner and Monica Prasad dub “asset bubble Keynesianism” and “mortgage Keynesianism,” respectively.²¹ Though they disagree on some historical details, Crouch, Brenner, and Prasad agree that the prosperity-generating functions, reserved for the welfare state under Keynesianism and the regime of stable Fordist employment, have found their match in a highly speculative and consumption-fuelled regime which seeks to replace whatever income was previously derived from stable employment with income generated from investment in houses and other speculative assets.

One key element missing from their analysis is that this push to drive up the value of assets to make people feel wealthy—and indeed, some truly did become wealthy by selling property at the right time—was also matched with a particular attitude towards antitrust law allowing more monopolies to form, achieve economies of scale and tap into labor markets in the developing world, thus offering many of their

21 Crouch, Colin. “Privatised Keynesianism: An unacknowledged policy regime.” *The British Journal of Politics & International Relations* 11.3 (2009): 382-399. Brenner, Robert. “What is good for Goldman Sachs is good for America: The origins of the present crisis,” www.sscnet.ucla.edu/issr/cstch/papers/BrennerCrisisTodayOctober2009.pdf (2009). Prasad, Monica. *The Land Of Too Much: American Abundance and The Paradox Of Poverty*. Harvard University Press, 2012.

products at extremely low costs. This is what has come to be known as the Wal-Mart Effect: people's real incomes may have fallen, but not as quickly as Wal-Mart's prices, thus concealing the actual economic situation of many families.

The rise of digital capitalism with Silicon Valley at the helm has turbocharged both of these processes. On the one hand are firms like Uber, which from the passenger's perspective manage to leverage the advanced technology found in our smartphones to offer extremely low rates, achieved in part through better capacity utilization due to sensors. As with infrastructural investors, Uber excels at "sweating the asset"—its executives frequently speak of creating a "perpetual ride"—allowing the magic of Big Data and algorithms to produce a pick-up schedule so intricate and complex that the Uber car never stands idle, fetching customers wherever it goes. Global presence—backed by capital injections from the likes of Goldman Sachs and Saudi Arabia—also allows Uber to operate on a massive scale, and to accept short-term losses by offering low rates in order to destroy all competition. As long as they are promised low rates, customers do not seem to mind.

Uber drivers also have something to gain in an environment where stable jobs are hard to come by. The system of course exhibits many flaws and exploitative practices, carefully documented in studies of actual Uber drivers, but the fact remains that Uber is a system which allows a small percentage of the population to earn money when their regular jobs no longer deliver or even exist. Even this limited idyll is unlikely to last forever, as Uber has already expressed its desire to switch to fully automated cars being tested in select US cities. Drivers will not be happy, but for passengers it will mark another occasion to celebrate, as rides will become even cheaper.

In light of these projected ever-falling transportation costs, one can see why cash-strapped

cities are beginning to seriously consider subcontracting public transportation to the likes of Uber, particularly in the United States. Smaller cities from Florida to New Jersey are now paying Uber to offer subsidized rides to its inhabitants, while Washington, DC already employs Uber to transport the disabled—deemed preferable (and cheaper) than investing in new bus lanes, trains, or other forms of public transportation. Uber is thus homing in on the most lucrative sector—rides guaranteed by government—and essentially becoming part of the privatized public transportation system in the United States.

Airbnb can be understood along similar lines. For decades now, national governments under the influence of neoliberal thinking have preached the values of homeownership ideology: Renting was supposedly bad, as was communal, publicly owned housing.²² Real wealth, governments assured, came from investing in privately owned housing. Such a stance fit well with the overall neoliberal transformation of society, as it helped to decouple workers' loyalty from previous institutions of solidarity and support, such as trade unions, and instead tie it to the performance of stock markets and central banks. Workers were to be reinvented as entrepreneurs who borrowed against future earnings and invested in real estate.²³

Airbnb follows this logic to its ultimate conclusion by allowing users to generate short-term rents on their property. In an environment where stable and well-paying jobs are hard to come by, Airbnb becomes a powerful vehicle for earning supplemental income. This fact is no coincidence, but rather a normal feature of the "privatized Keynesianism" under which we now live. Just like the "perpetual ride" is the dream of Uber and (for the time being) its drivers, the

22 For an excellent summary see Aalbers, Manuel B. *The Financialization of Housing: A Political Economy Approach*. Routledge, 2016.

23 Payne, Christopher. *The Consumer, Credit and Neoliberalism: Governing the Modern Economy*. Vol. 152. Routledge, 2012.

Box 7. User Mobilization by Uber, Airbnb, and Facebook Against Prospective Regulations

One of the most controversial consequences of privatized Keynesianism has been the alignment of consumer-entrepreneurs' interests (who might be listing their apartment on Airbnb or using Uber as a driver or passenger) with those of monopoly platforms like Airbnb and Uber. This has fostered an environment in which users come to believe (not entirely unreasonably) that any attempt to regulate these services by municipal or national authorities is likely to result in higher prices or fees (or lower wages, in the case of Uber drivers) which will eventually be passed on to the users. While similar arguments could be made by most companies, the case of firms like Airbnb and Uber is unique in that their immense power to mobilize users via their own apps and emails means they can rally support against regulation relatively quickly. This is precisely what happened when New York City attempted to regulate Uber: The company added a "DeBlasio" Uber tab to its app, which caused all cabs to disappear once the user clicked on it. Users were also encouraged to email the city administration with complaints. Facebook engaged in similar practices when Indian authorities considered blocking its "Free Basics" program. Airbnb, while yet to deploy any technical gimmicks, is nonetheless organizing its fans into a worldwide movement with an explicit political agenda. Said movement is always latent, ready to be mobilized whenever Airbnb requires. While some legal scholars have floated the idea of treating tech firms as "information fiduciaries" with a set of well-prescribed duties precluding them from abusing their reach to advocate for their own causes, it remains unclear how well this approach would work outside of the United States. For now, cities should probably be prepared to be outwitted in the coming battles to rein in these platforms, for which a clever publicity and communications strategy will be essential.

"perpetual stay" is the dream of Airbnb and its hosts: Ultimately, it all boils down to effective capacity utilization, which is a function of creating new markets by integrating sensors, pricing algorithms, and one's reputation as a guest and host.

If the likes of Uber and Airbnb are indeed the logical consequences rather than aberrations of "privatized Keynesianism," then non-neoliberal cities seeking to challenge these firms find themselves trapped in a double bind. On the one hand, directly confronting these firms means immediately turning one's citizens against the city: Regulating or banning Airbnb and Uber, as many cities' experiences have shown, results in massive discontent on the part of users who rely on these firms to earn or save money. On the other hand, doing nothing about these firms means alienating those who

either never were or no longer are direct beneficiaries of privatized Keynesianism—think of renters who watch their neighbourhoods gentrify and their rents skyrocket as Airbnb-loving tourists invade them, drivers made obsolete by self-driving cars, or aging customers without credit cards or smartphones who could still use a public bus, but not Uber.

The only solution appearing plausible in this context is to tacitly accept that cities cannot reverse decades of policy at the national and global level—much of it pushed by unaccountable central banks—and are thus unable to defeat the logic of privatized Keynesianism no matter how rebellious they are. Nor is it obvious that they should reject the basic principle at work here: There is no reason for cities to prefer the organized business interests of real estate developers who own and run hotels to those of

individual homeowners, provided they comply with fire safety, hygiene, and other regulations. The real challenge is identifying the professional real estate developers who operate multiple properties but pass for ordinary users on Airbnb, thus enjoying many advantages and

accelerating gentrification. Because Airbnb and similar operations do not want to share data which would allow for effective control of such behaviour, the only long-term solution for cities would be to think of running their own platforms under their control.

4. Smart Austerity

It would be mistaken to think that Uber and Airbnb are the only major corporations finding ways to profit from the stagnating global economy. Many other firms—including giants like Google—are busy entering cities, pitching various products from free wireless internet (in exchange, of course, for users' data) to sensor-based apps promising to "solve" the parking problem and thus relieve us of both stress and environmental waste. Cities find themselves caught in a vicious cycle: The more services they subcontract and the more infrastructure they privatize, the more assistance they require from the likes of companies like Google in running whatever remains of resources and assets under public control.

The real novelty here is that firms like Google specializing in data extractivism—essentially, their model is to harvest as much data as they can by subsidizing the activities generating it or funding them through advertising—can always position themselves as veritable white knights, determined to rescue the public sector. This narrative appears increasingly appealing as tech firms position themselves alongside the far more rapacious consulting firms which have pillaged city budgets by demanding cash—rather than data, as in Google's case—in exchange for their services. For cash-strapped cities already facing fiscal waterboarding via austerity, this is a much more attractive proposition: Data is something they do not account for or measure and thus can easily give it away

in exchange for nominally free Wi-Fi offered to inhabitants, or advanced traffic analytics software provided to city planners.

Here, cities engage in the creation of a dangerous dependency which will inevitably come back to haunt them. After all, Google is not collecting data merely to help them sell advertising—in many cases, data collection has nothing to do with advertising. Rather, the data are required solely to accelerate development of its advanced artificial intelligence technologies, helping Google to automate processes which currently require human input, from driving and image classification to trend-spotting. Google's self-driving cars have made so much progress over the last decade not due to fundamental breakthroughs in computer science, but rather because all of the harvested data have allowed developers to revolutionize previously less effective AI approaches like neutral nets. Ultimately, whoever controls the means of producing the most data obtains the best AI, making everyone else dependent on it and allowing AI be fashioned as a service accessed on a permission-based basis.

Such AI-powered services can then be used to further optimize how the city runs and operates—the city itself becomes a problem to finally be solved. The language used by Y Combinator, a prominent Silicon Valley start-up incubator, is typical of how the tech world thinks about "solving cities." Y Combinator recently

asked in one of its posts: “What should a city optimize for? How should we measure the effectiveness of a city? What are its KPIs (key performance indicators)?” Here we can observe the emergence of yet another vicious cycle: The logic of privatization and austerity along

with the numerous problems it causes push cities into the arms of technology firms, luring them with products deemed so essential and unique that cities embark on repeated waves of privatization in the name of deploying AI in order to cut costs.

Box 8. Google Sidewalk Labs: The Urban Start-up of a New Type

Google’s latest foray into the world of cities, a new Alphabet unit called “Sidewalk Labs,” signifies the importance technology companies attach to urban problems—as does the choice of Wall Street veteran and former deputy mayor of New York responsible for economic development, Daniel Doctoroff, to lead it. While most of Sidewalk’s projects thus far have focused on relatively straightforward issues like free Wi-Fi in New York (albeit featuring extensive user data collection) along with attempts to automate parking and optimize traffic flow, the company has dropped several hints that its ambitions extend much further, including the possibility of taking over an existing city or building one of its own in which to showcase the latest smart technologies. To some extent, Google is no stranger to urban issues: Its maps are widely used, while its purchase of the Israeli start-up Waze in 2013 also made it an important player in real-time traffic management (Google has since used Waze to create a program targeting many major cities, whereby municipalities receive access to Google’s traffic data in exchange for their own data on roadblocks, planned maintenance and so forth). It is difficult to say to what extent Google’s steps in the urban space are informed by a clear strategy, or mere reactions to steps taken by competitors (in 2016, for example, it launched a Waze-based ride-sharing service in the Bay Area—likely a response to Uber). The Sidewalk Labs team now features senior executives who previously worked on Google’s smart virtual assistant, Google Now, suggesting the company is likely to take advantage of its presence in so many smartphones as well as its immense AI capabilities to streamline the provision of real-time, contextual information about the city, its services, cultural events, transportation, and so on. This could potentially have an adverse effect on municipalities’ efforts to control the distribution and access to such information themselves.

That said, this phenomenon is by no means unique to cities, as the nation-states in which they are located are driven by the same logic. One need only look at the speed with which the UK National Health Service has welcomed the advances of Deep Mind, Google’s AI division, sending the patient data of more than four million people through its algorithms in order to predict and fight disease. As with Uber and Airbnb, it seems unfair to blame cities for policies promoted, or at least tolerated, at the

national level—one should not, therefore, assume that the turn towards private technology providers is driven by corruption or malice rather than the desire to make do with the meagre amount of resources available to most cities today.

This connection between the logic of austerity and the imperatives of “smartness” deserves further investigation. As several scholars have shown, city administrators often cite the con-

Box 9. Data Analysis and Austerity

One of the promises of the open data/Big Data revolution in governance has been that of making government more effective by exercising coordinated control over its actual, previously unrecorded (and hence unknown) operations. At its heart, this agenda also promises a certain degree of non-ideological bipartisan consensus—after all, what political current would object to shuttering government programs which are both ineffective and terribly expensive? The extent to which efforts in this space will manage to transcend the confines of traditional ideology remains to be seen, but the cause of shrinking government by means of data analytics has already begun to attract the interest of conservative donors. The case of the Laura and John Arnold Foundation, established by the former Enron trader and subsequent hedge fund manager, is particularly noteworthy. The Arnold Foundation has garnered notoriety in the United States for supporting efforts to reduce public employees' retirement benefits in addition to several other neoliberal causes. The foundation donated \$7.4 million to Harvard University's Government Performance Lab in 2015 to "offer training and on-the-ground technical assistance to governments that are interested in using data and innovative procurement strategies to improve the performance of government programs." The history of the Government Performance Lab itself is intriguing as well, emerging out of the Social Impact Bond Technical Assistance Lab, in turn established with support from the Rockefeller Foundation to help cities embark on various neoliberal service delivery experiments, from "pay for results" social impact bonds to results-driven contracting. Many of these experiments—and their adoption by local authorities—are geared towards the current austerity climate, which greatly curtailed the levels of funding available for local services. Under such conditions, data, sensors, and other ways of measuring, detecting, and storing "outcomes" become crucial components the austerity agenda.

sequences of austerity as one of the reasons why so many hopes are pinned onto digital transformation and its promise of unleashing the creative and entrepreneurial potential of its citizens. The underlying assumption here is not only one of citizens as entrepreneurs (this was already the assumption of neoliberalism 1.0), but—suggesting, perhaps, that we are witnessing the emergence of neoliberalism 2.0—that they are also hackers,²⁴ in the word's original sense dating to the 1970s: capable of doing more with less, advancing through frugal innovation, and always able to find a way out even with their hands tied. And tied they will be—thanks to austerity!

²⁴ See Gregg, Melissa. "Hack for good: Speculative labor, app development and the burden of austerity." *Fibreculture* 25 (2015).

It is thus only through access to a wide panoply of digital technologies (including learning how to code) that citizens' full entrepreneurial (or at least coping) potential can be unlocked. Essentially, this attitude seeks to reintroduce with technology that which David Cameron's government failed to implement via the so-called "Big Society": the use of communitarian rhetoric to justify offloading even more social responsibilities onto individual citizens. Moreover, this logic recasts unemployment in a truly "smart" city as a personal choice rather than structural necessity: With 3D printers, social media, and Uber cars available to everyone, how could anyone not be employed? Technology (and smart technology in particular) creates a perfect alibi for ruling elites: They do their best to provide us with the necessary infra-

structure, albeit perhaps privatized, and it is our own fault for not taking advantage of it to the fullest.

None of this ought to suggest, however, that the “maker” movement or 3D printers could not be repurposed to serve a different project. Rather, a commitment to serve that different

project cannot limit itself only to the desire to use 3D printers and makerspaces differently—cities must confront the challenge of austerity head-on, combining it with alternative economic policies and doing their utmost to tackle the root causes of privatized Keynesianism and the austerity drive needed to keep this regime running.

Box 10. The Emergence of City Data Marketplaces

Copenhagen launched the world’s first data marketplace in May 2016, City Data Exchange, together with Hitachi Consulting, an emerging player in the smart city market. Funded by the City of Copenhagen and the Danish Capital Region, the marketplace launched with 65 different data sources, some of which are only available for a fee. The project seeks to motivate third-party companies to develop data-oriented solutions to urban problems like congestion, pollution, and burglary. The underlying notion is that, thanks to monetization, data holders (particularly in the corporate sector) now have incentives to collect and share important data to improve problem-solving by other parties. One of the first initiatives to treat city data as a commodity was a data exchange between Strava, the owner a popular app to track bike rides, and the City of Portland, which purchased biking data from Strava in 2014 to improve its planning process and aid in the placement of bike lanes. London is one of the other major cities currently building its own city data marketplace. The underlying rationale of these projects fits well with a philosophy of governing which views networks and third parties as more effective problem solvers than public institutions themselves.

5. Technological Sovereignty: A Potential Solution?

Cities do not hold the keys to most of the world’s problems, regardless of how many city parliaments and new urban agendas are launched every year. No city can match the computing power of Google or Facebook or even Uber—in fact, even a coalition of cities would probably lack the know-how to compete with these firms. Thus, any search for a non-neoliberal smart city must begin by acknowledging that the political and economic models on which most of our cities function are not determined locally, but rather na-

tionally and globally. Thus, the models must be changed at the two higher levels as well—there are good reasons to celebrate the spirit of rebel cities, but we must also be aware of the limits of this rebelliousness, particularly if they do not align with coalitions of non-urban actors.

That said, it just so happens that many political forces questioning elements of the neoliberal agenda have considerable influence in cities, often much more so than in national terms.

While it might be nice to imagine challenging privatized Keynesianism or reversing the take-over of public infrastructure by private actors in a setting beyond that of the city, it is, for better or for worse, mostly at the city level that such struggles are likely to be waged.

What can cities do? First of all, it is crucial that they manage to preserve their ability to implement independent, effective policies and decide their own fate. This ability is increasingly under threat due to the proliferation of both bilateral and multilateral trade agreements which considerably restrict the ability of governments on all levels to dictate the terms of trade to global corporations. As a close analysis of draft texts of treaties like TTIP and TPP illustrates, one of the consequences of passing them (should this ever come to pass under the Trump administration) would be to make remunicipalizing key infrastructure practically impossible—a provision which would surely affect cities' ability to think outside the corporate "smart" box, pioneer alternative data ownership regimes, or ban Airbnb from favouring the interests of property speculators over ordinary citizens.

In other words, a non-neoliberal city cannot exist in a world where the likes of TTIP and TPP determine the political and economic context. Although it is heartening to see cities like Barcelona vote against TTIP several times, these remain largely symbolic: a kind of rebellion which yields few tangible results. If city parliaments—along with the other international frameworks set up to bring cities together—really have any teeth, they ought to be able to influence the outcome of such treaty negotiations.

Cities also require a new vocabulary and conceptual apparatus to reassess their relationship to technology, data, and infrastructures. When data, sensors, and algorithms—the chief ingredients of the variety of "smart-

ness" offered by neoliberalism—mediate the provision of services in many other domains from utilities to transportation, education and health, it is obvious that the discussion cannot be restricted to infrastructure alone. Rather, we are dealing with some kind of meta-utility—composed of those very sensors and algorithms—which powers the rest of the city. As cities lose control over said meta-utility, they find it increasingly difficult to push for non-neoliberal models in supposedly "non-technological" domains such as energy or health care. A strong argument can be made concerning the path-determining nature of many smart technologies: In other words, building hi-tech socialism using neoliberal infrastructure may very well be impossible.

One highly useful concept for cities seeking to preserve a degree of autonomy and establish a buffer between themselves and their technology providers is that of "technological sovereignty"—a rather simple idea which denotes citizens' capacity to have a say and participate in how the technological infrastructure around them operates and what ends it serves. The notion of "sovereignty"—whether of finances or energy—permeates the activities of many urban social movements, including those transitioning into leadership positions in their respective cities. Concepts like energy sovereignty may be easily grasped and capable of mobilizing large sections of the population, but what does energy sovereignty mean once we transition onto the smart grid, and firms like Google offer to cut our energy bills by one third if only we surrender our energy data? Does the struggle for "energy sovereignty" mean anything if not intricately tied to the struggle for "technological sovereignty"? Probably not.

Likewise, we must also view the rest of the rebel cities' radical agenda through the lens of technological sovereignty. What does the "right to the city" mean in a fully privatized,

digital city, where access to resources is mediated by the swiping of a “smart card” tied to our identity? How can this right be effectively exercised when infrastructure is no longer in public hands and corporations determine terms of access—including the terms on which protests against them are to unfold? How can cities claim to be spaces of becoming, contestation, and anonymity when techniques such as algorithmic regulation seek to resolve all conflicts in real-time while imprisoning us in the straitjacket of austerity? Without an accompanying struggle for technological sovereignty, the fight for the right to the city loses much of its power.

While it would be an overstatement to say that some cities are aware of the importance of technological sovereignty and actively pushing for it, it is fair to say that some are considering specific measures in step with this spirit. They can be roughly classified into several groups: those offering an alternative regime for dealing with citizen-produced data; those promoting an alternative, more cooperative model of service provision—including by private players—which does not rely on or promote data extractivism by a handful of giant tech firms; those seeking to control the activities of platforms like Airbnb or Uber by demanding access to their data; and those promoting and building alternative infrastructures to compete with Silicon Valley, at least in some domains.

The most important thing to bear in mind is the need for a holistic approach focused on multiple elements, whether they be data, infrastructure, or transparency in algorithmic decision-making. A city that manages to force technology companies to share collected data—indeed, many firms already charge for data or use it as bargaining chips in negotiations—may find itself unable to act upon the data without advanced computing infrastructure or access to the original algorithms used

in turning that data into, say, price signals. Thus, merely establishing a different legal regime for data is unlikely to generate adequate results—it must be complemented by a strategy to reclaim infrastructure as a whole.

This is where many urban social movements reach for the usual tool in their arsenal: appeals for remunicipalization. After all, such appeals have worked with remarkable success in many cases when it comes to efforts to reclaim and repurpose electric grids, gas pipelines, and water systems. That said, remunicipalizing digital infrastructure is complicated: First of all, companies often have no physical presence in the cities or even countries in which they operate, making threats ineffective. Secondly, much of the infrastructure they operate is not the bulky physical infrastructure occupying our public space like electricity poles or water pipes. Instead, we are often dealing with sensors embedded in smart phones belonging to individual citizens, such as those Google uses to predict traffic on many roads. The notion of cities reclaiming such sensors appears ridiculous, and makes these firms even less susceptible to dialogue with city leaders. Absent major action on the national scale or clever strategic coordination between cities on the international scale, it will be extremely difficult to reverse this already worrying trend.

No specific city has “gotten it right” thus far, but quite a few have gotten it wrong—falling for the promises of greater efficiency delivered by start-ups, greater creativity delivered by hackathons, and greater transparency delivered by open government initiatives which, rather than help to eliminate corrupt sections of the public sector, provide the rationale for cutting those that function rather well. Silicon Valley and the Big Four consulting firms which between themselves dominate the smart city market do not exercise their hegemony effortlessly—it takes a lot of hard work, manifested

in endless conferences and expos, commissioned think-tank reports, and regular think pieces to frame the smart city issue as an inevitable, self-evident, and progressive project.

It is a world where venture capitalists broadcast their own podcasts, write books on political topics, and fund philosophers (and occasional law-suits). In such a world, defending technological sovereignty would require not only practical interventions in the inner workings of our cities, but constant ideological and intellectual work in order to counter the constant reframing of issues in favor of big business. Given the high turnover of concepts and narratives supplied to us by Silicon Valley and its resident intellectuals—the smart city, after all, is complemented by the sharing economy, big data, the internet of things, algorithmic regulation, and Web 2.0—the very idea of technological sovereignty will likely soon be twisted into something it is not.

In practical terms, technological sovereignty should also mean the ability of cities and citizens to organize their affairs according to principles beyond what philosopher Roberto Unger calls “the dictatorship of no alternatives,” slowly imposed by the proponents of neoliberalism through the backdoor of metrics and quantification. As more and more urban spaces begin to differentiate themselves through the logic of absence—of Wi-Fi connectivity, laptop plugs, any tolerance for people hoarding coffee tables to stare at their screens all day—one could also imagine a similar logic of absence in how data is gathered and analysed. There is no need for technocratic city managers to know everything, let alone reduce knowledge to a single score to then be compared with other cities.

There is no danger in neglecting to learn certain elements or dimensions of a problem. Carving out spaces of such ignorance and institutionalizing them—court juries, for ex-

ample, are expected not to read the news or follow social media accounts of the accused during deliberations—has improved rather than harmed our democracy. If the motto of the neoliberal quantifier is “what cannot be measured cannot be managed,” then the appropriate non-neoliberal response should be “what cannot be managed cannot be privatized.” There are many things our smart devices should not know, which in turn must be reflected in their design rather than relying on the goodwill of their operators.

In the short term, the struggle for technological sovereignty is merely another attempt to “buy some time” to articulate a more coherent and ambitious political and economic agenda capable of reversing the damage wrought by the neoliberal turn in both urban and national policy. However, cities should also use this time to reflect upon what kinds of fights they would like to take up—and what exactly they are defending in the process.

Suppose, for example, you believe surveillance to be one of the worst sides of the smart city, and argue for prioritizing privacy as an appropriate response. But do we want privacy to be provided as a right, or offered as a service? The latter function can easily be accomplished even by the privatized smart cities themselves: As long as you are willing to pay, someone will offer you additional privacy. The fight for mobility poses similar questions: If we seek to defend mobility as a right, the landscape is quite bleak. If we favor mobility as a service, however, Uber is always there to help—and at much reduced rates, subsidized by its global monopoly status and your own local taxes. Ultimately, the right to the city might need reformulation as the right to enjoy rights altogether, as the alternative means risking that digital giants like Google will continue redefining every right as a service (perhaps even a free service) as long as data can be harvested while providing it.

6. Strategic Interventions and Potential Alliances

A battle against the smart city agenda cannot succeed without strong connections to the ongoing fights of urban social movements and a new generation of politicians governing the “rebel cities” and rejecting various aspects of highly financialized austerity urbanism, generally depicted as the only game in town. Fights for the right to the city and the aforementioned struggles to remunicipalize key utilities and infrastructures are the sorts of efforts which can provide the necessary activist and intellectual backbone for questioning the smart city agenda’s hegemony.

Even reframed along these lines, however, vast political gaps would still require quick filling. What, for example, does a right to the city mean in a city operated by technology companies and governed by private law, with citizens and social communities unable to freely and unconditionally access key resources like data, connectivity, computing power, which could allow them to pursue self-management? And to what extent would losing control over the information-powered meta-utility undercut successful remunicipalization campaigns, whether to reclaim energy or water infrastructure, allowing the utilities in question transition to their own “smart” consumption model with a new set of private intermediaries?

Demystifying “smartness” by presenting it as a continuation of the very same neoliberal agendas of privatization and outsourcing bulked up and extended by technological means would be a welcome step in the right direction. This is one area in which urban social movements have made impressive progress in at least identifying the kinds of practical interventions which can make a difference: auditing a city’s existing contracts and debt agreements (often with the aid of mechanisms like citizen audit), requiring a certain level of transparency and commit-

ment in the tendering process, investigating the role of consulting firms and various private contractors in the running of public-private partnerships and private finance initiatives, and naming and shaming private equity firms and alternative asset management funds that come to own important infrastructure only to neglect long-term investments in its maintenance.

Well-targeted pragmatic interventions can also have a big impact. Insofar as signing smart city contracts requires purchasing software licenses, every effort should be made to demand free software and open source alternatives—a measure which many cities would be well-advised to codify into law. Moscow is a pioneer on this front, pledging to drop Microsoft products from its systems. Ultimately, efforts to oppose the dominance of the neoliberal smart city paradigm will depend on the ability of the brave cities who dare to defy it to demonstrate several things at once. First, they must show that the economic models proposed by the likes of Uber, Google, and Airbnb do not deliver the promised results—at least not without causing a considerably amount of damage to the cities in question, from the rise of the speculative economy to the immense blockage of social innovation by those without access to data.

Secondly, they must prove that the key resources and infrastructures we currently describe as “smart” can be deployed under a different legal and economic model to produce outcomes which would not reject technology outright, but rather deploy it to benefit local residents and local industry rather than transnational corporations. Retreating into technophobia and the threat of increased regulation—without offering constructive alternatives—would accrue little good-will among citizens whose expectations for disruptive innovation have already been shaped by their experiences in the private sector.

Thirdly, it would require constant small-scale pilot projects and experiments to zoom in on projects capable of delivering value to residents, and discard those which are not.

These projects cannot afford to shy away from taking some of the more radical ideas associated with neoliberal smart city ideology—such as the notion of city data marketplaces—and twisting them around in order to unleash the creativity of local communities, albeit under a non-market model. Cities must appropriate and run collective data on people, the environment, connected objects, public transport, and energy systems as commons. Infrastructures for data capture, visualization and analysis which mainly feed municipal Operations Centres owned by big IT vendors (such as IBM's Rio de Janeiro Intelligent Operation Centre) can be harnessed by citizens for their own purposes, to raise issues of corruption, equity in the distribution of municipal resources, and other questions of power and access in support of autonomous self-governance.

The most ambitious program to reclaim technological sovereignty on a city level would naturally entail efforts to reclaim or at least replicate all key elements of the emerging informational meta-utility, from sensors and computing power to AI and data. Realistically speaking, even cities with fiscally sound budgets may prove unable to pursue this agenda in full, forced to pick and choose if only for political reasons. Many

of these steps—like building an alternative AI system—would be impossible without the participation of other like-minded cities.

Changing the data ownership regime, however, may be the most affordable option, if only because it would not require massive financial commitments and represents an agenda with intuitive popular appeal: Cities and citizens, not companies, ought to own the data produced in cities and should be able to use said data to improve public services and put their policies into action. Taking a firm stance on data ownership may accomplish several goals at once. Firstly, it would make the rampant real estate speculation facilitated by the likes of Airbnb much more difficult: Cities and ordinary citizens would be able to check whether the claims frequently made by Airbnb in its defence—that it primarily benefits ordinary users—are empirically verifiable. Secondly, placing cities in charge of their own data would remove one of the main bargaining chips firms like Uber now have when negotiating with regulators: In Boston, for example, Uber offered the authorities access to traffic data expecting lighter regulation in return. Thirdly, it seems highly unlikely that cities could stimulate growth of an alternative digital economy with robust local and decentralized alternatives to Uber and Airbnb without a robust alternative data regime: Without the troves of data available to these giants, these smaller contenders may prove unable to compete.

Section II

7. Beyond Smart Cities: Democratic and Common Alternatives

As already noted, the debate on what kind of alternative public policies and pragmatic interventions can be implemented must be embedded within the broader framework of

struggles against austerity, predatory neoliberalism, and the corporatization of everything. In Europe, we find good examples of citizen-led movements to reclaim urban re-

sources as common goods, advocating for the collective management of public resources such as water, air, energy, housing, and healthcare under the broad umbrella of “Right to the City.” These are the sort of alliances which must be established or strengthened when designing public policies around technological sovereignty.

These movements are mainly active at the city level, fighting against evictions, energy poverty, labor precarization, and remunicipaliza-

tion of public infrastructures. In some cases, cities have opposed neoliberal financialization, threatening to drop—or, as was the case with Madrid, actually doing so—the credit rating agencies and devote some of the money saved to social spending. Public policies must contest a privatized smart city constructed from the top down and favoring foreign corporations, oppose monopolized ownership of intellectual property, and reverse the private appropriation of collectively produced value by rent-seeking digital platforms.

Box 11. Barcelona Digital City Case Study: [Barcelona.cat/digital](https://barcelona.cat/digital)

Barcelona is currently undergoing a citizens’ democratic revolution from below, promoting networks of rebel cities which innovate public policy and challenge the status quo. Barcelona’s mayor Ada Cola is considered one of the most radical mayors in the world; a former housing and anti-eviction activist, she won the municipal elections backed by a tremendous anti-austerity mobilization, representing the main opposition against a political and economic elite who had led Spain into a deep financial and social crisis which left hundreds of thousands of families homeless.

Crowdfunded and organized through a collaborative platform featuring policy input from thousands of citizens, the new governing coalition “Barcelona en comú” initiated a series of social reforms soon after taking office. Some of the main policy actions revolve around stopping evictions and expanding social housing, recuperating over 550 houses left empty by big banks, and regulating short term rental platforms such as Airbnb that contribute to unsustainable price increases in the housing market.

Besides this initiative to halt an unregulated, on-demand economy, Ada Colau has also initiated a shift towards remunicipalization of infrastructure and public services such as water and energy. Some of their main actions comprise the fight against energy poverty, affecting over three million households in Spain unable to pay their electricity bills. They promise to remunicipalize the water company and change public regulations, introducing labour, environmental, gender, open source, and ethical standards, as well as allow social enterprises and cooperatives to access public funding more easily.

These new policies also involve a critical approach to the neoliberal smart city run by big tech corporations and new policies towards democratic, open source, and commons-based digital cities built from the bottom up. The mayor has nominated a new Technology and Digital Innovation Commissioner, Francesca Bria, in charge of a **Digital Innovation Office** to define the city’s digital and data policy, lead the digital transformation of City Hall, and initiate new strategic innovation projects in line with the policy priorities of all key departments through the creation of a **Mayor’s Committee on Digital Innovation**. The aim is to generate a new vision in which the city begins to think and experiment with what technology that serves the people could look like.

Barcelona launched a **Digital Plan** last October, developed with the participation of citizens, tech communities, makers, tech companies, and the academic ecosystem. Barcelona seeks to lead a transition towards technological sovereignty that allows the government and its citizens to determine their own priorities in terms of the direction and use of technological innovations, with clear social benefits and public returns. This implies reclaiming critical knowledge regarding data and technology infrastructures which far too often remains in the hands of major multinational service providers, while involving local SMEs and innovators to develop the digital services and solutions citizens need.

Furthermore, the City has developed a **digital transformation roadmap** (<http://ajuntament.barcelona.cat/digital/ca/documentacio>) with clear guidelines and democratic digital standards including a technological code of conduct, the migration to open source software, open architectures and open standards; the adoption of agile methodologies to develop user centric digital services; the publication of a technology procurement handbook that specifies contractual clauses in procurement contracts mandating transparency, open standards and open data; and a new data directive with data ethics, privacy and citizens' data sovereignty at its core.

The ambition is to develop technologies for the common good, which help cities generate new productive and sustainable economic models and facilitate knowledge sharing between cities and movements. The Barcelona strategy consists of engaging the city's ecosystem through a series of co-creation workshops where they can provide solid inputs to the City's strategy, evolving from a top-down to a bottom-up process, promoting the collective intelligence of citizens and involving all players.

In particular, Barcelona is betting on a new approach to data called "**city data commons**", meaning to strike a **New Social Pact on Data** to make the most out of data, while guaranteeing data sovereignty and privacy. Data is a key city's infrastructure, and can be used to reach better, faster, and more democratic decisions, incubate innovation, improve public services, and empower people. At its core, however, Barcelona seeks to couple these opportunities with an **ethical and responsible innovation strategy**, preserving citizens' fundamental rights and information self-determination. This will help ensure that public resources and assets are publicly owned and managed for the collective good.

Data commons can also help cities develop alternatives to predatory on-demand platforms like Uber and Airbnb. Introducing fair regulation and algorithmic transparency to tame the on-demand economy, as many cities are currently doing, is necessary but insufficient. Barcelona has launched a variety of initiatives to empower sharing economy alternatives such as **platform cooperatives** and experiments with **next-generation collective platforms based on data commons**, where citizens own and control their data (www.decodeproject.eu).

The main obstacles to implementing these new approaches based on technological sovereignty concern transforming the culture and inner workings of public institutions. One of the main challenges is **transforming procurement**, introducing innovative, ethical, gender equitable and sustainable clauses in how cities buy products and services. Public institutions are exceedingly difficult to access. Rules are often complicated, and decision-making processes regarding funding al-

location opaque. Cities should thus promote more participatory and innovative funding methods, both in terms of creating new funds for projects in specific fields where more social need exists, and by promoting new funding models which ensure better and more democratic opportunities to access and share resources, such as crowd-funding and match-funding.

Next, it is critical to foster **a culture of transparency that puts an end to corruption**, as Barcelona is developing with the Bustia Etica project (xnet-x.net/en/whistleblowing-platform-barcelona-city-council/), an encrypted whistleblowing infrastructure allowing citizens to denounce cases of corruption safely. With projects like these, cities can also raise awareness of citizens' rights in the digital era, such as their right to privacy and to access public information and knowledge.

Finally, cities must promote an agile and experimental culture in the organization, introducing new methods of service delivery (such as agile development and co-design approaches) which place citizens' needs at the centre, and where social impact is clearly measurable.

Public institutions should also promote a culture of collaboration and partnership with citizens and communities, beyond corporations. The public sector can do a great deal to sustain and empower community networks and movements and give people more tools and legal instruments to collectively self-organize and gain power to change society.

In a truly democratic city, citizens would enjoy access to knowledge commons, open data, and cities' public digital infrastructures to ensure better, more affordable, fairer public services and an improved quality of life. This implies taking back the critical knowledge, data, and technology infrastructures which too often remain in the hands of a few large multinational service providers. Furthermore, technological sovereignty—including the adoption of open source software, open standards, and open architectures—must be conceived as a prerequisite to developing a truly democratic technology agenda able to generate new productive economies and facilitate knowledge sharing between cities, countries, and movements.

What can cities do to promote the transition to a non-neoliberal smart city? As outlined by Paul Mason²⁵ during the launch of BITS,²⁶ cities

require a new holistic approach to technology policy, as summarised in the following central public policy actions:

- ⇒ Establish the city of the commons and collaborative production as global points of reference.
- ⇒ End privatization and the transfer of public assets into private hands, while promoting remunicipalization of critical infrastructures and services.
- ⇒ Massively reduce the cost of basic services like housing, transportation, education, and health care in order to help society's most precarious strata.

(BITS) is a strategic partnership between Hans Crescent Symposium London, the Internet Interdisciplinary Institute (IN3/UOC), the Institute of Government and Public Policy (IGOP/UAB), and a network of social movement activists and academics aiming to trigger a global debate on changes in the meanings of sovereignty, and explore ways in which the various types of sovereignty of citizens, cities, nations, and regions align with global technologies.

25 <https://medium.com/mosquito-ridge/postcapitalism-and-the-city-6dda80bc201d>.

26 The Barcelona Initiative for Technological Sovereignty

- ⇒ Build data-driven economic models with real inputs (using real-time data analytics), enabling participatory democracy to model complex decisions.
- ⇒ Prefer and promote collaborative organizations over both the centralized state as well as market solutions.
- ⇒ Institute a universal basic income focused on targeting poverty and social exclusion.

- ⇒ Build city data commons: Decree that the population's networked data generated in the context of public services cannot be owned by service operators.

One innovative example is the new Digital Agenda of the Barcelona Government, which sets explicit standards of transition towards technological sovereignty and a commons-based city.

8. The Right to the Digital City: Towards Technological Sovereignty

Cities can harness the power of technology and digital innovation to benefit all citizens and improve the economy's diversification, making it more plural, sustainable, and collaborative. Introducing network technologies in the urban environment is not just about providing the city with connectivity, sensors, and AI, but also adopting a wider and more ambitious goal for rethinking the political and economic models which make cities work, while taking on long-term urban challenges such as wage gaps, affordable housing, sustainable mobility, public corruption, as well as aggregating the collective intelligence of citizens through participatory processes in political decision-making.

Based on some of the main actions cities are carrying out against the neoliberal agenda, we propose the following lines of political action for cities to take control of their digital policies, and a democratic agenda of alternatives and more sustainable models characterized by public control, democratic governance, and citizens' self-organization:

1. Promote alternative data ownership regimes.
2. Move information services to open source, open standards, and adopt agile delivery.²⁷

3. Transform procurement to make it ethical, sustainable, and innovative.
4. Control digital platforms.
5. Build and grow alternative digital infrastructures.
6. Develop cooperative models of service provision.
7. Maximize innovation with public value.
8. Rethink welfare schemes and complementary currency systems at the local level.
9. Promote digital democracy and digital sovereignty.

8.1 Alternative Data Ownership Regimes: City Data Commons

Access to and control over data has become a strategic asset for cities. While the platform economy exhibits clear potential for huge economic impact, several important issues must be resolved (first and foremost those of own-

ment methods described in the *Agile Manifesto* (2001). Unlike traditional waterfall software engineering, agile methods are iterative and flexible, software evolves in response to changes in the business environment or social requirements, while solutions emerge through the collaboration of cross-functional service development teams, early delivery, and continuous improvement.

²⁷ The term *Agile* refers to the software project manage-

ership, control, and management of personal data). The current digital ecosystem and IoT landscape is highly fragmented, featuring a multitude of non-interoperable vertical solutions offering their own sets of devices, gateways, platforms, and means of data handling in data “silos.” This fragmentation makes data unmanageable and ultimately takes it out of end-users’ control. This status quo arises as

small SMEs, start-ups, and other innovators cannot identify a clear value proposition in offering open, horizontal, interoperable components and data-driven solutions, while the costs of engineering such solutions from scratch are simply unaffordable.

Cities should aim to disrupt this data accumulation by making data available across vertical

Box 12. The Right to Data as Commons

DECODE, Barcelona & Amsterdam

Through the EU-funded DECODE project, the cities of Amsterdam and Barcelona will deploy a decentralized data infrastructure that devolves data ownership and control to citizens, provides privacy-aware and flexible data management and IoT data-sharing solutions, while fully protecting privacy rights. Based on blockchain technology, this infrastructure will be built with the active participation of citizens, social entrepreneurs, hackers, and privacy researchers. Once it commences operations, innovators will be able to build interoperable solutions on top of the platform through workshops and challenges (decodeproject.eu).

MyData, Helsinki

MyData is a human-centred approach to personal data management combining organizations’ need for data with digital human rights, allowing people to consent to the secondary use of their data. The approach is based on the new EU General Data Protection Regulation, which permits citizens more control over their personal data, and allows them to see and change how they consent to their data being used over time. A variety of technical and legal projects fall within the MyData framework, and a community is currently forming to develop national (internationally scalable) open standards and interoperability models for personal data management (<https://mydatafi.wordpress.com>).

DataCités, Paris

This program was launched in 2016 and is led by the OuiShare community (a sharing economy network) and Chronos. Largely based in France, it explores the topic of citizens’ rights to data as commons by bringing together relevant stakeholders. The program aims to promote alternative models for urban services based on data as a common resource in the field of mobility, energy and waste management (<https://datacites.eu>).

Health Knowledge Commons, UK

Health Knowledge Commons, pioneered by the UK foundation Nesta in its work with the UK National Health Service (NHS), brings together what is known about diseases, diagnoses, and treatments, and makes it easy to use, thereby making it feasible to link this to personalized data concerning, for example, genetic dispositions (www.nesta.org.uk/publications/doctor-know-knowledge-commons-health).

Midata.coop

MIDATA enables citizens to gather all their health-related and other personal data in one secure place. Citizens can decide to share data with friends or physicians or to participate in research by providing access to subsets of their data. MIDATA.coop enables citizens to securely store, manage, and control access to their personal data by helping them establish and operate national and regional non-profit MIDATA cooperatives.

Data Analytics Offices for Improved Public Services

Access to open public data makes it possible to redefine services, identifying, for example, underused buildings and the average price index, improving mobility, or linking up datasets in the case of a public health emergency. These services will build on open APIs like the ones already used in transportation. As it stands today, they could be used to regulate (and tax) parts of the sharing economy like Airbnb and Uber. Many major cities such as London, Barcelona, Boston, and New York are setting up data analytics offices to help them make the most of existing public data.

silos, experimenting with decentralized and privacy-enhancing data infrastructures and distributed ledgers such as blockchains, and proposing new frameworks and business models that reward and incentivize openness, thereby enabling data discovery, transaction, and secure data sharing.

Cities could also design new legal, economic, and governance schemes as well as common standards to foster collaborative behaviour by individuals to contribute to the digital commons, including those involving personal data.

One key reason cities and municipalities have failed to foster local data-intensive business that can compete with Uber and Airbnb is the lack of access to raw data. Today's cities have more data than ever before (90% of the data that currently exists did not exist three years ago), yet this information is neither organized nor accessible. Part of it is on the Internet, while the rest is divided between the multiple departments and companies constituting City Hall. Citizens live in all types of hyper-connected virtual spaces, generating and using real-time information or accessing remote databases and participatory crowdsourcing. Knowledge is distributed, not centralized.

Cities should seek to disrupt this data accumulation by making data available across vertical silos. Cities should experiment with building a commons-based sharing economy which is data-centric, but where data is generated and gathered by citizens and public sensor networks available for broader communal use—with the appropriate privacy protections. As a result, a new cluster of start-ups, SMEs, NGOs, cooperatives, and local communities can take advantage of that data to build apps and services most relevant to them and the wider community.

This aims to create a decentralised innovation ecosystem attracting a critical mass of innovators, able to shift the current centralized data-driven on-demand economy towards a decentralized, sustainable, and commons-based economy. City data commons initiatives put agency and data control into the hands of citizens, with the aim of leveraging collective data and information to improve citizens' wellbeing.

8.2 Open Source, Open Standards, and Agile Service Delivery

Cities are undergoing a major digital transformation, involving the implementation of new stra-

tegic digital services in the areas of affordable housing, health, energy transition and mobility. Cities are also transforming the frameworks (legal, policy, procurement) that make government more transparent, participatory, and efficient, while upgrading the digital infrastructures that make the city work better and more focused on citizens' needs.

Public services must be “digital by default,” designed with citizens at the centre in order to provide public value. Moreover, services must be designed in a more agile way, and must be usable and accessible to everyone—including citizens with meagre digital skills or disabilities of any kind. They must be open, modular, and interoperable, so as to be reused by other cities. At the same time, we must avoid proprietary solutions favoring vendor lock-ins and thus creating long-term dependencies. The use of free, open source software, open standards, and open architectures is key to this objective. In moving towards open, interoperable, and neutral architectures, cities are faced with complex proprietary legacy systems, strong power structures favouring big tech firms, and a sometimes-rigid public administration that, through inertia, proceeds with unfair and expensive solutions that create long-term dependencies on external providers and deprive the city of strategic insights and know-how.

In order to implement this new strategic vision, cities must build new alliances and transform technology procurement by designing a new multi-vendor procurement framework and an open digital marketplace that promotes fair competition and supplier diversity, and by creating new partnerships with the community of technology providers that include SMEs and new-comers. The new providers' marketplace will facilitate the adoption of innovative solutions, thus moving away from large framework contracts and lock-in solutions, and opening up new opportunities for innovative SMEs, startups and social enterprises. This should be coupled with new frameworks for open and ethical

technology procurement, specifying new contractual clauses that favor open standards and open source solutions, together with ethical and responsible innovation, data sovereignty, and data protection. Cities should also put in place a culture and capability plan to change organizational culture, develop new skills in-house, and retain critical capacities that are too often outsourced to effectively manage change.

Many cities are working to transition key products and services to free and open source software and open standards, creating shared open licence code repositories, which can be re-used across organizations. Furthermore, cities are sharing migration plans and technology codes of practice to guide the open digital transformation, the development, reuse, and sharing of code, and the delivery of common government solutions. Open source software, open standards, and open architectures make it possible for government organizations to share innovations with other municipalities without incurring additional costs. In this way, digital policies are designed to support open access and re-use with custom-developed public open source code. By making source code available for sharing and re-use across cities, local governments can avoid duplicative custom software purchases and promote innovation and collaboration across public agencies, including joint procurement processes.

Cities can be highly dynamic in pushing forward the free software transformation, and have a central role to play in the implementation of open source and open standards recommendations laid down by national governments and the European Commission.

8.3 Ethical, Sustainable, and Innovative Public Procurement

Public procurement is central to all governments, representing 17% of European GDP.

Box 13. Open Source, Open Standards and Re-Use in Government

Open Source and Open Standards in Government

The European Commission's Digital Agenda recommended that all government bodies across Europe implement open standards in 2012. The policy was designed to free public institutions from dependence on proprietary software and tech vendors. In March 2016, the EC published an in-depth study conducted by consultants from PwC on ICT procurement best practices for reducing lock-in. Contrary to EU policy, it identified more than 2,620 references to 188 named suppliers in a sample of 1,726 tender documents, the most frequent of which were Microsoft, SAP, Oracle, IBM, and Linux. Microsoft's dominance has gradually been challenged as government agencies begin switching from Microsoft Office to open source alternatives. Today, the debate has moved on to avoiding lock-in through the use of open source operating systems, and software in government datacentres and the cloud.

The City of Munich spent the last ten years migrating away from Windows by adopting Linux, OpenOffice (later LibreOffice), and other open-source solutions. The migration was formally declared complete in 2013. According to a 2008 EC report, the primary motive behind migration was "the desire for strategic independence from software suppliers." A 2012 report commissioned by the city boasted that this migration had actually saved Munich €11.6 million. Following a change of government in 2017, the new administration began discussing the possibility of abandoning the city's open source operating system LiMux and returning to Windows by 2021. This has sparked a fierce debate regarding the costs of switching back to proprietary systems, as well as its short- and long-term impacts. It also demonstrated the difficulties in making these kinds of changes sustainable over time without a strong alliance and holistic approach integrating alternative technology, economic, and legal frameworks.

Cities are also beginning to collaborate in the creation of shared open code repositories on Github, following the example of cities like Chicago, Barcelona, and Amsterdam. New York, San Francisco, and Helsinki also maintain in-house open software development teams.

A concerted push to encourage governments to increase open source and open standards usage has come from the governments themselves. Throughout Europe, public sector bodies have migrated, or at least tried to migrate, to open source software: a Swedish pension fund, schools in the Polish city of Jaworzno, the city administrations of Barcelona and Rome, the Camden local council in London, public authorities in Nantes, the regional government in Spanish Extremadura, 75% of the municipalities in the Walloon region of Belgium, or the Portuguese city of Vieira do Minho. The Italian Defence Department and the French state police (the Gendarmerie Nationale) have also launched major migration projects towards open source software, thereby saving taxpayers millions.

The most holistic effort came from the UK government initiative **Government Digital Service (GDS)**, establishing a **Digital Service Standard** and a **Technology Code of Conduct** that explicitly recommends the use of open source software and open standards. British public institutions are required to publish everything in an open format, fostering a change in the way public services are designed that must be "digital by default" and put "citizens first." According to the

digital service standard, public services must be designed to place the citizen at the centre in a flexible and iterative way, in order to deliver better services in response to citizens' needs. This process has resulted in the development of new public services, saving time and resources, and attracting tech talent to work for the government. Although local authorities and the NHS remain heavily reliant on proprietary software, the message is gradually spreading to smaller government departments across Britain.

Accordingly, the strategic use of public procurement by public administrations has an enormous effect. Government contracts and procurement must include new actors and new formats to enable government products and services to be open sourced; this means incorporating innovative elements with a focus on sustainability and inclusion into the procurement process. Innovative procurement means involving purchasing departments in the sourcing process, in order to ensure that technology (such as free and open source software) can be obtained from reliable

suppliers at a lower cost for higher quality, and that open standards and interoperability are implemented. Open source software should be easy for governments to acquire at all levels.

The European Parliament's public procurement directives adopted in January 2014 included changes such as increased flexibility and simplification of procedures, negotiations and time limits, clearer conditions on how to establish collaborative or joint procurement, and the creation of innovation partnerships.

Box 14. Sustainable, Open, and Innovative Procurement

Cities are increasingly aware of the power of strategic public procurement. In its 2016-2019 Government Agenda, **Barcelona** is reviewing the entire procurement process to facilitate more efficient public spending that innovates with regard to both products and services as well as supplier profile, with easier access for SMEs. The City Council is introducing **innovation and ethical clauses in public tenders**, incorporating this new vision and facilitating SME access to public procurement. New technology procurement will be more open, transparent, innovative, and agile, expanding the range of suppliers and facilitating the procurement of open source solutions and open standards. It will also consider aspects of data sovereignty and privacy, in compliance with legal regulations and data protection including ethics and a privacy impact assessment. As a result, new procurement processes, a digital marketplace, and new handbook for technology procurement will be produced (<http://ajuntament.barcelona.cat/contractaciopublica/en>).

Europe features several good examples in the "smart city" field, such as how the City of Hamburg procured new lighting systems for its public buildings, or sustainable energy consumption in municipal buildings in 37 municipalities of the Basque Country. These and others were documented in a toolkit on sustainable procurement published by the European Commission: www.forumforthefuture.org/sites/default/files/project/downloads/sptoolguidance.pdf

Open Contracting Standards (OCDS)

Governments worldwide spend more than \$9.5 trillion annually on contracts, yet little informa-

tion about how this money is spent is publicly available. The **Open Contracting Data Standard (OCDS)** fosters disclosure of data and documents at all stages of the contracting process by defining a common data model linked to the improvement of procurement and openness of contract data. It will allow the public sector to provide better services for the taxpayer through access to a diverse group of suppliers, avoiding vendor lock-in and corrupt practices. It was created to help organizations increase contracting transparency, and to allow for deeper analysis of contracting data by a wide range of users, with the aim of fighting corruption and improve service delivery. Built in 2014 by the Web Foundation, the Standard is now being tested by six countries, where it has already facilitated the release of over two million government contracts.

Technology for Transparency: Barcelona's Whistleblowing Platform

Xnet, an activist project working on digital rights since 2008 as part of the Citizens' Advisory Council of the Barcelona City Office for Transparency, launched the first public Anti-Corruption Complaint Box using anonymity protection technology like Tor and GlobaLeaks ("Bústia Ètica" in Catalan) in January 2017. With this pioneering project, Barcelona City Hall is the first municipal government to provide citizens with tools to send information in a secure way, guaranteeing privacy and giving them the option to be totally anonymous.

Within the EU framework of innovative public procurement,²⁸ a clear political boosting and promotion of innovation should be addressed, with a specific focus not only on products and services, but also on facilitating access to public procurement for SMEs, cooperatives, and suppliers—a valuable source of innovation. For the most part, such organizations rarely consider accessing such contracts given the difficulty of managing them, as well as restrictions in terms of financial solvency that in some cases limit participation to several large corporations.

The ultimate goals of procurement transformation are: i) fostering a more strategic, efficient, and transparent use of public resources and investment in government; ii) promoting innovation in government with social impact and in the service of environmental transformation; iii) improving the quality of public services to meet real citizens' needs; and iv) facilitating access to public procurement for SMEs and cooperatives, offering them new opportunities to scale and sustain their solutions, and thereby favoring the creation of quality jobs.

²⁸ www.innovation-procurement.org.

8.4 Taking Control of Digital Platforms

On-demand platforms like Uber, Lyft, and Airbnb are growing at incredible rates, disrupting sectors and challenging public regulations. The future of the on-demand economy is crucial to the European economy, particularly in terms of the rapid automation of production within Europe's current crisis of employment. In response to large-scale automation and labor market deregulation engendered by the gig economy, some cities are launching experimental pilot programs in a variety of policy areas ranging from the introduction of basic income schemes to new educational programs teaching STEAM²⁹ subjects and digital manufacturing in schools.

However, they are also struggling to introduce fair regulations regarding the taxation of large digital platforms and tech companies, unable to ensure fair competition for local players. A new focus of regulation is the question of algorithmic transparency, where governments and antitrust authorities are beginning to demand access to companies' data and metadata in or-

²⁹ https://en.wikipedia.org/wiki/STEAM_fields.

der to prevent algorithmic discrimination in areas like dynamic pricing or personal insurance targeting vulnerable individuals. The risk is that the on-demand economy will increasingly disrupt local industry, resulting in unemployment and labor precarization for young people in particular. We can find apt examples of cities developing new ways of regulating Airbnb and Uber, demanding access to data and algorithmic transparency so as to be able to enforce local laws.

Companies like Uber have been under attack across European cities in recent months, and are now trying to change their business model and open up their platforms to taxi drivers as a result. The public sector, however, should have already opened up data and platforms to create new jobs and innovations for the public good. Cities and governments should be able to run these systems and the data layer on their own (setting up systems intrinsically respectful of data protection, privacy, and sovereignty of cit-

izens), and then invite local companies, co-ops, and social organizations to come in and offer services on top of public data infrastructures. One key reason cities and municipalities have thus far failed to foster local data-intensive business, which can compete with Uber and Airbnb, is a lack of access to raw data. Cities should foster and exemplify local open and decentralized data platforms, where people can use contextual data to inform meaningful decisions and actions.

The future of the sharing economy consists of cities taking control over digital platforms, moving beyond the regulation of incumbents and empowering sharing economy alternatives such as platform cooperatives, maker districts which are reinventing manufacturing, the development of new productive cities where circular economic models can be experimented with and scaled, and the creation of city data commons to grow an alternative data-driven economy.

Box 15. Platform Control: Uber in Moscow, Airbnb in Amsterdam and Barcelona

Cities are putting forward more aggressive public policies to regulate on-demand economy players whose anti-competitive practices tend to bypass local regulations.

In the transportation sector, **Moscow** has reached an agreement with Uber permitting the US technology giant to operate in the Russian capital only if the company uses officially registered taxi drivers and shares travel data with local authorities. Uber entered the Russian market in 2013, with the aim of rapidly expanding into 40 major Russian cities. Russia, however, has a highly competitive local taxi market, with players such as Yandex and many smaller local companies operating a rather efficient system, and local players pressured city authorities to find a solution to Uber's attempt to capture the market. The Moscow Transport Authority concluded the deal in March 2016, after initially threatening to ban Uber outright. The company has agreed to share travel data with other public institutions in cities like Boston, New York, and San Francisco (although many conditions of such arrangements remain inaccessible for analysis). For cities, accessing Uber data is crucial to evaluate the impact of transportation systems on the city and regulate the taxi market and taxi pricing in a fair way, without allowing Uber to crash the local competition using its massive financial advantage.

In a similar vein, **Amsterdam** is currently negotiating with Airbnb to stop illegal renting. Airbnb poses a growing challenge to affordable public housing policies, driving up rents and promoting

the financialization of urban life. Airbnb has agreed to place a limit on its website, restricting renters to 60 nights per year and a maximum of four guests per apartment. Furthermore, residents will now be able to lodge complaints against noisy and aggressive tenants. Amsterdam is now targeting illegal renters, honing in on professional intermediaries who use Airbnb to squeeze out extra profits. The city will evaluate this agreement every three or four months to monitor progress and ensure compliance.

Barcelona, on the other hand, has sought to regulate Airbnb in a stricter way. The new government soon began cracking down on uncontrolled tourism, picking a fight with home rental websites and seeking to improve the lives of the city's 31,000 families without housing. The council froze new licenses for hotels and other tourist accommodation, and promised to fine firms like Airbnb and Booking.com for marketing apartments not registered with the local tourism board. The city offered these companies the chance to negotiate 80% of the penalty if they donate the empty apartments to the Social Emergency Housing Consortium of Barcelona to be allocated as social housing for three years. As Colau declared: "An Internet platform cannot become a means to block the regulations and to shelter illegal tourist apartments."

Airbnb occupies a dominant position on the short-term rental market. Offering 17,370 accommodations in the city, Barcelona represents the company's fifth-largest market overall. In this way, Airbnb significantly boosts tourist demand and creates additional external pressures on the city, driving rents up and residents out. Despite the Catalan Tourist Act mandating that tourists' accommodations be registered with the Catalan Tourist Office, 78% of Airbnb accommodations in Barcelona have no license to operate (InsideAirBnb). According to the Council, 7,000 of the city's 16,000 holiday rentals are unlicensed.

The City Council has acted decisively to crack down on illegal unlicensed apartments, doubling the teams of inspectors monitoring illegal rentals by cross-referencing licences with properties advertised on the platform, and fining Airbnb €600,000 for continuing to advertise unlicensed flats on its platform. The city has now called for a Popular Assembly for responsible tourism where citizens can democratically debate which tourism model they would like to see for their city.

8.5 Building Alternative Digital Urban Infrastructures

Many cities across the globe are investing in infrastructures like broadband to deliver digital services across borders, underwriting equal, society-wide access to connectivity. Strong interventions on the part of cities to provide broadband connectivity for all citizens are also planned due to recent attacks on Net Neutrality and regulatory proposals which establish an unequal playing field in terms of access to networks favoring the largest Internet companies, broad-

band, and commercial content providers. This situation is pushing cities to become more proactive concerning the provision of neutral infrastructure and broadband as a basic right.

Cities are also deploying alternative decentralized digital infrastructures that include open data distributed repositories, bottom-up networking and ad-hoc Wi-Fi, federated clouds, and distributed data management systems. The objective is to foster a whole open ecosystem of services and applications on top of open urban platforms, based on a participatory innovation

model employing open source and open hardware developments.

Strong public intervention at the regional and EU levels (through regional development and infrastructure funds, for example) could support this area of alternative development, situated so far from the short-term interests of large corporations; so far, it has been left to isolated initiatives, activists, hackers, and users themselves. An alternative digital ecosystem based on open and decentralized technologies would recognize the high social potential of this model and allow for a whole new generation of industrial and social innovation to launch and scale.³⁰

Other threats loom on the horizon. Since the global economy is increasingly based on the management of knowledge-intensive services underpinned by digital networks, knowledge and information systems risk becoming locked within walled gardens and proprietary ecosystems³¹. The Internet's once distributed, scalable, and open architecture is currently evolving towards centralized data infrastructure based on closed and proprietary standards, with unaccountable governance and revenue models in which large US corporations capture monopolistic rents due to large network externalities.

Furthermore, many smart city projects are conceived as proprietary urban operating systems; this leads to market domination by just a handful of corporate actors and intensifies pervasive targeting of consumers through sensor technologies and surveillance mechanisms. The challenge for smart cities is to answer these criticisms by constructing technologies responsive and accessible to the people whose lives they affect. The value of networked technology is found in access to one another and deepened social relationships, not access to data or information alone.

Smart cities must become open and flexible systems which adapt to social changes and institutional innovations. They should be designed based on the political priorities and needs of citizens themselves, rather than vendors' technological imperatives and business models. Many initiatives focus on developing methods to actively involve citizens in the design of the next generation of public infrastructures and services, thereby building common ecosystems and common frameworks (legal, commercial, economic) for interoperable digital services. Furthermore, processing urban information in real time and making data publicly accessible can facilitate a transformation in how public resources are used, together with improving public services such as mobility, transportation, and health care systems.

Mobilizing the shared potential of software and telecom infrastructures paired with increased public investment will deepen cooperation between cities and regions in infrastructure development. Local and regional authorities can thus serve as catalysts for innovation, coordinating urban innovation strategies and funding scalable pilot programs in real-world contexts, bringing together European developers, designers, entrepreneurs, and end-users. Even if smart social platforms in cities and regions become self-organizing and self-sustaining systems at a later stage of development, their current implementation requires a clear systemic approach and public investment at the regional level.

One example of a more structured effort is the European Commission's CAPS program,³² which has invested roughly €60 million into collaborative and open digital platforms to pilot bottom-up, citizen-led projects with high social impact, or the Next Generation Internet initiative,³³

30 www.nesta.org.uk/sites/default/files/dsireport.pdf.

31 http://cordis.europa.eu/fp7/ict/fire/docs/tafi-final-report_en.pdf.

32 <https://ec.europa.eu/digital-single-market/en/collective-awareness>.

33 <https://ec.europa.eu/digital-single-market/en/policies/next-generation-internet>.

which intends to fund alternative European internet platforms, fostering an alternative to

the current US monopolies more attuned to European values and regulations.

Box 16. Open Platforms for Cities

Public Broadband for All in New York City and San Francisco

Many cities are claiming improvements in the regulatory framework for providing high-quality public and free Wi-Fi, and the subsequent expansion of municipal Wi-Fi service coverage. At the same time, cities find themselves on the frontlines of the struggle for open, free and neutral telecommunications networks to ensure connectivity in the many districts and communities which still suffer from a lack of infrastructure. According to the OECD, the United States ranks 15th in broadband connectivity, behind such countries as South Korea and Canada. Several major US cities are leading a new “broadband for all” initiative with aggressive broadband expansion in the case of New York and San Francisco. Expanding broadband infrastructure and providing affordable access to low-income residents is an essential step towards bridging the digital divide regarded as a social justice issue by many.

Bottom-Up Networking Deployments: the Case of Guifi.net

While commercial access networks from either commercial telecom companies or local governments tend to follow a well-known centralized network architecture and operation model, community-owned open local IP networks are an emerging model of open, decentralized infrastructures which, collectively, have the potential to exhibit more resilience. Community-owned open local IP networks have integrated test-beds for experimental research connecting three existing community networks: Guifi.net (Catalonia, Spain), FunkFeuer (Vienna, Austria) and AWMN (Athens, Greece). These networks are extremely dynamic and diverse, successfully combining different wireless and wired (optical) link technologies, as well as both fixed and ad-hoc routing schemes. The **Guifi.net** initiative, probably the most noteworthy, has established a free, open, neutral, and largely wireless telecommunication community network, which began in Catalonia in 2004 and today features almost 20,000 working nodes, most of them linked to a main network in Catalonia.

Open Urban Platforms in Barcelona and London

Barcelona developed a horizontal data platform called CityOS, an open-standards urban platform for managing and analysing city data with common ontologies. CityOS integrates the open sensor platform Sentilo and the city’s various analytics dashboards. Its modular architecture is based on open standards and open source software, allowing the creation of a large community of users as well as its replicability and adoption by other cities.

Sentilo is an open platform for managing sensors and actuators (Internet of Things - IoT) allowing open access to data and increased interoperability. It is built, used, and supported by an active and diverse community of cities and companies who believe that using open standards and free software is the first “smart” decision a smart city should take. In order to avoid vertical solutions, Sentilo is designed as a cross platform with the objective of sharing information between heterogeneous systems and easily integrating legacy applications. Sentilo is now being adopted by more

cities across Spain and around the world, thanks to open specifications and open APIs which make it easier for organizations to build third-party modules on top of Sentilo.

Further bottom-up, citizen-led projects that harness open sensor networks to democratize data access and involve citizens include the European projects Making Sense (<http://making-sense.eu>) and Citizen Sense (<https://citizensense.net>). These projects show that by engaging citizens one can achieve collective change regarding environmental practices towards more sustainable behaviours.

The projects are based on the **Smart Citizen Kit**, an Arduino based sensor kit that provides sensor network tools to citizens, enabling the measurement of levels of air pollution, noise pollution or air humidity in the vicinity of a private home, school, or office. The project was originally developed by the Fab Lab Barcelona at the Institute for Advanced Architecture of Catalonia, and crowd-funded via the Goteo and Kickstarter crowdfunding platforms. With its relatively low-cost model, the Smart Citizen Kit views itself as a bridge between more typically technical and non-technical citizens, seeking to solve environmental challenges in unconventional ways through better monitoring. The Smart Citizen Kit is based on two core components: the “kit” itself, and the platform used to share data between people operating a kit. The kit is an electronic board based on the Arduino, equipped with sensors and a wireless antenna. A number of cities including Manchester and Amsterdam have supported citizens in monitoring environmental data in real time, launching city-wide pilot programs using the Smart Citizen Kit.

London has developed a free and open data-sharing platform allowing anyone to access data on the city (economy, transport, housing, environment). Launched in 2010, the London Datastore provides over 700 datasets to help understand London and develop solutions to the city's problems, whether for citizens, enterprises, researchers or developers. The main interface on the London Datastore website is the London Dashboard. Described as a window into London's public services, it displays data in the form of tiles depicting selected statistics marked with either an up or down arrow, coloured green or red to indicate whether a statistic is positive or negative.

Helsinki Smart City App Hack

Helsinki is a pioneer in opening up its data repositories, having already made vast numbers of datasets available through the Helsinki Region Infoshare (HRI) service (<http://www.hri.fi/en>). Now the city seeks to encourage developers to develop new kinds of applications, visualizations and dashboards using open data, shedding light, for example, on what is taking place in Helsinki or how the city is evolving. Another example are mobile applications to help tourists find interesting locations and events, or allowing citizens to participate in public decision-making processes. Helsinki encourages user-oriented and diverse application of the available open data sets in the HRI service, particularly the open APIs. As a source of inspiration and assistance for developers, the city is showcasing potential ideas, datasets, and contact points related to the five smart city topic areas. Additional information and links to other open data resources are available on the Helsinki Smart City App Hack page (<http://smartcityapphack.com>).

Citizen Ownership of Energy Grids in Hamburg and Berlin

Remunicipalization of critical services and network infrastructures is a growing trend in many cit-

ies. A number of cities and regions from Germany to Latin America are attempting to take water supply, waste disposal, and energy provision contracts back into public hands, prioritizing citizen needs and community interests over private commercial objectives. A significant innovation in this field has been the growth of new forms of public utility ownership combined with more decentralized forms of collective ownership, including a high preponderance of cooperatives with shares held jointly by the local authority, trade unions, and citizens.

In Germany, we witnessed numerous launches of municipal utility companies in both major centres like Hamburg and Berlin, as well as rural areas. Two great examples of this trend are the referenda on participatory public ownership of energy infrastructures in the German cities of Hamburg and Berlin, following the federal government's directive to bring down greenhouse gas emissions by 40 percent by 2020, and up to 95 percent by 2050 as compared to 1990 rates. In this context, local policy makers opted for remunicipalization as a means to pursue independent energy policies at the local level, crucial to creating the necessary conditions for a successful and efficient transition to renewable energies and energy efficiency.

The citizens of Hamburg voted for full remunicipalization of the city's energy distribution grids in a 2013 referendum. In February 2014, the City of Hamburg reached an agreement to purchase the electricity distribution grid. The transition to municipal ownership was completed in April 2016 while retaining the entire workforce.

Although the Berlin referendum failed due to insufficient turnout, the grassroots campaign led by the Berliner Energietisch coalition generated sufficient pressure to create a municipal grid operator and energy supplier (www.berlinerstadtwerke.de), which now competes against the Swedish coal and nuclear company Vattenfall to buy back the energy grid currently under its control. The campaign also resulted in the emergence of the citizen-led initiative Burger Energie, launched in 2015 when citizen cooperatives chose to participate in the municipal tender process to operate the municipal energy grid and raise awareness about citizens' role in the economy and local energy structures. They received €12 million of pledged investment from roughly 3,000 residents, with the aim of taking control of the energy grid, moving towards renewable energy and investing in local sustainability projects, as well as distributing profits to other citizens in the cooperative.

8.6 Cooperative Models of Service Provision

Thus far, we have seen little systematic public support from governments at all levels for innovations harnessing digital technology to address social challenges and democratize ownership and control. Despite this lack of support, a growing movement of social and technological entrepreneurial initiatives are working on important social issues pertaining to health care, democ-

racy, responsible consumption, spending, transparency, education. The development of open digital infrastructures (open data platforms, p2p knowledge production networks, decentralized technology such as blockchains, free software, open hard-ware, etc.) can create the necessary conditions to promote this development and foster collective action for social change.

The on-demand economy is growing at incredible speeds, with companies like Uber and

Airbnb now dominating the global market. What makes many people uncomfortable about companies like Uber is its ownership structure and negative impact on workers and local operators. Many people now support alternative economic and governance models—especially cooperatives—that transcend the data extractivism of platform monopolies like Uber, based on distributed, worker-owned, and managed platform cooperatives.³⁴

Platform cooperatives are online organizations currently growing in many different areas, from food service and transportation to p2p consumption, logistics, and freelancing. They allow workers to exchange their labor without manipulation by an intermediary, as they are managed by members in a democratic fashion while supporting the development of digital commons.

Many cities support these alternative initiatives and encourage the growth of digital social innovation and platform cooperatives. They link these initiatives to public procurement and make it easier for them to access public funding, while promoting new funding mechanisms, new regulations, and new norms favouring open standards, open source software, open hardware, and bottom-up networking, as well as new ways of making (Ateneus de fabriació, FabLabs, Maker-spaces, distributed manufacturing) and other collaborative economy initiatives.

Alternative forms of public and common platform ownership will help to create a more democratic economy, transcending the logic of market-based, rent-seeking, privatized network systems leading to the appropriation of common resources for private gain. Cooperative alternatives represent a much longer-term approach for the democratic management of public resources.

³⁴ Trebor Scholz, 2016, *Platform Cooperativism: Challenging the Corporate Sharing Economy* RLS-NYC, rosalux-nyc.org/platform-cooperativism-2.

8.7 Grassroots Innovation

Cities should consider supporting programs for grassroots communities of innovators and start-ups alongside promoting alternative cooperative models of service delivery. In order to align technology and innovation capacity with real social challenges, cities must design innovative systems with public purpose and long-term investments in critical social areas such as health, education, transportation, and energy transition. This means rethinking the relation between the public and private sectors, ensuring that the public sector can shape the direction of innovation and allow society to reap the returns of public investment in research and innovation, thus socializing risks as well as rewards.³⁵ The public sector has a strategic role to play in setting the direction of change with which bottom-up solutions can then experiment. Emphasis should then be placed on orchestrating the innovation ecosystem as a whole via strong public policies capable of investing in education and research and targeting ambitious challenges, thus reverting the current trends of low growth rates, low investment, and low productivity.

Numerous supporting programs around the globe focus on investing in innovative SMEs to produce strong social impacts over massive, top-down tech corporations with large-scale economic impacts. Good working instruments can be institutional settings such as innovation partnerships or innovation funds, or the European SME instrument and innovative public procurement in order to help small and medium-sized enterprises. Cities should also create new specific instruments for social entrepreneurship, leveraging innovative public procurement, European Regional Development Funds (ERDF), and specific EIB (European Investment Bank) innovation funds. These measures make innovative SMEs and start-ups less dependent on volatile financial capital and venture capital financing,

³⁵ Mazzucato developed this thesis at length: <https://mari-anamazzucato.com/entrepreneurial-state>.

Box 17. Cooperative Platforms and Sharing Services

Sharing Cities Seoul initiative

The Seoul Metropolitan Government announced its Sharing City Seoul initiative in September 2012, when the Mayor of Seoul declared his intent to turn Seoul into the world's first city to adopt the concept of the sharing city, developing and implementing many initiatives throughout the city using public and private resources to tackle social problems while boosting civic engagement. The Seoul Metropolitan Government has designed 63 new sharing services as part of a broad social innovation programme with the ambitious goal of creating new economic opportunities, empowering citizens, reducing waste, and tackling economic, social, and environmental problems. Services range from car and parking space sharing to shared bookshelves, house sharing, and citizen participation projects (<http://english.sharehub.kr/what-is-a-sharing-city-seoul>).

Community-Owned Transport Platform "LaZooz"

LaZooz, originally launched in Israel, is a project seeking to reinvent real-time ridesharing in a decentralized way. It relies on the blockchain, a distributed ledger technology also used by the virtual currency Bitcoin, but introduces interesting technical innovations to achieve its objectives. LaZooz replaces Bitcoin's proof of work method, which requires great computational power to generate tokens, with "proof of movement" generating new tokens called "zooz." Basically, one begins earning zooz tokens—which can be also used to pay for the trip—as soon as driving commences. The overall objective is to grow a community and reward those who contribute most, whether as a driver, coder, or funder. This community-led rewards system is the added value of LaZooz compared to companies like Uber, allowing the community to take control and be empowered (<http://lazooz.org>).

App-Based Driver Association, California

Beyond cooperative platforms, there is a need for new forms of collective organizing of temporary workers in the "on-demand" economy. The growth of the sharing economy has thus far entailed growing labor precarization, as well as an erosion of job security, social protection, and workers' social safety nets such as health care, pensions, parenting subsidies, and so on. In recent years we have seen a growing number of strikes (at Deliveroo and Uber, for instance) and class-action lawsuits by precarious workers in the gig economy, together with new government regulations and restrictions. On-demand platforms treat their workers as independent contractors, as opposed to employees with full labour rights. Companies use this framework to externalize most costs onto workers, reduce collective bargaining and implement intrusive data-driven mechanisms of reputation and rankings to reduce transaction costs.

One effective example of collective organizing in the gig economy is the CADA, an alternative organizational model for drivers in transportation services, representing owners and drivers from Uber, Lyft, Sidecar, Toro Ride, Opali, and others. The organization is governed by a democratically-elected Leadership Council. The CADA seeks to ensure that app-based drivers are represented in a unified way and have the necessary resources to carry out their actions in the growing transport platform industry (www.cadateamsters.org/aboutus.php).

FairBnB, Amsterdam

FairBnB is a citizen-led response to the increase of short-term rental apartments in Amsterdam,

which has caused nuisances in local neighborhoods and pushed up housing prices which were already inflated to begin with. Despite Amsterdam's new regulation to limit the power of housing platforms and efforts to pursue illegal renters, enforcement of said regulation is exceedingly difficult because companies like Airbnb refuse to provide the data of hosts running illegal apartments. FairBnB seeks to be a transparent and accountable sharing platform alternative with a positive impact on the city and its citizens, and is based on a fair, non-extractive, and collaborative economic model (<https://fairbnb.coop>).

Digital Social Innovation Platforms for Collective Action

As defined by the EU project, "Digital Social Innovation (DSI) is a type of collaborative innovation in which innovators, users and communities collaborate using digital technologies to **co-create knowledge and solutions for a wide range of social needs** and at a scale that was unimaginable before the rise of the Internet."

A large-scale pan-European initiative to grow Digital Social Innovation projects was launched by the European Commission in the context of the **Horizons 2020 Research & Innovation program with funding of over €60 million**. The EU has identified over 2,000 initiatives and organizations **using open, collaborative, and ethical technology to tackle social issues and create community value**. These range from social networks for those living with chronic health conditions such as **Cancer Research UK** and their citizen science **platform Cellslider** to online platforms for citizen participation in policymaking such as the **D-CENT project**, those using open data to create more transparency about public spending such as **Open Corporates** and other projects such as the bottom-up networking community **Guifi.net**, or providing Internet access to rural communities. The **Tor project** promoting anonymous communication and digital rights for all citizens, or **Arduino** which is strengthening the open hardware and maker movement in Europe, are further examples. Social innovation ecosystems are now being fostered in cities, in some cases with specific allocated funding schemes to help these initiatives grow and scale (<http://digitalsocial.eu>).

Maker Cities and FabCity Networks

Cities around the world such as Barcelona, Milan, Berlin, Amsterdam, Detroit, New York City, and Shenzhen are taking advantage of the digital transformation and the new industrial revolution (Industry 4.0) based on robotics and automation to implement new strategies for urban manufacturing and local sustainable production. Cities are also developing programs to "bring manufacturing back to the city" and encourage the use of digital fabrication for the circular city. One of the most interesting initiatives of this kind is the FabCity Initiative, made up of 16 members, 12 cities and regions such as Amsterdam, Paris, Barcelona, Shenzhen, Detroit, Boston, and Kerala (<http://fab.city>).

generally focused on a quick and profitable "exit" usually through an IPO or sale to a big company and unable to provide the kind of patient long-term financing needed for radical innovations.

At the municipal level, we find examples such as the **New York Agency for Economic Devel-**

opment and its **entrepreneur program** in particular.³⁶ Very similar to this is Barcelona Activa, the local agency for employment and economic growth for the Barcelona area,³⁷ or StartupAm-

³⁶ www.nycedc.com/service/programs-entrepreneurs.

³⁷ www.barcelonactiva.cat/barcelonactiva/en/index.jsp.

Box 18. Crowdfunding and Challenge Prizes for Social Innovation

Crowdfunding tools can help involve the community in choosing the best projects to be funded as part of their R&D programmes. Crowdfunding allows people to support what they consider to be attractive ideas and make them real, while often accruing benefits from the new product (reciprocity being one element of crowdfunding).

The UK innovation foundation Nesta's work on crowdfunding (www.nesta.org.uk/project/start-up-europe-partnership) has forecast the **growth of alternative finance since 2014** (including peer-to-peer business lending, peer-to-peer consumer lending, equity crowdfunding, community shares, pension-led funding, and invoice trading). The major crowdfunding platforms are Kickstarter and Indiegogo, alongside many oriented towards charitable causes such as JustGiving, Goteo, Crowdfunder, Spacehive, and other platforms found in the directory of crowdfunding platforms **CrowdingIn** (www.crowdingin.com). Two particularly interesting examples of promoting alternative collaborative economic models in cities are the Spanish platform Goteo and the German crowdfunding platform Startnext.

Goteo emerged from a collaborative founding investigation, and was launched in 2011. Currently, the platform has more than 90,000 users who collectively earn around €4 million. The software used to develop the platform is open source and released according to a copyleft licence, meaning its data is open and freely accessible. Furthermore, all projects are obliged to clearly define their social responsibilities. Startnext was founded in 2010 to support innovators, social entrepreneurs, and makers to promote their ideas, attract supporters and raise necessary funds. It is now the largest crowdfunding community for creative projects and start-ups in the German-speaking countries, with a clear focus on sustainability and public welfare projects. It counts over 835,000 users, with more than 5,000 successfully funded projects.

There are other effective funding instruments such as **prizes, challenges, and competitions** which should also be included as new funding mechanisms for cities to foster social innovation. **Nesta Centre for Challenge Prizes** (www.nesta.org.uk/our-projects/centre-challenge-prizes) has bestowed awards in everything from energy and waste to data and education, or for encouraging challenge-driven innovation. Nesta runs the **Longitude Prize**, involving the public in choosing which of six major global challenges deserved to be the focus of its £10 million prize fund. Other successful challenges have included the **Open Data Challenges Series** run in collaboration with the **Open Data Institute** to attract developers and social entrepreneurs to develop innovative solutions to social challenges using open data, the **European Social Innovation Competition** launched by the European Commission to encourage new social innovations from all over Europe such as new solutions to reduce unemployment and climate change, and the **Inclusive Technology Prize** to encourage innovation for social inclusion.

sterdam,³⁸ a municipal and global platform for the start-up and tech scene, and the **Berliner Start-up Agenda**, a collaborative effort to im-

prove conditions for young and innovative companies with a specific focus on IoT, media, energy tech, and health care.³⁹

³⁸ www.iamsterdam.com/en/business/startupamsterdam.

³⁹ www.berlin-partner.de/en.

Several other examples come from private organizations. The **Impact Hub Network**,⁴⁰ for instance, is a network of several cities across the world connecting creatives, freelancers, and entrepreneurs and enabling them to access shared resources to sustainably develop their ideas and projects. The co-working movement gathering around the **Coworking Manifesto**,⁴¹ signed by more than 17,000 coworking spaces, has grown significantly in recent years and consolidated the movement's values, shared annually at the Global Coworking Unconference.⁴²

Finally, there are programmes such as **Startup Europe Partnership**⁴³ specifically designed at the European level to grow the continent's start-up capacity by facilitating partnerships between start-ups and corporations, as well as between start-ups and public administrations through innovative procurement and challenges. **STIR** (Start-up in Residence), launched by the Mayor's Office of Civic Innovation (MOCI) in San Francisco and immediately adopted by other cities in the US and Europe, is a program connecting government agencies with start-ups to develop technology and products to address civic challenges. The program enables start-ups to understand the needs of government more deeply, and seeks to eliminate barriers to connect small businesses and entrepreneurs with local governments more effectively.

8.8 Rethinking Welfare Schemes and Complementary Currency Systems at the Local Level

Improvements in technology and the development of new business models based on platforms, data, artificial intelligence, and extreme automation are creating new types of jobs, while making others obsolete. To cope with this enormous transformation, both gov-

ernments and technology companies alike are now rethinking employment and social security systems, advocating for a guaranteed basic income as a possible solution to extreme automation, unemployment, and the crisis of social security. Although technologies have been providing faster, better, cheaper processes and products, advances in the life sciences, AI, big data, etc., we also observe widening inequalities of income, wealth, and political power.

For big tech companies, basic income is a tool to protect people expected to lose their jobs due to globalization and technological change, while at the same time making governments more lean and efficient. Some basic income proposals are focused on cash transfers—a universal basic income as the ultimate social safety net. Other approaches argue we require a basic income as a dividend paid by robot-enhanced productivity which flows back to the society responsible for collectively producing wealth in the first place. According to this view, basic income will be very important to stabilize society in a system of value production and wealth creation becoming increasingly collective and social, while returns become increasingly private.⁴⁴

Several mainstream policy experiments have been established in Canada, Finland, and The Netherlands, while the Swiss even held a national referendum on UBI. Google.org is one of the founders of a Kenyan experiment running a randomized trial that will issue 6,000 Kenyans a basic income for a decade, while Y Combinator—one of the most influential tech accelerators in Silicon Valley—is running a basic income research project with an initial pilot program in Oakland.

New basic income experiments are up and running in cities around the world, from Oakland, California to Utrecht and Livorno, combining the

40 www.impacthub.net.

41 <http://coworkingmanifesto.com>.

42 <https://gcuc.co>.

43 www.nesta.org.uk/project/startup-europe-partnership.

44 www.opendemocracy.net/can-europe-make-it/francesca-bria/robot-economy-full-automation-work-future.

Box 19. Basic Income and Digital Currency Pilots

Y Combinator Oakland

One of the most successful start-up accelerators in Silicon Valley, Y Combinator, launched a basic income experiment in Oakland in 2016 targeting around 100 residents entitled to an unconditional guaranteed minimum income for a period of six to twelve months. One of the pilot's main objectives is to promote freedom and examine the opportunities people can take if guaranteed financial security, as well as how their happiness is affected by participation in the project. Oakland was chosen for this short-term study due to its great economic and social diversity and considerable social inequality. Should this pilot project prove successful, it will be followed by a trial scheduled to last five years.

Basic Income Municipal Experiments in Utrecht, Livorno, and Glasgow

Utrecht is currently designing a municipal basic income scheme to test a new programme for delivering social assistance, following new conditions for claimants to access benefits payments. The experiment is set to launch following final approval by authorities due in December 2017.

Several municipalities in the Netherlands initiated unconditional cash transfer programmes to revitalize their workfare-oriented social assistance programs in 2016. The cities of Groningen, Tilburg, and Wageningen have also presented schemes which are now being reviewed by the National Ministry of Social Affairs. All programs are designed as randomized control trials in which citizens are randomly selected from a pool of current social security claimants to test new rules and new types of welfare innovations.

Last year, Italy also launched a municipal basic income experiment in the **Tuscan city of Livorno**. The scheme consists of providing €500 to 100 families threatened by poverty over a period of six months, in order to cover basic needs such as food and part of the rent. The project was extended to another 100 families in 2017. The project has inspired other Italian cities such as Naples, which are now looking into similar projects.

In Scotland, **Glasgow** launched a project to design and implement a basic income pilot program in partnership with the Royal Society of Arts. A series of workshops were conducted between June and September 2017 to evaluate the feasibility of implementing such pilots and a report on the feasibility of the municipal basic scheme is forthcoming.

Municipal Complementary Digital Currencies

To address the effect of the current economic and financial crisis and cities' evident lack of resilience, many are seeking to reduce their dependency on the traditional financial sector by strengthening complementary monetary circuits. The WIR system in Switzerland was the first to be implemented, over 75 years ago. In more recent years, a variety of towns and regions across Europe such as Bristol, Nantes, Sardinia, and Catalonia have introduced complementary local currencies used in parallel with conventional forms in order to strengthen the local economy by increasing the "multiplier effect" of money in the local economy. Based on empirical data from pilot projects, complementary currencies have shown to facilitate business-to-business transactions by linking unused resources to unmet needs, and encouraging the growth of a diverse and more resilient local economic ecosystem.

Complementary currencies can exhibit different properties, and can be designed to work for people and planet rather than accumulation and profit. The current hype around complementary currency is linked to new digital tools, as secure mobile digital networks such as the blockchain underpinning the Bitcoin cryptocurrency make it possible to innovate financial services as never before. Some of the most successful examples of complementary currency circuits designed to work at municipal and regional levels are the virtual currency Bitcoin, mutual credit systems such as Sardex and C3, and community currencies.

The European project **Digipay4growth** has created a general framework for complementary currency (www.digipay4growth.eu/wp-content/uploads/2014/05/DigiPay4growth-manual-first-version-February-2016.pdf) that can be implemented across Europe as local economic development policy. Supporting pilots in a number of cities, the project is based on the idea of “social trade credit”—a solution to supply countercyclical credit for SMEs in times of economic crisis. Social trade credits can overcome credit access barriers for SMEs and the high costs of credit expenses incurred by interest, which threaten the survival of many small businesses. This measure can lead to more sustainable economic activity, more income for businesses, and ultimately more jobs in the locality or region.

Cryptocurrencies based on decentralized ledgers or the blockchain **such as Bitcoin** are spreading rapidly. Blockchain-enabled digital currencies are now being embraced by cities such as San Francisco, Amsterdam, Vancouver, New York, and London, which provide networks of Bitcoin ATMs and invest in Bitcoin and blockchain start-ups.

Mutual credit clearing systems such as the Sardex trade exchange in Sardinia, Italy or C3 in Uruguay are interest-free credit issued into networks of SMEs, exchanging commercial transactions with each other using a shared online payment system.

Another example of successful community currency is Torekes, launched in Ghent, Belgium designed to reward civic contributions, and implemented in disadvantaged neighbourhoods to foster positive, mutualistic behaviors, and community resilience.

basic income scheme with local welfare provisions and complementary municipal currencies. To address the current economic crisis, cities can also encourage the development of an ecosystem of currencies at the municipal level. Local currencies can create decentralized networks of mutual services and goods based on local trust, reinforced and nourished by a connection to “paying” services, both public (i.e., local contributions payable in local currency) and commercial (local shops, PMEs, etc.), and local social innovation initiatives (car sharing, CSA, local energy cooperation, and so on).

A sustainable 21st century city can only thrive if it is able to pursue its needs (economic, social, infrastructural, educational, cultural) with the objective of diversifying the local economy by utilizing an ecosystem of local currencies designed for different needs, capacities and interactions (B2B, community, and civic currencies).

The creation of new capacities to serve local needs is facilitated by introducing “complementary currencies” which stimulate local interaction, exchange, and production. These interactions and transactions take place among SMEs

(B2B currencies), citizens' organizations (community currencies), and between citizens and the city itself (civic and municipal currencies).

Complementary currency schemes are devised in a participatory and democratic manner, revised on a regular basis so as to adjust the currency to new needs or capacities, changing contexts or new opportunities. The rules of the game can be designed in a participatory way involving citizens, businesses and other social groups. These mechanisms nourish the collective sphere (commons, co-creative initiatives) in response to local needs and ambitions, developing and stimulating work in a collective way with a view to the community's wellbeing.

8.9 Digital Democracy & New Rights

Digital participation and engagement tools open up a new scenario for democratic innovation, with many cities willing to research and develop new organizational models involving citizens in the policy-making process, while innovating procedures and mechanisms for participation in the city itself. We are currently witnessing the emergence of new hybrid models combining representative and direct democracy, online and offline interaction, and blending new forms with old ones. These hybrid models range from the rise of new networked parties such as Podemos in Spain and M5S in Italy, citizen-led coalitions practicing direct democracy while running major cities such as Madrid and Barcelona, to large-scale participatory budgeting initiatives around the world

The digital society should be built together with its citizens. Barcelona, for example, encourages the use of technology to facilitate an active democracy. This means developing new models of engagement in digital environments (open, secure, and free) for a new form of inclusive and participatory policymaking. To this end, cities are developing tools for large-scale collab-

oration, cooperation, and internal participation at City Hall. These new tools and methods can engage strongly with the new generation of digital natives which has lost faith in the traditional political system and current institutions, which no longer seem to provide credible visions for the future. Youth movements around the world are inspired by the nature of bottom-up digital networks, demanding new accountable practices and the end of institutional corruption. This leaves a gap for a new 21st century politics capable of targeting a much younger age group.

Cities are coming together in gatherings such as "Democratic Cities",⁴⁵ initiated by the D-CENT project, to address fundamental questions concerning the design of new democratic institutions best suited to next-generation democracy—open, experimental, and able to tap into the collective intelligence of citizens.

In order to increase technological sovereignty of both governments and citizens alike, a debate is emerging among governments on the use of technology in the city. In cases such as Barcelona, economic and social agents, academia, and citizens in general can submit proposals concerning the city's technological strategy, fostering the creation of open spaces for debate and activating working groups and conferences on the relationship between technology, democracy, and sovereignty.

By placing citizens at the heart of the project, cities also aim to increase their digital sovereignty and ensure citizens can fully exercise their freedoms and digital rights, including their right to data protection, privacy, and information self-determination. Raising awareness on the new rights and freedoms which must be affirmed as part of the information society is a major task facing cities today. The freedom to access, share, and own common knowledge must be acknowledged in a knowledge society.

45 <http://democratic-cities.cc>.

Box 20. Large-Scale Online Participatory Platforms: Decide Madrid and Decidim Barcelona

Decide Madrid (<https://decide.madrid.es/>) is an open consultation and direct democracy platform launched by the City of Madrid following the 2015 municipal elections, enabling citizens to propose, debate, prioritize, and implement city policy. It is built on an open source software called Consul released in September 2015, allowing other governments and organizations to easily replicate it.

Decide Madrid was conceived as a bottom-up proposal mechanism in which anyone can propose and debate, but only residents of Madrid have a binding vote. A deliberative forum is integrated into the citizen proposal mechanism, along with, more recently, a participatory budgeting tool, with the city investing €10 million in citizens' proposals thus far.

Last year, the city experimented with the first round of participatory budgeting, allocating €60 million euro to be realized by bottom-up citizens' proposals. More than 5,000 proposals have been made, some of them from individuals and others from collaborative face-to-face meetings in every district. The process is designed in a similar way to Better Reykjavik in Iceland: People are obliged to meet a budgetary bottom line, adding proposals until they reach the total quantity allowed.

Decidim.barcelona (www.decidim.barcelona) is the main online participation platform for the City of Barcelona. Through the democracy platform, Barcelona is currently running large-scale experiments with new methods aiming towards a genuinely participatory democracy. Decidim was developed with open source software and a modular architecture based on open standards, which will allow the city council to implement large-scale participatory processes around city policies. Furthermore, the platform allows city organizations to run their own autonomous participatory processes, such as open budgeting and policy co-creation projects. Decidim Barcelona has 27,000 registered users presenting over 11,700 proposals, with 11 participatory processes running in parallel.

One of the best use cases regarding participation in Barcelona has been the participatory urban planning process. Here, the city involves neighbourhood groups and citizens in the planning process through offline citizens' assemblies and the online platform decidim. Together with its citizens, the city drafted an ambitious mobility plan to curb excessive air pollution, lower noise levels, and reduce traffic by 21%. The plan is based around the idea of superilles (superblocks)—mini-neighborhoods around which traffic will flow, and in which spaces will be repurposed into green space for citizens, freeing up 60% of streets currently used by cars. Barcelona's new plan consists of creating superilles through gradual interventions to repurpose existing infrastructure, ranging from traffic management to changing road signs, the creation of new orthogonal bus networks, and the introduction of 300km of new cycling lanes to increase mobility by foot, bike, and public transport. The use of sensor networks, digital signalling and Big Data analytics will help to better define and predict public mobility policies, as well as measure the urban impact.

Participatory Budgeting in Paris and Porto Alegre

Local city councils are experimenting with participatory budgeting initiatives in order to enhance citizen participation in the allocation of public finances worldwide. For participatory budgeting to

work effectively, it must open up new democratic spaces. Accordingly, the process must follow a robust and legitimate methodology to ensure wide-ranging citizen involvement and embed participatory budgeting into public policies, ensuring that it is complemented by public investment in fundamental social services.

Participatory budgeting began more than a decade ago in Porto Alegre, the capital of Brazil's southern state of Rio Grande do Sul. It is a process which allows citizens to present their proposals and priorities to address social challenges, and influence the budgetary allocations made by their municipal governments through collective debates and voting. Participatory budgeting has led to better and more effective decisions regarding new welfare projects for the citizens of Porto Alegre, reaching participation levels of 40,000 citizens per year. New projects for the improvement of sewer and water infrastructures were built, while participation in the process by low-income groups represented a clear sign of social empowerment. The success of popular participation in determining the use of public welfare investment in Porto Alegre has since inspired more than 140 Brazilian municipalities to take up participatory budgeting.

Over the years, resources allocated through participatory budgeting have grown as the practice has spread beyond Brazil. Participatory budgeting has also been successfully implemented in European countries such as Estonia and Iceland, as well as around the world in cities like New York and Paris.

A participatory budget was launched in Paris in 2014 to mobilize public agents, professionals, and citizens in prioritizing specific actions and projects. Between now and 2020, residents will decide how €426 million is spent, constituting over five percent of Paris' total municipal budget. Using an online platform as well as polling stations to reach as many people as possible, it represents a major democratic experiment for the city. 3,200 projects were submitted in 2016, of which 624 were selected with a special focus on deprived areas in need of social and territorial inclusion. More than 160,000 people voted in this year's round, deciding how to allocate €100 million.

AI-driven Participatory Platform for Citizens, Reykjavik

The Citizens Foundations "Your Priorities" open-source e-democracy software was created in 2009 and has since been used by more than 600,000 people, empowering communities and enabling hundreds of citizens' proposals to become reality. Successful Your Priorities projects include the Better Reykjavik participatory democracy and budgeting project in the Icelandic capital, and the Rahvakogu (People's Assembly) project in Estonia, which has contributed to making the Estonian legal environment more open and participatory. Better Reykjavik was one of three pilots run by the European project on direct democracy, D-CENT. It has been used in many countries including the UK, US, Greece, Bulgaria, Slovenia, Croatia and Australia.

The City of Reykjavik more recently launched a new service to boost participation through Artificial Intelligence and Virtual Reality. The service, named Active Citizen, is integrated into Your Priorities and uses new augmented interfaces combined with online and offline citizens' assemblies to unite their respective strengths. This approach increases bottom-up citizen participation and helps people make more informed decisions with less time and effort.

Free speech should consist not only of rejecting all new forms of censorship, but also in recognizing the right to anonymity and the full freedom to “seek, receive and impart information and ideas” (as per article 19 of the Universal Declaration of Human Rights).

The protection of personal data must be understood as an autonomous fundamental right

beyond the conventional right to privacy, an essential component of contemporary freedom, thus avoiding societies resting on control, surveillance, classification, and social selection. Ethical standards and legal principles should converge towards laying out the framework safeguards required to prevent a highly dangerous type of social, political, or institutional control.

9. Creating Alliances Beyond Predatory Digital Capitalism

An effective battle against the smart city agenda—at least of the pseudo-democratic, neo-liberal variety—requires clever, progressive alliances between cities, movements, and political organizations. It will require adopting a mission-oriented and long-term approach to technology policy, with ambitious public investment in future data-intensive infrastructures and welfare systems for the common good.

Cities and governments have yet to fully grasp that data lies at the heart of most power relations today. As illustrated here, a robust alternative data regime could put cities in control of critical urban infrastructures and data-driven public service delivery. A public debate has recently emerged—and could soon become much more visible—which frames digital platforms as meta-utilities, with the data and information layer integrated into physical urban infrastructures and pervading all other vertical services such as transportation, energy, construction, health care, education, and more. This is rapidly changing the way public services and infrastructures are financed, managed, and delivered, affecting the sustainability of their long-term economic models. Data, identity, and reputation are critical infrastructures of the platform economy to which citizens must reassert their claim.

The major corporations of Silicon Valley run on a model that turns data into a new asset class—a commodity to be sold and traded on financial markets, with new property regimes emerging in order to ensure the ongoing marketization of data. Only a handful of US-based corporations (“GAFA”—Google, Apple, Facebook, Amazon) have the capacity to aggregate, mine, and analyze a vast amount of data while running sophisticated machine learning programs and predictive models to exploit artificial intelligence in order to deliver personalized and added value services—a model so accurately described as “surveillance capitalism.”

In this context, cities should have the right to own their data, control critical infrastructures (software, hardware, datacentres), and develop their own artificial intelligence and machine learning capacities. Such steps ought to allow them to follow a pathway towards technological sovereignty. This digital transformation will in turn determine the future of the economy and urban services: From driverless cars to deep learning and personalized care in the healthcare sector, or on-demand tourism platforms and smart energy grids.

The challenge is to move from surveillance capitalism to a system capable of socializing data and experimenting with new forms of cooper-

ativism and democratic social innovation to rethink future welfare and sustainable economic models for our cities. This transition could begin by running regular small-scale pilots and experimentations, before scaling—at the city level—projects which actually deliver value to residents, while discarding those which do not. Suitable areas for such experiments include services built on data commons, initiatives around basic income, complementary currency and remunicipalized distributed energy or water infrastructures.

Cities cannot succeed in isolation: They must build solidarity networks and alliances between cities, movements, progressive political parties, and governments to ensure that all data produced by platforms, devices, sensors, and software does not get locked down in corporate silos, but rather is made available for public and socially-driven uses. Cities, for instance, should be able to run distributed common data infra-

structures on their own, with systems intrinsically respectful of data protection, privacy, and sovereignty of citizens. They should then invite local companies, cooperatives, civil society organizations, and tech entrepreneurs to offer innovative services on top that function based on principles of solidarity and respect for workers' rights, as well as labor, environmental, and gender standards.

The current predatory paradigm is not the only solution. This paper shows how cities are promoting well-targeted pragmatic interventions to harness the technology-driven transformation, improving our society and general welfare for the collective benefit of all. Alternative forms of public and common ownership for data-intensive algorithmic platforms and services will help to create a more democratic and cooperative economy with new rights for workers and citizens, transcending the logic of short-termism, speculation, and rent extraction.

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