BEYOND THE SMART CITY

TOWARDS NON-NEOLIBERAL ALTERNATIVES

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Introduction

Any modern effort to update *Keywords*, Raymond Williams' classic vocabulary of the terms that define the cultural contours of the present, should reserve a prominent place for "smart" – that quintessential adjective of our digital era that has come to promise so much and deliver so little. "Smart" is everywhere these days, from "smart toothbrushes" to "smart growth" to "smart homes," seeking to capture a rapidly expanding, yet still 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" – all of them positive, bright terms that hint at emancipation, promise sustainability, assure us that no waste is left behind. And who could possibly be against any of that?

"The smart city" is, surely, one of the most visible "smart" concepts that have conquered public imagination in the last decade. It's 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 that surely accounts for the rapid uptake and proliferation of this buzzword amongst the professional elites. What, to some, refers primarily to the judicious and ecologically-friendly use of city resources, to others signifies the deployment of clever, real-time contraptions – cue smart traffic lights, installed in Rotterdam, that privilege bicyclists over drivers in rainy weather[1] – that promise a hassle-free urban experience, 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 a fair amount of criticism. Its critics are not numerous but they are vocal nonetheless, attacking the utopian visions behind the smart city for their unrealistic abstractions, their lack of connection to the problems of real people living in the real world, their technocratic quest for domination of our everyday urban existence (this time by means of sensors rather than zoning requirements), their almost pornographic obsession with surveillance and control, their inability to think in ways that put citizens – rather than firms or planners – at the center of the development process[3].

It's, perhaps, a testament to the intellectual force and clarity of this critique that many technology companies already hesitate to associate their products and services that, just five years ago, would be uncontroversially presented as part of the "smart city" package with that brand. Google, which

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[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.

[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, Richard. "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.

has recently entered the field, shies away from this term altogether, with the head of its city unit explicitly saying 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 many previous campaigns against the excesses of technocratic urbanism led by the likes of Jane Jacobs. Yet, most of these critiques fail to recognize that cities are also motors of capitalist accumulation; that they are economic actors as well as social ones; and that most processes happening in cities are propelled by economic and political forces that have been in the making for a very long time – certainly before many of the current players of 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 Fordist-Keynesian compromise of the postwar era to the highly entrepreneurial and financialized urbanism that arose 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 – should begin by investigating how it fits into the broader set of neoliberal precepts that have constrained the autonomy of cities, along with the kinds of political and economic choices that they have been making over the course of the last thirty years.

Unfortunately, most critiques of the smart city offer very few reflections on the geopolitics of the smart city agenda – another serious oversight. How, for example, could we explain the appearance of "smart cities" – listed right next to TTIP and "Digital Single Market" – on the official policy priority list of the US Department of Commerce's Mission to Europe[6]? And what are we to make of the fact that giant technology firms from Germany, China, and the US find themselves pitted against each other – with political leaders of all three countries helping to mediate the conflict – in a market like India, which has promised to raise one trillion dollars to develop over a hundred of smart cities in the next few years?

The present essay aims to address some of the above-mentioned gaps by investigating the connections between the digital infrastructures – i.e. sensors, screens, algorithms, routers, mobile phones, cameras, and many other ingredients that put "smart" into the "smart city" – that have recently reshaped the technological landscape of cities and the political and economic programs that cities have embarked upon – or might embark upon soon.

The essay makes no strong causal claims about how technological infrastructures and political agendas interact: we take it for granted that they affect each other in numerous, overlapping, and

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[4] Interview with Dan Doctoroff, https://charlierose.com/videos/25929

[5] For some 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 perspective." *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

mutualy constitutive ways, providing observers no easy way to deduce and postulate linear, direct, soundbyte-friendly effects between the two. That said, it does seem to be the case that technological infrastructures configured in a fashion more congruent with the dogmas of neoliberalism – e.g. that treat data gathered in the city as a commodity to be bought and sold in secondary markets, that delegate a greater share of public transportation to firms like Uber and permit a more hands-off approach to the likes of Airbnb – will make it rather hard for cities to experiment with non-neoliberal political and economic agendas. Fortunately, the converse is true as well: technological infrastructures designed on principles that depart from the key tenets of neoliberalism (e.g. privatization, the celebration of entrepreneurship above all other forms social and economic activity, the rejection of social justice as a legitimate goal of public policy, etc) will help amplify and consolidate the efforts of cities that seek to depart from the neoliberal model in non-technological areas.

As already noted, the term "smart," capacious as it is, enjoys tremendous semiotic flexibility. For example, as charges of technocracy and accountability appeared on the horizon, the smart city industry wasted no time in championing the needs of "smart citizens" and emphasized the need to promote "smart participation" (which, needless to say, proved easy to reconcile with the rest of the neoliberal package). Hence, we also take a rather flexible approach to defining the subject matter.

In the context of this essay, "smart" refers to any advanced technology, deployed in cities, with a view of optimizing the use of resources, producing new resources, changing the behavior of users, and promising many other types of gains: e.g. in flexibility, security, sustainability. These gains occur primarily thanks to feedback loops inherent in the deployment and use of intelligent devices that feature connectivity, sensors, and/or screens.

Such a capacious definition permits 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 – that would not otherwise be present alongside the numerous self-described "smart city" products and solutions offered by the likes of Cisco or IBM.

There's no point in building a non-neoliberal smart city that is liberated from the likes of Cisco and IBM only to find that it has already surrendred to the likes of Google and Uber. Obviously, what is opposed here is not some interpretation of "smartness" but, rather, its political and economic consequences; those, 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" part of the "smart city" concept has so far attracted far less attention than the "smart" part but it seems equally important to approach with a critical mindset. After all, cities have always occupied a particularly important place in the neoliberal imagination. The work of Edward Glaeser, backed by the Manhattan Institute, a prominent conservative think-tank, is a case in point; in Glaeser's work, as Jamie Peck has pointed out in his extensive recent critique[7], urbanism just becomes yet another tool to rationalize the superiority of the market form to all others, whatever minimum concessions Glaeser might make to acknowledge global warming or income

[7] Peck, Jamie. "Economic Rationality Meets Celebrity Urbanology: Exploring Edward Glaeser's City." *International Journal of Urban and Regional Research* (2016).

inequality. Likewise, many libertarians warm up to the idea of the "voluntary city,"[8] where all key services, from emergency assistance to schooling to police, are provided by the market (or, the second best option, by "civil society") and regulated by private contracting, has long dominated the urban agenda. In this case, concepts like "the voluntary city" are regularly brought up to show that even though neoliberal dogmas might not work in theory, they do actually work in practice.

In other words, what holds such a capacious and ambiguous term together might actually be its "city" part, not its "smart" part: in as much 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 might 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 is in full evidence once one notices that its history is usually allocated just a few 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 any politics and accounts of contestation, such narratives inevitably celebrate 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 the technology- and information-driven evolution of cities, their growth and ubiquity being checked by the rate of civilization's inventiveness rather than any external political or economic factors. The previous instantiations of this very idea – the media city, the information city, the telematic city, the city of bits – almost never get a mention. In the rare cases that they do, it's mostly to signal the inability of those earlier terms to live up – technologically so – to the utopian visions invested in them. No context is usually provided for the sudden irruption of "smart" as the moniker du jour, as if this idea just dropped from the sky and immediately found like-minded allies in city after city.

Academics who did look into the genealogy of the term point out that its origins – and the phenomenal reception it has had across the gtlobe – are to be found in the reorientation of giants firms like IBM away from their traditional business model of selling hardware and software to selling services, including consulting[10]. As IBM embarked upon its "smarter planet" strategy, seeking to orient itself towards various optimization needs of the private and public sectors alike (eventually culminating in the production of yet another buzzword "cognitive computing," of which

[8] E.g. Beito, David T., Peter Gordon, and Alexander Tabarrok. *The voluntary city: choice, community, and civil society*. University of Michigan Press, 2002 and Goldsmith, Stephen. *Putting faith in neighborhoods: Making cities work through grassroots citizenship*. Hudson Institute, 2002.
[9] Söderström, Ola, Till Paasche, and Francisco Klauser. "Smart cities as corporate storytelling." *City* 18.3 (2014): 307-320.
[10] E.g. 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.

IBM Watson is supposed to be the king), it was lucky to have stumbled upon the term "smart" in relation to cities, putting into wider circulation in the business community[11] (initially, it even trademarked the term "smarter cities" but eventually settled on "smart cities" instead).

The many predecessors that emphasized the ecological rather than 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 on emissions and energy costs was one of the primary drivers that pushed cities to start experimenting with smart technologies and keeps being the factor that helps to humanize the corporate smart city agenda: in the absence of other immediately available and affordable ways to fight climate change, cities will keep on reaching for corporate digital solutions – and to oppose, in any meaningful way, this process would also mean to risk drawing the ire of environmentalists.

From the perspective of cities, the motivation for 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 some ambitious and universally accepted political goals: to promote political participation amongst ordinary citizens; to help personalize public services and de-bureaucratize national and local governments; to create a more enjoyable and less discriminatory urban environment that would stimulate economic growth, reduce tension, promote creativity and serendipitous discovery.

Box 1. The "smart city" market & related technologies

According to major business consultancies, the smart city market is estimated to reach $3 trillion by 2025 and exceed 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 making up the "smart city"). Below are some of the examples of key "smart city" products offered by the multinationals that are shaping this market.

Siemens: *Infrastructure Business & Asset Analytic Services for Predictive Maintenance*
Simens' smart business model as system integrator focuses on "building integrated intelligence into infrastructures", and, in particular, on leveraging smart asset management, smart grids and building management systems. 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 is also focused on promoting Industry 4.0 models for manufacturing, advising on transformation roadmap for companies to digitize their factories.

IBM: *Intelligent Operations Center for Public Safety and Law Enforcement*
IBM has promoted its "smarter planet" strategy to centralise the analysis of the interconnected information coming from cities and embedded in systems and infrastructures to better control operations, grab and optimize the use of resources. In support of this vision IBM has established an Intelligent Operations Center (IOC) that enables the optimization of critical information stored in disparate systems across multiple departments for the benefit of the city's population, economy, and greater ecosystem. For example, the IOC has been implemented in Rio de Janeiro, Brazil in 2010, focusing on flood prevention and transport management; in Miami to manage the footbal stadium

[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.

operations, to facilitate data-driven decision making, and predict crowd problems to minimize the impact of disruption. IBM solutions focused on law enforcement solutions, predictive policing, and crime prevention, leading to the establishment of "Intelligent Law Enforcement Centers" and "Real Time Crime Centers". For instance, in Atlanta and Chicago, IBM uses facial recognition, advanced video monitoring and other and pervasive surveillance technologies to provide accurate information to offcers that would allow them to discover 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 implemneted Cisco systems that integrate data from a variety sensors, solutions, applications, platforms and analytics to manage urban services. For instance, Cisco's Command and Control Center has been already implemented in Dubai, Kansas City, MO in the US, Adelaide in Australia, Hamburg in Germany, and Bangalore in India to manage a variety of urban services in different sectors such as energy, e-government, logistics. Cisco is promoting latest Internet of Things platforms such as their fog computing solution capable of gathering, processing, and conducting analysis at the edge of a network, where it can be acted upon more immediately.

Phillips: *Smart connected LED lighting*

Phillip's entered the smart city market through the development of connected LED lighting solutions for cities, promising energy efficiency and savings in maintenance costs, combined with intelligent lighting control systems, and sensors that target security and safety in public spaces, inside buildings and at home. Its CityTouch city lighting management system and control platform also proposes a new model for city's infrastructure investment, where new lighting functionalities can be continously 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 a 'Pay per lux' model, an intermediary platform than treats products as resource banks, facilitating resource management between manufacturer, supplier and end-user. Examples have beeen implemented by the City of Buenos Aires, Los Angeles, Holbaek in Denmark, and Tenerife in Spain amongst others.

The second type of motivation, that of the pragmatic variety, spans a much wider and far 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 at a time of budget cuts and severe austerity. Others desire them because they want more security and policing, especially on the eve or during the so-called mega events like the Olympics, which have come to provide an economic lifeline to many cities that had 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 to exercise targeted, effective controls over areas that were previously hard to reach and govern. Combined with ever-improving drones and a new generation of policing robots, smart technologies breed a context of heavily militarized urbanism that was previously reserved to hotspots like Fallujah[12].

Box 2. Smart Cities and Surveillance

One of the most high-profile uses of the smart city technology remains IBM's Operations Room in Rio de Janeiro, which received a lion's share of media attention, especially in the run-up to the World Cup of 2014. Much of the value added of technologies like IBM's resides in system integration: they take existing data feeds coming from municipal departments and private suppliers and integrate them into an easily manageable and highly visible interface that promise 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 rather mundane and administrative nature: the amount of rainfall, the state of garbage collection, the congestion level. However, a high-level of system integration, especially 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 that were 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 offers "public safety and justice solutions" and targets specifically municipal police departments with its products and services. CityNext also includes several products that 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 wide criticism from scholars of criminology (e.g. predictive policing often reinforce existing social inequalities as it feeds on biased data) but these shortcomings often fade from view as such programs are rebranded and sold as part of a broader "smart city" package.

Finally, some cities opt for smart technologies because they promise to pragmatically resolve a problem that might be specific to that particular city: congestion caused by crumbling road infrastructure and lack of repairs; lack of jobs that, with some luck, can disappear as smart money follows smart citizens into the smart & creative urban districts; the ineffective garbage disposal system that clogs the streets and infuriates many citizens who are frustrated that garbage trucks have excessive capacity when there's little garbage and always seem to be overstretched when the need for them is the greatest. Real-time, immediate feedback loops, with the capacity to learn and listen and adjust, all occurring thanks to celever sensors inserted into "smart trashcans" that could tell passing trucks if they need to be emptied: has there been a clever solution to the problem of garbage disposal?

[12] Graham, Stephen. *Cities under siege: The new military urbanism*. Verso Books, 2011.

Box 3. Smart Cities Beyond the Global North

In contrast to Western Europe, North America, and parts of South America, where the discourse around smart cities revolves, primarily, around infrastructural improvements to existing cities, in Asia – and especially in India and, to a lesser extent, China – there are numerous examples of "smart cities" that are being built from scratch. Thus, whereas in the Global North the dominant discourse around smart cities 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, the formalization of the previously informal industries and services, and often overlaps with discourses of financial inclusion/entrepreneurship (as is the case in India) and ecology/sustainability (as is the case 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 that can now be reactivated with 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 lot of interest amongst consultants and triggered a lot of interest 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 like 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 of making India more attractive to foreign capital, even if that also entails greater inequality, deregulation (especially in the interest of designating some of those cities as special economic zones), discrimination, and the misappropriation of public funds to cater to the needs and interests of the well-off elites who are more 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), so the shock value of 100+ smart cities delivered in just a few years is not what one would have expected.

2. Smartness and Neoliberalism

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

First of all, if neoliberalism – as many scholars have argued over the years – is marked by the transition from a rule enacted by centralized government to a rule underpinned by decentralized governance, then one must also account for the precise mechanisms – and their technological enablers – of this newer, softer, less obvious way of ruling. One such mechanism identified in the burgeoning literature on neoliberalism in general[13] and in the somewhat smaller literature on

[13] E.g. Giannone, Diego. "Neoliberalization by Evaluation: Explaining the Making of Neoliberal Evaluative State." Partecipazione e conflitto 9.2 (2016): 495-516.

neoliberalism and cities[14] is the growing importance of various rankings, competitive tables, and comparative scores. While rankings of city debt by credit agencies like Moody's or Standard & Poor are at the root of this trend, with cities vying for a favorable rating, which determines their costs of borrowing, today this function is also exercised by various rankings – of innovation, creativity, even smartness itself – compiled by the newly formed urban-philantrocapitalist complex of think-tanks, foundations, and supposedly neutral NGOs, which set the broader constraints and parameters on which cities must compete.

How cities perform on those secondary indicators, in turn, feeds into how investors view their competitiveness, which, ultimately, feeds into the ratings given by credit agencies, thus affecting what it costs them to borrow. And borrow most of them must given their budgets have been shrunk by national governments; the worsening economic conditions in many of them – most visible, above all, in the looming pension crises of public sector employees – puts additional strain on their budgets. As a result, a city need not harbour any strong, rational desire to be smart in order to embark on a smart city agenda of some kind: to do otherwise would be to risk one's standing in the international bond markets.

Related to this is the pressure, also experienced by many cities, to quantity 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 its "logic of discipline,"[15] depending on one's theoretical predilections. While this drive to quantification – of which cities like Boston, with their own "city score," are clearly in the avant-guard – is rarely linked to the smart city phenomenon, at least not in the popular discourse, it's obvious that the ranking-of-everything mentality that it rests upon is only possible in a city capable of hoovering in, analyzing, and processing vast amounts of data. Thus, willingly or not, the smart city agenda, along with the infrastructure of sensors and connectivity that it promotes, also opens the doors to the kind of audit-obsessed quantification beloved by neoliberalism.

An analytical lens well-trained on the methods, techniques, and aspirations of neoliberalism can help us uncover several other dimensions to the smart city problematique that usually escape those analyzing it from a purely technical angle. In the last three decades, as the logic of corporatism and embedded liberalism that dominated the political landscape of Western Europe and North America gave way to the logic of highly globalized and liquid capital that elevates 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 subject to immense pressure to both roll-back some of the institutions of the welfare state and roll-out some policy innovations of their own[16].

Two of such processes are of particular importance to us here: the delegation and contracting out of responsibilities previously reserved to public institutions to private players and the enrolment of

[14] E.g. 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.
[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] Peck, Jamie, and Adam Tickell. "Neoliberalizing space." *Antipode* 34.3 (2002): 380-404.

private financial capital – mostly coming from pension funds, insurance firms, various alternative asset management funds – into the management, maintenance, and construction of infrastructure, most of it operating at a local level. Both have significant, if under-explored, connections to the smart city agenda, since both require an extensive infrastructure of gathering, analyzing, and acting upon data to succeed and proliferate.

The contracting-out can, of course, be described as a further privatization of public services and such a description would be entirely correct. While the exact service providers and the distribution of responsibility between them and public institutions vary from country to country, one can, nonetheless, point out several similarities. First, much of this contracting-out is facilitated by the so-called Big Four accounting and consulting firms, many of which are now also doubling as technology providers, rapidly investing in technologies like blockchain and Big Data.

Some of them talk of the "solutions economy" (Deloitte) while others promise us the "outcome economy" (Accenture). The end result, though, is the same: this model rests on the commodification of solutions to social and political problems, the enrollment of actors (like banks and other financial institutions) that would traditionally not be part of the "solution," and the heavy deployment of data analytics and measurement to assess whether the specific target or outcome is being delivered, with timely interventions to steer the process towards those outcomes. None of this would be possible without an extensive infrastructure for tracking and controlling both physical and human resources, with quantification of performance opening the way to all sorts of other, even more advanced experiments, being built on top.

The rapid proliferation of social impact bonds can illustrate the operative logic of this hybrid solutions/outcome economy at play here. Such bonds are issued by governments as they delegate responsibility for a particular sector – like prisons or schools – to a financial firm like Goldman Sachs. The latter promises to meet a particular target of repeated offenses in the case of prisons or literary in the case of schools – and gets paid for its services only if that target is met. To encourage financial firms to participate in such endeavors, their risks are often underwritten by foundations, who, caught up in their own philantrocapitalist bliss, would like to see the social sector to become subservient to the logic of financialization.

The practice is extremely controversial and several such experiments have failed but it 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 – hence perpetual surveillance, coupled with nudging and other forms of producing desired behavior, and, should that monitoring capacity not suffice, it would be advantageous to have the means to produce statistics so obscure and impenetrable that the operating entity – in this case, Goldman Sachs – can claim that it has, actually, met its target and should be paid the amount due to it (as regularly happens at the end of 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 on a regular basis by the private service providers.

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

While often situated on the periphery of the smart city discourse, a set of players that are neither municipalities nor technology firms have been excercising a considerable amount of influence on setting the tone to the discussions, supporting continued media coverage of smart cities, and creating a panoply of rankings of various dimensions of "smartness" to get cities competing with each other. Not all of these players have an explicit interest in smart cities; some have been attracted to it indirectly, by pursuing some other policy objective ("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 big-name consulting firms, sensing that there'd be lucrative opportunities in the continued restructuring of municipalities, have established their own departments and institutes to deal with problems of the city. Numerous high-profile conferences and expos – which typically combine product demonstrations with conference sessions aimed to fill the somewhat empty subject of the "smart city" with content – have also sprang up, first in Europe and North America, but are increasingly spreading across Latin America and Asia. To the extent that the smart city discourse is hegemonic in discussions of the problems facing modern cities, it's these intermediary institutions, from foundations to expos to consulting firms, that are responsible for giving the discussion a particular neoliberal bent.

The enrollment of financial capital into the provision of infrastructure operates on a rather similar logic. Most players in this industry, 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, the idea is to make a big enough speculative gain and exit within a decade (even if the speculative gain is not large enough, this is hardly a problem, as most such firms earn their money from transaction and management fees, which are independent of returns).

The obvious downside of this model is the chronic underinvestment into long-term facilities and planning of the infrastructure in question: when investors have a short-term perspective, they are not motivated to undertake expensive infrastructural updates. But this is only part of the problem as, in their pursuit of short-term monetary gains, these investors also do their best to extract as much value as they can from the asset under management in the short period of time that they own it, thus, often degrading it much faster than a longer-term operator or owner would. In the industry parlance, this is known as "sweating the asset" – a most ordinary practice for investors in infrastructure.

This happens in several ways. One is to charge the users of that infrastructure the maximum that they can bear; with infrastructure, this is usually a rather high number, as, almost by definition, we are talking about goods and assets that are scarce and do not have easy alternatives. Another one is to use the assets more heavily, making sure that they never lie dormant, increasing capacity utilization almost to the maximum. It might have been hard to pull of thirty or twenty years ago but today, with sensors and ubiquitous capability, finding alternative users for the dormant infrastructure is as easy as finding tenants for an empty apartment on Airbnb.

"Sweating the asset," in other words, presupposes the very same smart infrastructure of sensors, connectivity, and basic computing as the outcome/solutions economy: neoliberal techniques look far less effective in the absence of the technological infrastructure to activate 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 to the advancement of this model: as long as differentiated pricing remains the best way to maximize one's revenue stream from an asset, one can be assured that sensors – including vary advanced biometric sensors that can identify us and link our face to our social media accounts – will keep invading 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 exercises: one can, of course, keep hoping that all these sensors and routers will be deployed to humanize and personalize national and local bureaucracy – but that seems like a rather naïve aspiration, given that bureaucracy itself is being increasingly taken out of the government itself. And, once privatized, this humanizing rationale disappears as if it never existed: a privatized toll road – the quintessential example of smart infrastructure built to "sweat the asset" – has no need for humanism.

Box 5: Emergence of Infrastructure as an Alternative Asset Class

Stagnant global economy and the low interest rate environment it has spawned are responsible for a growing interest that many investors, from pension funds to boutique asset management firms, show towards infrastructure. As one of the 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 – very appealing to investors: it offers a stable, long-term return, well-protected from inflation or swings in the economy. Infrastructural investments are generally of two types -- "greenfield" (where the infrastructures in question need to be built from scratch, yielding higher risks but also higher payoffs) and "brownfield" (which refer to investments in already existing infrastructures, sparing investors the higher risks associated with construction but also lowering the expected payoffs). Both types usually involve governments and municipalities as much infrastructure is financed through public-private partnerships, whereby the local authorities might grant private operators concessions to operate certain infrastructures in exchange for a significant upfront payment calculated against expected returns. Such model 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 they of the resource they consume or, say, on their ability to pay for it). The ubiquity of "smart" and always-on sensory infrastructures allows to pursue both of these strategies at once: costs can be minimized and completely pushed to the users while the ability to recognize the user and link any act of consumption with their entire life history allows to settle on a price that the user is unlikely to resist. 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. To some extent, the same applies to real-estate, where the ability to retrofit buildings with sensors and engage in sophisticated forms of asset management is supposed to add value to the property in question.

Surprisingly so, most traditional accounts of the rise of the smart city ideology downplay – if they mention it at all – the role of the most powerful sector in our cities, that of real estate and construction companies. In a way, their interest in "smartness" is alike to that of investors in infrastructure: sensors and connectivity allow for more hands-on management of their resources, including buildings, whose structural faults, problems, and inefficiencies 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, one can start marketing entire "smart districts," accelerating the process of gentrification and driving up the rents even further – especially if one could also demonstrate that the area is beloved by local entrepreneurs and startups. Tellingly, Richard Florida, the proselytizer-in-chief of the 'creative class' and the requisite 'startup 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."

In addition, the proliferation of secondary data about tenants permits to screen them more effectively, thus reducing the risks of delayed payments and any other costs associated with problematic tenants. Not surprisingly, several startups already offer such screening services, promising landlords and real estate firms to create risk profiles of potential tenants based on careful analysis of their various online activities. In this instance, the logic of the gated community is not only applied to the outside but is also increasingly applied within: credit scores and reference letters no longer suffice, one has to 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 advanced by neoliberalism.

Box 6: Financialization of Infrastructure: the Brazil Example

Innovative financing tools and strategies have been tried in Latin America during the last decade. The strategies consisted in raising large amounts of public funding to pay for infrastructure projects spearheaded by estate developers. In Brazil, it soon became widespread practice. The model is as follows: The Bank of Brazil issues bonds to be sold to developers at auction 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 extra density in the area. The revenue from the bond sales is invested back into housing, roads and other infrastructure in the same redevelopment zone. Cities have been using these startegies to unlock the value of land for private investors, while capture some of this value back.

CEPACs were widely traded and became a solid investment vehicle for pension funds and real estates. This resulted in huge increase in land price and gentrification processes that slowly expelled the local population from their neighborhoods. Overall, CEPACs have led to large public spending, favouring large iconic infrastructure investments that bring big corporate returns, rather than prioritizing social policies, public services (such as transport and affordable housing) and real urban and development needs.

[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/

3. Cities of Privatized Keynsianism

Despite the incessant celebration of cities as the most important actors of the global system, with celebrity mayors rising to rule the world and soon, perhaps, the universe, the reality looks somewhat different. Contemporary cities are not isolated entities and much of what passes in them is still very much determined by transformations happening at the national and global scales. Armed with useful concepts like "urban entrepreneurialism" or "austerity urbanism" – and both are linked to the rise of the neoliberal ideology worldwide – one might be tempted to think that, somehow, we are dealing with purely locally driven processes, which are, perhaps, just logical consequences of local technocrats imbibing neoliberal ideology and embarking on transforming their cities in accordance with the neoliberal templates. This, however, is too simplistic of a picture that treats neoliberalism simply as a bunch 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-the-process, not just neoliberalism-the-ideology – that make such ideas and prescriptions either more or less likely to stick around and gain currency.

In practical terms, the appeal of quick technological fixes to city bureaucrats cannot be explained merely by their ideological confusion or technocratic faith, for there are actual structural factors that have made the enrollment of technology firms in the business of running the city as well as generating income for some of its inhabitants such an appealing choice to many city administrations. Understanding such structural factors should, at minimum, make us aware that articulating and executing a vision for a truly non-neoliberal smart city is much harder than it seems at first sight, for it's not just a matter of building different technologies or alternative property regimes around data generated in the city. Those are necessary but not sufficient conditions.

To understand the scale of the challenge facing the project of building non-neoliberal cities, one must come to grips with the fact that technology firms, many of them from Silicon Valley, operate a fully privatized shadow welfare state that runs in parallel to the actual, rapidly shrinking welfare states of many OECD countries. The presence of this privatized welfare state is most visible in America – where the core functions of the actual welfare state, like healthcare – have traditionally been delegated to private providers, with the government picking up some of the bills – but this model is also likely to spread to the cast-strapped European cities.

There are two sides to this regime of privatized welfare: one draws on advanced technology to produce significant savings to consumers, thus masking their rapidly falling real incomes, and one 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 – if one is lucky enough to have it – into a permanent hotel that can also double as an ATM.

Before reflecting on this model in detail, one has to mention that, even though most critical economists and sociologists are still unaware of it, Silicon Valley does constitute the latest frontier of what Colin Crouch calls "privatized Keynesianism" and what Robert Brenner and Monica Prasad

dub "asset bubble Keynesianism" and "mortgage Keynesianism" respectively[19]. Even though they disagree on some historical details, Crouch, Brenner, and Prasad agree that the prosperity-generating functions that, under Keynesianism, were reserved for the welfare state and the regime of stable Fordist employment, have found their match in highly speculative and consumption-fueled regime that seeks to replace whatever income we used to derive from stable employment with income generated from investment into houses and other speculative assets.

One key element that their analysis misses is that this push to drive up value of assets to make people feel wealthy – and some did become wealthy by selling property at the right time – was also matched with a particular attitude towards antitrust that allowed more monopolies to form, achieve economies of scale and tap into labor markets in the developing world, thus offering many of their products at extremely low costs. This is what has come to be known as the Walmart Effect: people's real incomes were falling but they were falling slower than the prices at Walmart, 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, we have firms like Uber, which, from the perspective of the passenger, manage to leverage advanced technology in our smartphones to offer extremely low rates. This is achieved, in part, through better capacity utilization thanks to sensors; much like with infrastructural investors, Uber excels at "sweating the asset" – its executives frequently talk about their dream of creating a "perpetual ride" – so that the magic of big data and algorithms can produce such an intricate and complex pick-up schedule that the Uber car will never stand idle, fetching customers whenever 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 take short-term losses by offering low rates in order to destroy all competition. Customers, as long as they are promised low rates, do not seem to mind.

Uber drivers, too, have something to gain in an environment where stable jobs are hard to come by. Of course, the system has many flaws and exploitative practices, carefully documented in many studies of actual Uber drivers. But the fact remains that Uber is a system that allows a small percentage of population to make some cash when their regular jobs no longer deliver or even exist. Even such a limited idyll is not likely to last forever, as Uber itself has indicated that it would like to switch to fully automated cars that it is already testing in select US cities. Drivers won't be happy but for passengers it will be another occasion to celebrate: the rides will become even cheaper.

Given this projection of ever-falling transportation costs, one can see how cash-strapped cities are beginning to seriously consider contracting out their public transit to the likes of Uber, especially in the United States. Small 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 – an option that is deemed preferable (and cheaper) than investing into new bus lanes, trains, or any other form of public transportation. Uber, thus, is zoning in on the most lucrative sector – rides

[19] 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." (2009). Prasad, Monica. *The land of too much: American abundance and the paradox of poverty*. Harvard University Press, 2012.

guaranteed by government – essentially becoming part of the privatized public transportation system in the United States.

Airbnb, too, can be read along these lines. For decades now, national governments, under the influence of neoliberal thinking, have been preaching the values of homeownership ideology: renting was bad, so was communal, publicly owned housing[20]. The real wealth, governments assured, is come from investments into privately owned housing. Such a stance was a good fit with the overall neoliberal transformation of society, as it helped to unhinge the loyalty of workers from previous institutions of solidarity and support – e.g. trade unions – and instead hinge it upon the performance of stock markets and central banks. Workers were to be reinvented as entrepreneurs, who were meant to borrow against future earnings, and invest in real-estate[21].

Airbnb stretches that logic to its ultimate conclusion in allowing to generate short-term rents on one's property. In an environment where stable and well-paying jobs are hard to come by, Airbnb does become a potent vehicle for earning some income to supplement what one earns on the side. This is not a coincidence – this is 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 "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 a host.

If the likes of Uber and Airbnb are, indeed, logical consequences of "privatized Keynesianism" rather than its aberrations, then non-neoliberal cities that would like to take on these firms find themselves in a double bind. On the one hand, to challenge these firms upfront is to immediately alienate one's citizens against the city: regulating or banning Airbnb and Uber, as experiences of many cities shows, results in massive discontent by their users, who have come to rely on these firms to make or save cash. On the other hand, to do nothing about these firms is to alienate those who are not direct beneficiaries of privatized Keynesianism – ever or anymore: think of renters who see their neighborhoods gentrify and their rents skyrocket as Airbnb-loving tourists invade them or think of drivers who will be made obso lete due to self-driving cars or just think of aging customers, without credit cards or smartphones, that could use a public bus but cannot use Uber.

The only solution that seems plausible in this case is to tacitly accept that cities cannot reverse decades of policies at the national and global level – much of it pushed by the unaccountable central banks – and thus are 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's no reason why cities should 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 differentiating those professional real estate developers who operate multiple properties but pass for ordinary users on Airbnb, thus enjoying many advantages and accelerating gentrification. Since the likes of Airbnb do not want to share data that would allow

[20] For a good summary, see Aalbers, Manuel B. *The financialization of housing: A political economy approach*. Routledge, 2016.
[21] Payne, Christopher. *The Consumer, Credit and Neoliberalism: Governing the Modern Economy*. Vol. 152. Routledge, 2012.

for effective control of such behavior, the only long-term solution for cities here would be to think of running their own platforms that they actually control.

Box 7: Mobilization of Users by Uber, Airbnb, Facebook Against Prospective Regulation
One of the most provocative consequences of privatized Keynesianism has been the alignment of interests of consumer-entrepreneurs (who might be putting their apartments on AirBnb or using Uber, as a driver or a passenger) with those of monopoly platforms (like AirBnb or Uber). This has created an environment, where users have come to believe (not entirely unreasonable) that any attempts to regulate these services by municipal or national authorities are likely to result in higher prices/fees (or lower pages in the case of Uber drivers) that will eventually be passed on to the users. While similar arguments could be made by most consumer companies, the case of firms like Airbnb and Uber is quite special: thanks to their immense power to mobilize users via their own apps and emails, they can rally up support against regulation relatively quickly. This is what happened when New York City tried to regulate Uber, for example the company added a "DeBlasio" Uber tab on its app, with all the cabs disappearing once the user clicks on it. Users were also encouraged to email the city's administration and complain. Facebook has engaged in similar practices when the Indian authorities were mulling whether to block its "Free Basics" program. Airbnb, while not deploying any technical gimmicks yet, is nonetheless organizing its fans into a worldwide movement with an explicit political agenda; that movement is always there, ready to be mobilized when Airbnb needs it. While some legal scholars have floated the idea of treating tech firms as "information fiduciaries" with a set of well-prescribed duties that would preclude them from abusing their reach to advocate for their own causes, it's not clear how well this approach would work outside of the United States. For now, cities should probably be prepared to be outwitted in their nascent battles to rein in these platforms; a clever publicity and communications strategy is essential for winning these battles.

4. Smart Austerity

It would be a mistake to think that it's only Uber and Airbnb that have found a way to profit from the stagnating global economy. Many other firms – including giants like Google – are busy entering cities, pitching various products, from free wifi (in exchange, of course, for our data) to sensor-based apps that can 'solve' the parking problem and thus relieve us of both stress and environmental waste. Cities find themselves in a vicious circle: the more services they contract out and the more infrastructure they privatize, the more help they need from the likes of Google in running whatever remains of the resources and assets under public control.

The real novelty here is that firms like Google that specialize in data extractivism – their model, essentially, is to harvest as much data as they can by, if necessarily, subsidizing the activities that generate it or funding them via advertising – can always position themselves as white knights keen on saving the public sector. This narrative doesn't look particularly implausible, once these tech firms position themselves next to the far more rapacious consulting firms that have pillaged city budgets by demanding cash – rather than data, as in Google's case – in exchange for their services. For cash-strapped cities that are already being

waterboarded by austerity measures, this is a much better proposition: data is something that they do not account for or measure and thus, they can easily give it away in exchange for nominally free wifi offered to their residents or advanced traffic analytics software offered to their planners.

Here cities are creating a dangerous dependency that will inevitably come to haunt them. Google does not need all this data because it helps them sell advertising; in many cases, it doesn't. It needs solely to make quick progress on its advanced artificial intelligence technologies, helping it to automate processes – from driving to image classification to trend-spotting – that currently require human input. The reason why Google's self-driving cars have made so much progress in the last decade is not because there have been some fundamental breakthroughs in computer science but, rather, because all this data harvested by the firms have allowed to revolutionize previously less effective approaches in AI like neutral nets. And whoever has the means of producing most data has the best AI, making everyone else depend on it, with AI becoming a service to be accessed on a permission-based basis.

Of course, such AI-powered services can be used to then further optimize how the city runs and operates; the problem that is the city can finally be solved. The language used by Y Combinator, a prominent startup incubator in Silicon Valley, is quite indicative of how the tech world thinks about "solving cities." As Y Combinator 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)?" We are observing the emergence of another vicious circle: the logic of privatization and austerity and the numerous problems that it triggers pushes cities into the arms of technology firms, which lure them with products deemed so essential and unique that cities embark on even more privatization, all in the name of deploying AI in the interests of cost-cutting.

This phenomenon, of course, is not unique to cities; nation states are driven by the same logic as well: one just needs to look at the speed with which the National Health Service of the United Kingdom has welcomed the advances of Deep Mind, Google's AI division, with patient data of more than four million people going through its algorithms in order to predict and fight disease. As is the case with Uber and Airbnb, it seems unfair to be blaming cities for policies that are 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 minimum amount of resources available.

Box 8: Google Sidewalk Labs: The New Kind of Urban Startup

Google's latest foray into the world of cities – a new Alphabet unit called "Sidewalk Labs" – is quite illustrative of the importance that technology companies attach to being to urban problems. As illustrative is the choice of Daniel Doctoroff – a veteran of Wall Street and a former deputy mayor of New York responsible for economic development – to lead it. While most of Sidewalk's projects so far have focused on relatively straightforward issues – free WiFi in New York (albeit featuring extensive data collection about users), attempts to automate parking and optimize traffic flow – the company has dropped some hints that its ambitions stretch much further (including the possibility of taking over an existing city or building a city of its own, where all the latest smart technologies can be

showcased. To some extent, Google is no stranger to urban issues: its maps are widely used while its purchase of the Israeli startup 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 can get access to Google's traffic data in exchange for sharing their own data about roadblocks, planned maintenance and so forth). It's hard to say to what extent Google's steps in the urban space are informed by a clear strategy and to what extent it's reacting to the steps taken by its competitors (e.g. in 2016 it launched a Waze-based ride-sharing service in the Bay Area – most probably, a response to Uber). The Sidewalk Labs team now features senior executives who previously worked on Google's smart virtual assistant, Google Now, which indicates that the company is likely to take advantage of its presence in so many smartphones as well as its immense AI capabilities in order to streamline the provision of real-time, contextual information about the city, its services, cultural events, transportation, and so on. This might have a rather adverse effect on the efforts by municipalities themselves to control the distribution and access to such information.

This connection between the logic of austerity and the smartness imperative bears some further investigation. As has been shown by several scholars, the need to survive the consequences of austerity – often by unleashing the creative and entrepreneurial potential of citizens – is regularly cited by city administrators as one of the reasons why so many hopes are pinned onto digital transformation and its promise. The starting assumption here is that citizens are not only entrepreneurs – that was the assumption of neoliberalism 1.0 – but, and here we can, perhaps, even speculate about the emergence of neoliberalism 2.0 – that they are also hackers[22], in the original sense attributed to that word in the 1970s: they are capable of doing more with less, they advanced through frugal innovation, and they can always find a way out even if their hands are tied. And tied they will be – because of austerity!

Box 9: Data Analytics & Austerity

One of the promises of the open data/big data revolution in governance has been that of making government more effective by exercising together control over its actual, previously unrecorded (and hence unknown) operations. At its heart, this agenda has also promised a certain degree of non-ideological bipartisan consensus, for what political course would object to shutting down government programs that are both ineffective and terribly expensive? The extent to which efforts in this space have managed to transcend the confines of traditional ideology remains to be seen. However, the cause of shrinking down governments by means of data analytics has attracted the interest of some conservative donors. The case of Laura and John Arnold Foundation, established by the former Enron trader and subsequent hedge fund manager, is particularly intriguing. The Arnold Foundation has received some notoriety in the United States for supporting efforts to reduce public employees' retirement benefits as well as several other neoliberal causes. In 2015, the foundation gave $7.4 million to the Government Performance Lab at Harvard University in order 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 Government Performance Lab itself has a very interesting history, growing out of Social Impact Bond Technical Assistance Lab, established with support of the Rockefeller Foundation in order to help cities embark on various neoliberal experiments of service delivery, from "pay for results" social impact bonds to results-driven contracting. Many of these experiments – and especially their uptake by local authorities – have to do with the climate of austerity, which greatly reduced the amount of funding available for local services. Under these conditions, data, sensors, and any other ways to measure, detect, and store "outcomes" become crucial components of enacting the austerity agenda.

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

Thus, it's only by giving them access to a wide panoply of digital technologies (including learning how to code) that the full entrepreneurial (or at least coping) potential of citizens can be unleashed. The Italian bureaucrat in charge of the smart city agenda in the country put it best when he said that, instead of building roads and beautifying pavements, we should just give people WiFi and they will organize and provide all those things -- and more -- on their own[23]. It's an attitude that tries to reintroduce with technology what David Cameron's government failed to introduce with the rhetoric of Big Society: the use of communitarian rhetoric to justify the offloading of even more responsibility for themselves on the shoulders of individual citizens. Besides, on this logic, unemployment in a truly smart city is recast as a personal choice rather than structural necessity: with 3D printers, social media, and Uber cars available to everyone, how else could one *not* be employed? Technology – and smart technology especially –creates a perfect alibi to the ruling elites: they've done their best to give us the infrastructure, even if fully privatized, and it's our fault for not having taken advantage of it to the fullest.

None of this is to say that, somehow, the maker movement or 3D printers cannot be repurposed to serve a different project. It's just that a commitment to serve that different project cannot limit itself *only* to the desire to use 3D printers and makerspaces differently; cities must address the challenge of austerity full-on, integrating it with alternative economic policies and doing their best to tackle the root causes of privatized Keynesianism and the austerity drive that keeping that regime alive necessitates.

Box 10: The Emergence of City Data Marketplaces

In May 2016, the city of Copenhagen, in partnerhsip with Hitachi Consulting, an emerging player in the smart city market, launched the world's first marketplace for data, City Data Exchange. The marketplace, funded by the city of Copenhagen and the Danish Capital Region, launched with 65 different data sources, some of which are only available at a fee. The goal of the project is to motivate third-party companies to develop various data-oriented solutions for problems - like congestion, pollution, home break-ins - that plague the city. The idea is that, thanks to monetization, data holders, especially those in the corporate sector, would have the incentives to collect and share important data that can improve problem-solving by other parties. One of the first initiatives in this direction of treating city data as a commodity was a data exchange between Strava, a company behind a popular add to track bike rides, and the city of Portland, which in 2014 purchased biking data from Strava in order to improve its planning process and decide where to install bike paths, etc. London is one of the other big cities currently building its own city data marketplace. The overall rationale behind such projects fits rather well with a governance philosophy that sees networks and third-parties as more effective at solving problems than public institutions themselves

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[23] Quoted in Pollio, Andrea. "Technologies of austerity urbanism: the "smart city" agenda in Italy (2011–2013)." *Urban Geography* (2016): 1-21.

5. Technological Sovereignty: A solution?

Cities do not have the keys to most of the world's problems, no matter how many more parliaments of cities and new urban agendas get launched every year. No city can match the computing power of Google or Facebook or even Uber; even a coalition of them might not have the know-how to compete with those firms. Thus, any search for a non-neoliberal smart city must begin with the acknowledgement that the political and economic models on which most of our cities run are not forged locally but nationally and globally. It's at those two higher levels that they need to be changed as well; there are good reasons to celebrate the spirit of rebel cities but it's to their own benefit to be aware of the limits of their own rebelliousness, especially if it's not matched up with coalitions of non-city actors.

That said, it just so happens that many political forces that do question many parts of the neoliberal agenda to have some influence in cities – often, much more so than nationally. While it might be nice to think about challenging the privatized Keynesianism or reverse the takeover of public infrastructure by the private equity industry in a setting that goes far beyond that of the city, it's mostly at the city level, for better or worse, that such struggles are likely to be waged.

So what can cities do? First of all, it's paramount that they manage to preserve their ability to make independent, consequential policy and decide on their own fate. That ability is increasingly under threat due to the proliferation of both bilaterial and multilateral trade agreements between states that considerably limit the ability of governments on all levels, from national to local, 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 (if that ever comes to pass, with the Trump administration at the helm of the US policy) would be precisely to make it next to impossible for cities to remunicipilize key infrastructure – a provision that will surely affect their ability to think outside the corporate "smart" box, invent alternative data ownership regimes, or ban Airbnb from favoring the interests of property speculators as opposed to ordinary citizens.

In other words, in a world where the likes of TTIP and TPP shape the political and economic context, a non-neoliberal city does not exist. And while it's heartening that cities like Barcelona have several times voted against TTIP, the impact of such votes is mostly symbolic: it's the kind of rebellion that yields few results. If the parliaments of cities – along with all the other international frameworks set up to bring cities together – really have any teeth, they should be able to also affect the outcome of negotiations over such treaties.

Cities also need a new vocabulary and a new conceptual apparatus to reassess their relationship to technology, data, and infrastructures. When data, sensors, and algorithms – the chief ingredients of the "smartness" on offer by neoliberalism – mediate the provision of services in many other domains, from utilities to transport and from education to health, it's obvious that we are not just talking about infrastructure, we are talking about some kind of meta-utility – composed of those very sensors and algorithms – that powers the rest of the city. Once cities lose control over that meta-utility, they will find it increasingly hard to push for non-neoliberal models in supposedly non-technological domains like energy or health. There's a strong argument to be made about the

path-determining nature of many smart technologies: building hi-tech socialism using neoliberal infrastructure might very well be impossible.

One concept of great help to those cities that are keen to preserve some autonomy and create a buffer between themselves and their technology providers is that of "technological sovereignty" – a rather simple idea that denotes the capacity of citizens to have a say and actually participate in how the technological infrastructure around them operates and what ends it serves. The talk of "sovereignty" – whether we talking about finance or energy – permeates the activities of many urban social movements; fortunately, it's still the case with those movements that transition to leadership positions in their cities. A concept like energy sovereignty is easily grasped and a lot of people rally behind the idea. But what does energy sovereignty mean once we transition to the smart grid and firms like Google offer to cut our energy bill by one third if only we surrender our energy data to them? Does the struggle for "energy sovereignty" have any meaning if it's not intricately to the struggle for "technological sovereignty"? Probably not.

Likewise, it's important to think through the rest of the radical agenda demanded by rebel cities 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 swapping of a "smart card" tied to our identity? How can one effectively exercise it when the infrastructure is no longer in public hands and it's corporations that determine the terms of access – including the terms on which the protest against them is to unfold? How can cities still 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 straightjacket of austerity? Without a parallel fight for technological sovereignty, a fight to protect the right to the city loses much of its potency.

While it would be an overstatement to say that some cities are aware of the importance of technological sovereignty and are actively pushing for it, it wouldn't be an overstatement to say that some are thinking of specific measures that would fit within its spirit. They can be roughly split into several groups: those that offer an alternative regime for dealing with the data produced by citizens; those that seek to promote an alternative, more cooperative model of service provision – including by private players – that does not rely or promote data extractivism by a handful of giant tech firms; those that seek to control the activities of platforms like Airbnb or Uber by demanding access to their data; those that try to promote and build alternative infrastructures to compete with those of Silicon Valley, at least in some of the domains.

The most important thing to keep in mind here is the need for a holistic approach that does not just focus on one element – be it data or infrastructure or the transparency of algorithmic decision-making. A city that manages to force technology companies to share the data they collect – and many firms already charge for that data or using as bargaining chips in their negotiations with cities – might find itself unable to act upon it if it doesn't possess advanced computing infrastructure to make sense of it or lacks access to the original algorithms that were used in turning that data into, say, price signals. This is why merely working out a different legal regime for data is unlikely to generate sufficient results; it has to be complemented by the strategy of reclaiming the infrastructure.

This is where many urban social movements might reach for the usual tool in their arsenal: the calls for remunicipialization. After all, such calls have worked – and with remarkable success in many cases – when it comes to efforts to reclaim and repurpose electric grids, gas pipelines, water systems. Remunicipilizing digital infrastructure is a bit tricky, however. First of all, there's often no physical presence that such companies have in the cities or even countries where they operate, making any threats to them ineffective. Second, the infrastructure that many of them operate is not the bulky physical infrastructure like electricity polls or water pipes that occupy our public space. Often, we are dealing with the sensors embedded in smart phones that belong to individual citizens; this is how, for example, Google is able to predict traffic on many roads. To think that cities can reclaim such sensors seems ridiculous, which makes these firms even less susceptible to dialogue with city leaders. It's one of those cases where, absent some major action on the national scale or clever and strategic coordination between cities on the international scale, it would be extremely hard to reverse this already worrying trend.

No one city has gotten it right so far. Many, however, have gotten it wrong, falling for the promises of greater efficiency delivered by startups, of greater creativity delivered by hackathons, and of greater transparency delivered by open government initiatives that, instead of helping to eliminate the corrupt parts of the public sector, provided the rationale for shrinking those that worked rather well. Silicon Valley and the Big Four consulting firms that, between themselves, dominate the smart city market, do not exercise their hegemony effortlessly; it takes a lot of hard work – which manifests itself 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's a world where venture capitalists have their own podcasts, write books on political themes, and fund philosophers (and occasional lawsuits). In a world like this, defending the theme of technological sovereignty would require not just practical interventions in the inner workings of our cities but also constant ideological and intellectual work in order to oppose the constant reframing of issues along the lines favorable to big business. Given the high turnover of concepts and narratives supplied to us by Silicon Valley and its resident intellectuals – it's not just smart city, but also the sharing economy, big data, the internet of things, algorithmic regulation, Web 2.0 – the very idea of technological sovereignty is likely to be soon twisted into something it should not be.

Translated into practical terms, technological sovereignty should also mean the ability of cities and citizens to organize their affairs according to principles that transcend what the philosopher Roberto Unger calls "the dictatorship of no alternatives" which is slyly imposed through the backdoor of metrics and quantification by the proponents of neoliberalism. Just like more and more urban spaces begin to differentiate themselves by the logic of absence – of WiFi 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 at work in how data is gathered and analyzed. There's no need for technocratic city managers to know everything, let alone reduce that knowledge to a single score that can then be compared with other cities.

Thus, there is no danger in refusing to learn certain elements or dimensions of a problem; carving our spaces of such ignorance and institutionalizing them – court juries are habitually expected not to read the news or follow social media accounts of the accused during deliberations – has enhanced

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 that our smart devices should not know – and we have to incorporate these principles into how they are designed rather than relying on the goodwill of their operators.

In the short term, the fight for technological sovereignty is just another attempt to buy some time to articulate a more coherent and ambitious political and economic agenda that can reverse the damage caused by the neoliberal turn in both urban and national policy. But cities should also use that time to reflect upon what kinds of fights they would like to embark upon – and what exactly would they be defending in the process.

Suppose, for example, that you believe that surveillance is one of the most evil sides of the smart city, so that the fight for privacy seems like an appropriate response. But do we want privacy to be provided as a right or we want it offered as a service? The latter function can be easily accomplished even by the privatized smart cities themselves: as long as you are willing to pay extra, someone will offer you an option to enjoy an extra privacy. The fight for mobility poses similar questions; if we want to defend mobility as a right, then the landscape is quite bleak. If we want mobility as a service, there's always Uber here to help – and at much reduced rates, subsidized by its global monopoly status and your own tax contributions to your local city council. Ultimately, the right to the city might need to reformulated as the right to have rights altogether; the alternative is to risk that digital giants like Google will continue redefining every right as a service, perhaps even a free one, as long as there's data to be harvested in the context of providing it.

6. Strategic Interventions & Potential Alliances

A battle against the smart city agenda cannot possibly succeed without strong connections to the arleady ongoing fights waged by urban social movements and a new generation of politicians that rule the "rebel cities" that reject various aspects of the highly financialized austerity urbanism, which is presented to them as the only game in town. Fights for the right to the city and the already mentioned struggles for the remunicipilization of key utilities and infrastructures are the sorts of efforts that can provide the necessary activist and intellectual backbone for questioning the hegemoncy of the smart city agenda.

But even once reframed around these themes, there would remain vast political gaps that need to be filled quickly. What, for example, does a right to the city mean in a city that is operated by technology companies and governed by private law, with citizens and social communities unable to freely and unconditionally access key resources – data, connectivity, computing power – that would allow them to pursue their own projects of self-management? And to what extent would losing control over the information-powered meta-utility undercut those successful remunicipilization campaigns, be it for reclaiming energy or water infrastructure, that would see utilities in question transition to their own "smart" consumption model, with a new set of private intermediaries in the middle?

In addition, demystifying "smartness" – by presenting it as a continuation of the very same neoliberal agendas of privatization and outsourcing, this time, however, bulked up and extended by technological means – would be a welcome step in the right direction. This is one area, where urban social movements have made impressive progress in, at least, identifying the sort of practical interventions that can make a difference: auditing a city's existing contracts and debt agreements (often, with the help of mechanisms like citizen audit); requiring a certain level of transparency and commitment 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; naming and shaming private equity firms and alternative asset management funds that come to own important infrastructure, only to neglect making long-term investments in its maintenance.

Well-targeted pragmatic interventions can make a big difference as well. In as much as signing smart city contracts requires purchases of software licenses, every effort should be made to demand free software and open source alternatives – a measure that many cities would do well to codify into law. The city of Moscow is one of the pioneers in this front, commiting to drop Microsoft products from its systems. Ultimately, the success of efforts to oppose the dominance of the neoliberal smart city paradigm would depend on the ability of those brave cities that do dare to defy it to show several things at once. First, they will need to show that the economic models proposed by the likes of Uber, Google, and Airbnb do not deliver the results they promise – not without causing a considerably amount of damage, from the rise of the speculative economy to the immense blockage of social innovation by those without access to data, to the cities in question.

Second, they will need to prove that the key resources and infrastructures that we currently describe as "smart" can be deployed, using a different legal and economic model, to produce outcomes that would not reject technology outright but would rather deploy it ways to benefit the interests of local residents rather than transnational corporations. Retreating into technophobia and the threat of more regulation – without offering any constructive alternatives – would not help garner much goodwill with citizens whose expectations on disruptive innovation have already been shaped by their experiences in the private sector.

Third, it would require constant small-scale pilots and experimentations to zoom in on those projects that actually deliver value to residents and discard those that do not.

Those pilots and experimenations should not shy away from taking some of the more radical ideas associated with the neoliberal smart city ideology – like the idea of the city data marketplaces – and twisting them around in order to unleash the creativity of local communities, albeit on a non-market model. Cities need to appropriate and run as commons the collective data about people, the environment, connected objects, public transport and energy systems. Infrastructures of data capture, visualisation and analysis that currently mainly feed municipal Operations Centers owned by big IT vendors (such as IBM's Rio de Janeiro Intelligent Operation Center) can be harnessed by citizens for their own purposes - to bring up issues of corruption, equity in the distribution of municipal resources, and to open up other questions of power and access, and support the aim of autonomous self-governance.

The most ambitious program for reclaiming technological sovereignty on a city level would naturally involve efforts to reclaim or at least replicate all the key parts of the emerging informational meta-utility, from sensors to computing power and AI to data. Realistically speaking, even cities with fiscally sound budgets might not able to pursue this agenda in full, having to pick and choose, if only for political reasons. Many of these steps – like building an alternative AI system – would not even be possible without the participation of other like-minded cities.

Changing the data ownership regime, however, might be the most affordable option, if only because it would not require massive financial commitments and represents an agenda that has intuitive popular appeal– i.e. cities and citizens, not companies, should own the data produced in cities and should be able to use these data to improve public services and out into action their policies. Taking on a firm position on data ownership might accomplish several goals at once. First, it would make the rampant real-estate speculation facilitated by the likes of Airbnb so much harder: cities and ordinary citizens would be able to check whether the frequent claims made by Airbnb in its defense – that it's benefiting primarily ordinary users and not real-estate firms – empirically verifiable. Second, putting cities in charge of their own data would remove one of the main bargaining chips that firms like Uber now have when it comes to negotiating with regulators: in Boston, for example, Uber offered the authorities access to traffic data in expectations of lighter regulation of the company. Third, without a robust alternative data regime, it seems highly unlikely that cities would be able to stimulate the growth of an alternative digital economy, with robust local and decentralized alternatives to Uber and Airbnb: without access to the troves of data available to these giants, these smaller contenders might not be able to compete.

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

Box 11: Data Control: Uber in Moscow, Airbnb in Amsterdam

Cities are putting forward more aggressive public policies that try to regulate those players of the on-demand economy that tend to bypass local regulations with anticompetitive practices.

In the transport sector, Moscow has reached an agreement with Uber so that the US technology giant can 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 to rapidly cover around 40 major Russian cities. Russia has a very competitive local Taxi market, with players such as Yandex and many local smaller companies that operate within a rather efficient system. Local players pressured the Moscow Authority to find a solution for Uber's attempt to capture the market. The deal was reached by the Moscow Transport Authority in March 2016, after the city initially threatened to ban Uber. Uber has agreed to share travel data with other public institutions in cities like Boston, New York, and San Francisco (albeit many of conditions of such arrangements remain inaccessible for analysis). For cities, it is crucial to be able to access Uber data to improve the impact of transportation shystems on the city and to be able to 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 has been negotiating with Airbnb to stop illegal renting. Airbnb is increasingloy challenging affordable public housing policies, driving up the price of rent and promoting the increasing financialisation of urban life. Airbnb has agreed to put a limiter on its website which means people will be able to rent apartments for 60 nights a year and host a maximum of 4 people per apartment. Furthermore, residents will be able to complain about noisy and aggressive tenants. The City of Amsterdam is now targeting illegal renats, focusing on professional intermidiaries that use Airbnb to squeeze extra profits. The City will evaluate this agreement every three or four mounths to monitor progress and ensure Airbnb is complying with the deal.

7. Beyond the Smart Cities: the Barcelona case study[24]

As already noted, the debate on what kind of alternative public policies can be implemented should be placed within a broader framework of struggles that are opposing austerity, predatory neoliberalism, and the corporatization of everything. In Europe, there are good examples of citizens-led movements to reclaim the common good, advocating for the collective management of pubic resources such as water, air, energy, healtcare. These are the type of alliances that must be established or strengthened when designing public policies for technological sovereignty.

These movements have been active mainly at city level, fighting against house evictions, energy poverty, precarization of labour, re-municipalization of public infrastructures; in some cases, cities have opposed neoliberal financialization, threatening to drop – or, as was the case with Madrid, actually dropping – the services of credit rating agencies, devoting some of the savings to social spending. Public policies must contest a privatised smart city that built top-down; they must oppose the monopolised ownership of intellectual property; they must reverse the process of the private capture of externatlities by bigh high tech corporations. One interesting example is the new Digital Agend of the Barcelona Government that explicitly set the standard of transition towards technological sovereignty and a commons-based city.

After the large mobilization of the 15M Movement, the anti-eviction housing activist Ada Colau became the mayor of Barcelona, representing the main opposition against a political and economic elite who had led Spain into a deep financial and social crisis leaving hundreds of thousands of families without a home. Crowdfunded and organised through a collaborative platform that features policy input from thousands of citizens, the new coalition started a series of social reforms soon after they took office.

In particular, they started to crack down on uncontrolled tourism, picking a fight with home rental websites, trying to improve the life of 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 if they market apartments without being on the local tourism register. Barcelona then provided these companies the possibility to negotiate 80% of the penalty if they give the empty apartments to the Social Emergency Housing Consortium of Barcelona to be allocated to social rent for 3 years. As Colau declared: "An Internet platform cannot become a means to block the regulations and to shelter illegal tourist apartments". The city has now called for a Popular Assembly for responsible tourism where citizens democratically debate what touristic model they want for their city.

Besides this initiative to stop an unregulated on demand economy, Ada Colau has also promised a shift towards re-municipalization of infrastructures and public services such as water, electricity, and housing. This also involves a very critical approach to the neoliberal smart city run by big tech corporations and promises a shift to democratic, open source, and commons-based digital city built from bottom-up. The city has launched a digital roadmap, which outlines Barcelona's transition to technological sovereignty.

The priority of Barcelona is to go beyond the smart, taking advantage of opportunities brought about by data-driven technologies that can transform the city and the lives of its citizens. The goal is to go beyond a technology-push approach focused only on sensors, gadgets and connectivity, with the infrastructure mainly managed by big foreign corporations and put people and public return at the centre of the technology Agenda. This strategy focuses on investing in digital public

[24] This and the following section are primarily authored by Francesca Bria.

infrastructures that can enable higher quality public services, promoting a more sustainable and collaborative economy.

Next generation technology-driven public digital services will mean better feedback, more efficient government and more engaged communities. For instance, intelligent public transport networks can improve congestion, deliver better mobility and more public space for all citizens and lower energy costs. Public connectivity, and a large-scale civic digital infrastructure deployment will enable better learning and better digital skills for all citizens, tackling the digital divide. Having a clear strategy for investment, development and deployment of innovation technologies is a key element in developing better social policies like social housing, reducing energy poverty, and the creation of meaningful and good quality jobs.

From an economic point of view, it is necessary to put forward an inclusive and mission-oriented technology and innovation strategy, with strong participation from all stakeholders such as industry, academia, research centers, citizens, developers, social entrepreneurs, cooperatives, local service providers. With appropriate public policies and instruments, technology can be the driving force to foster a more equitable and sustainable economy, reducing social and economic inequalities and ensuring sovereignty of technology and data, democratizing knowledge access and ownership, protecting the digital rights, autonomy, and information self-determination of citizens.

Barcelona aims to create a new powerful vision where technology is an instrument to empower people and transform the city. In a truly democratic city, the citizens should be able to access knowledge commons, open data and the public information infrastructures of the city to have better and more affordable public services and a better quality of life.

Barcelona wants to lead a transition to technological sovereignty that allows the government and the public to decide their own priorities in the direction and use of technological innovations that have a clear benefit for the City. This implies taking back the critical knowledge regarding data and technology infrastructures that too often remains in the hands of few big multinational service providers. In addition, technological sovereignty, including the adoption of open source software, open architectures, and open standards, should be a tool for the common good, to generate new productive and fair economic models and facilitate knowledge sharing between cities, countries, and movements.

What can cities do to promote the transition to a non-neoliberal smart city? Following the Barcelona case study, as outlined during the launch of BITS[25], we can summarise the following main public policy actions:

- Establish itself as a global reference point as a city of commons and collaborative production
- End privatisation and trasfer of public assets in private hands, while promoting remunicipalization of critical infrastructures and services
- Massively reduce the cost of basic services like housing, transport, education and health, in order to assist those in the most precarious strata of the population
- Build data-driven models of the economy, with real inputs (using real time data analytics) so that participatory democracy could model complex decisions
- Prefer and promote collaborative organisations over both the centralised state and the market solutions (start investing higher percentages of public budget in innovative SMEs and the cooperative sector)
- Institute a citizens basic income focused on targeting poverty and social exclusion

[25] https://medium.com/mosquito-ridge/postcapitalism-and-the-city-6dda80bc201d#.oys6hkoek

- Build city data commons: decree that the networked data of the population generated in the context of using public services cannot be owned by service operators.

BARCELONA CITY OF COMMONS

THE PEOPLE'S ROADMAP TOWARDS TECHNOLOGICAL SOVEREIGNTY[26]

Digital technologies have redefined urban life in the twenty-first century. Digitalization can improve the life of our cities and we are very committed to become a global reference to ensure that cities, citizens and industry work together to the serve the people and maximize the socio economic impact of technology, linking innovation with values such as social justice, solidarity, pluralism and gender equality.

We need to exploit the power of technology and digital innovation to benefit all citizens and improve the diversification of the economy, making it more plural, sustainable, and collaborative. For us, introducing network technologies in the urban environment is not just about providing the city with technology, sensors and actuators, but also adopting a wider and more ambitious goal for taking on long-term social urban challenges, such as inequality in salaries, climate change, scarcity of natural resources and employment, as well as involving citizens through participatory processes to make a more democratic society. We have therefore evolved from a top-down process to a bottom-up one, promoting collective intelligence and involving all the city's players.

This Roadmap proposes 8 lines of action. For each line of action the activities (actions, initiatives or projects) to be carried out are detailed. These initiatives are grouped in three areas mentioned above as follows:

1. Open source and agile digital transformation of the City Hall
2. Open, ethical and innovative public procurement
3. Open sourcing the smart city: Affordable digital public services and re-municipalization of critical urban infrastructures
4. City data commons
5. Growing the postcapitalist collaborative & circular economy: digital social innovation, the makers movement, platform cooperatives & STARTS (science, technology and the art)
6. Technology, automation and the future of education and work
7. Digital democracy and citizens empowerment
8. Promoting sovereignty, information self-determination and digital rights

[26] This is based on the Barcelona Digital City Roadmap: http://ajuntament.barcelona.cat/estrategiadigital/uploads/Pla_Ciutat_Digital_MdGovern.pdf

1. TECHNOLOGIES FOR BETTER GOVERNMENT: OPEN SOURCE AND AGILE DIGITAL TRANSFORMATION OF THE CITY GOVERNMENT

The city of Barcelona is undergoing a major digital transformation. This involves the implementation of strategic new digital services in the area of affordable housing, health, energy transition and mobility, as well as transforming the frameworks (legal, policy, procurement) that make government more transparent, participative, and efficient; and upgrading the digital infrastructures that make the city work better.

The government is building digital services that are simpler, clearer and faster to use. IMI, the city's technology Institute will lead the digital transformation, starting a process of change to become a modern, agile organization with a new culture focused on delivering better digital services

Public services must be "digital by default", designed with the citizens at the centre in order to provide public value. Services must be designed in a more agile way. They must be usable and accessible to everyone, including citizens with low digital skills or with any kind of disability. They have to be open, modular and interoperable, so they can be reused by other cities. At the same time, we need to avoid proprietary solution that favour vendor lock-ins and that create long term dependencies. The use of free and open source software, open standards and open architectures will be fostered.

Barcelona will transform technology procurement. We will design a new multi-vendor procurement framework and a marketplace that promotes competition and supplier diversity, creating new partnership with the community of technology providers. The new providers marketplace will facilitate the adoption of innovative solutions, thus moving away from large framework contracts and opening new opportunities for innovative SMEs and startups. We will also create a guide for open and ethical technology procurement, specifying new clauses that favour open standards and open source solutions, together with ethical and responsible innovation, data sovereignty and data protection.

With these actions, Barcelona wants to become a leader in digital innovation in the public sector, establishing new standards of public service that are "digital by default", designed and developed putting citizens at the centre, using open source solutions, and with privacy and security in mind. This process will increase transparency, accountability, and efficiency.

Main actions:

• **Transition to free & open source software and open standards:** Barcelona will transition to free and open source software and open standards, applying and adapting the best Spanish and European best practices. A migration plan will be outlined and a new **technology code of practice** will be designed to guide the open digital transformation, the development, reuse and sharing of code and the delivery of common government solutions.

• **Barcelona Digital Service Standard and Technology Code of Conduct**: This initiative fosters a change in the way public services are designed. It is what we call "digital by default and "citizens first". They must be designed putting the citizen at the centre and in a flexible and iterative way in order to deliver better services that respond to citizens' needs. This process of change, inspired by the examples of the UK Government Digital Service, will provide new public services for the common good, saving time and resources.

- **Digital marketplace:** Barcelona will develop a Digital Marketplace, which is an online platform that the Government will use to find and buy technology services in an open, agile and transparent way. This will allow the public sector to provide better digital services for the taxpayer if they have access to a diverse group of suppliers, avoiding vendor lockin and corrupted practices. This is linked to the improvement of procurement and openess of contract data.

• **Technologies for transparency, accountability and anti-corruption:** In the context of this Plan, the transparency portal will expand the information published will be more accessible by introducing easy to use data visualisations. There will also be more tools to facilitate accountability and control of the budget and management processes by citizens.

2. OPEN, ETHICAL AND INNOVATIVE PUBLIC PROCUREMENT

Public procurement represents 17% of GDP in Europe, and therefore the exemplary effect of the public administrations that strategically use it is huge. Barcelona City Council is very aware of the power of the strategic public procurement, contained in the PAM 2016-2019, is working on the promotion of Social Public Procurement, Green Public Procurement and good government Procurement. With this initiative, we want to go one step further open and public procurement as criteria, and review the procurement process to foster a more efficient public spending, more transparent that innovates both regarding the product/service and the supplier profile, with easier access for SMEs. New technology procurement will be more open, transparent, innovative and more agile. It will expand the range of suppliers, facilitating the procurement of open source solutions and open standards. It will also consider aspects of data sovereignty and privacy, observing compliance with legal regulations and data protection, including ethics and privacy impact assessment. As a result, there will be new procurement processes, a digital marketplace, and new manual for technology and digital services procurement.

In the framework of innovative public procurement, a clear political boost and promotion of innovation should be addressed, with a specific focus not only on the products/services but also working to facilitate access to public procurement to SMEs, cooperatives and suppliers, a valuable source of innovation. Very often up until now they did not consider accessing these contracts given the difficulty of managing certain contracts, as well as restrictions for solvency, that in some cases limited the participation to a few large companies.

The ultimate goals are a) Fostering a government with a more strategic, efficient and transparent use of public spending b) Promoting innovation in government and business, always at the service of social environmental transformation c) Improve the offer and quality of public services to better meet the needs of citizens d) Facilitating access to public procurement by SMEs and cooperatives, offering them new business opportunities, facilitating their development and favoring the creation of quality jobs.

This project also aims to be aligned with and take advantage of new trends, mechanisms and tools for open public procurement driven by Barcelona City Council, and will work hand in hand with the Directorate for the Coordination of Administrative Contracts.

Main actions:

- **Introduction of innovation clauses in public tenders**: Revision of the standards of public procurement of innovative technology. Municipal guides of use. Consolidation and generalization within the City Council of new procurement processes that incorporate this

vision and are used regularly to move towards municipal sovereignty technology, and facilitate access of SMEs to public procurement. Actions in line with the initiatives undertaken in social and responsible public procurement.

- **Use of an open and innovative public procurement**: Definition and articulation of a municipal strategy promoting the use of innovative public procurement of innovation, at the same time that advises during the process, with a strategic, methodological and operational orientation.

- **Calls for challenges to engage statups and SMEs**: The Urban Lab Infrastructure to be recovered will be key in this field to involve SMEs and the research environment in the co-creation and testing of new urban solutions. Under this project, the City Council wants to invest €10M during this mandate to ensure that SMEs in the city have access to public contracts so that municipal suppliers diversify and the local social-economic fabric gets richer and stronger, at the same time that better services to citizens are offered and a more transparent and efficient use of public spending is implemented

1. OPEN SOURCING THE SMART CITY FOR THE PEOPLE: RE-MUNICIPALIZATION OF CRITICAL URBAN INFRASTRUCTURES & AFFORDABLE DIGITAL PUBLIC SERVICE DELIVERY

Until now, the smart city paradigm has been developed mostly following a technology push model, investing in large-scale technological projects managed by big high tech corporations. The idea was that technology would provide easy fixes to complex social problems while too often forgetting the ultimate reason for the application of these technologies, which is serving the citizens and deliver better public services. Barcelona wants to change this approach and foster a rigorous and objective evaluation of the economic and social viability of innovations before and after their implementation, and emphasize the policy priorities set by this mandate and Barcelona's urban and social challenges.

With this plan we will ensure on the one hand that Barcelona has **a pervasive digital infrastructure** to support the management of the city's services in an efficient way, ensuring broadband coverage and connectivity for all citizens and evenly in all territories and, on the other hand, ensure that these technological infrastructures are the means to enhance bold public policies such as affordable housing, youth unemployment, social exclusion, public health, energy transition and a better mobility.

This line of action includes the development of digital technologies to reduce the socio digital divide between the different districts of the city, and to promote digital education and research and innovation. It also tackles the improvement of services for citizens considering actions that allow addressing the most important problems concerning urban society, such as waste management, energy, mobility, housing, the fight against social exclusion and the aging of the population, in order to ensure a better and more equitable quality of life.

Main actions:

- **Public broadband connectivity for all- Internet access and Universal Service Network:** This plan will work to improve the regulatory framework for the provision of wifi services by municipalities and the subsequent expansion of the municipal wifi service coverage. At the same time, we will cooperate with organizations and social projects of technological base for the construction of common, open, free and neutral telecommunications networks

to ensure connectivity in all those districts and communities where there is still a big lack of infrastructures. Finally, we will act to ensure a balanced deployment in the territory of the new generation (5G) telecommunication network.

In Barcelona there is a significant digital divide among neighbourhoods especially based on their income level that worsens when combined with factors like employment and education level. For example, 84% of Barcelona citizens have broadband at home while there are considerable differences between districts regarding Internet connection at home. It is a commitment of this government team to ensure that the access to the services and solutions offered by the Internet is effective and balanced throughout the territory. Therefore, we will work with third sector organizations to reduce the digital divide with digital inclusion programmes and specific projects targeting those most vulnerable groups. A goal to achieve is that no one in the city remains without connectivity because of a lack of resources.

- **Open standards for municipal digital platforms:** Barcelona is moving towards open standards, decentralised and privacy-aware digital architectures. Sentilo is an open standard and open source municipal platform for the management of sensors and actuators (Internet of Things - IoT). Sentilo will be enhanced during this mandate, promoting its adoption by more cities in Spain and around the world. Its functionalities will be extended thanks to the development of third-party modules and applications and it will be integrated into the Barcelona digital urban architecture. At the same time, new transversal open data infrastructures such as CityOS will be developed, so that SMEs, cooperatives, associations and organizations in Barcelona can easily access relevant data, test their solutions, integrate them and generate higher socio- economic impact. Distributed data architectures based on blockchains such as DECODE will be also tested and scales in collaboration with other European cities.

- **Water municipalisation:** Many cities are putting forward policies for the recovery of the public management of water, the implementation of new models of democratic and participatory management, and the implementation of shared collaboration strategies between social organisations and municipal councils. Barcelona committed to the public, transparent, participatory and sustainable management of the integral water cycle and to guarantee that the right to a provision of water supply and sanitation services must be guaranteed for all citizens by the public administration.

- **Energy sovereignty:** Barcelona is working on the implementation and development of a municipal energy operator that promotes power generation from renewable sources and its commercialization. We will also continue working on measures to reduce energy consumption in municipal buildings, shops and houses in Barcelona. Under the Digital Barcelona will test new distributed digital platforms for storage and display of energy consumption and environmental data relating to municipal buildings. At the same time, we will promote citizen participation to own and share their consumption data and control the use of energy and self-consumption, offering tools for energy management at home.

- **Affordable social housing and municipal FairBnB platform:** As part of the ambitious Affordable Housing Plan, Barcelona will carry out the integration of all housing services under a single information system. Moreover, there will be actions to influence the rental housing market, such as the detection of empty or for illegal uses houses by using Big data

technologies or others, or create a digital platform to rent houses and bedrooms at an affordable price.

- **Giving public space back to citizens-Superillas:** Barcelona has an ambitious mobility plan to fight excessive air pollution, noise levels, and to reduce traffic by 21%. The plan is based around the idea of *superilles* (superblocks) – mini neighbourhoods 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 that will repurpose existing infrastructure. Starting with traffic management through to changing road signs, the creation of new orthogonal bus networks and the introduction of 300km of new cycling lanes in order to increase mobility by foot, bike and public transport. The use of sensors networks, digital signalling and Big Data analytics will make possible to define and predict better public mobility policies, and measure the urban impact. We will also work on the creation of a new integrated centre for the management of urban space and mobility. Barcelona is involving neighbourhood groups and citizens in the planning process since we want these new public spaces to be areas where one can exercise all citizen rights: exchange, expression and participation, culture and knowledge, the right to leisure.

- **Digital health for the elderly:** A new model of care and relationship with older people using digital technologies will be defined. Starting from two services, "Vincles" and telecare, we will move towards the integration of both systems within a single mobile digital service platform for social service. We will also expand and enhance new socio-health digital services and will improve the quality of physical services such as home care, residential centres or assisted housing for the elderly.

- **Digital tools for socio-economic inclusion:** Barcelona will reverse the low penetration of ICT in social and occupational areas. A new system of citizen self-assessment of their social rights to access aids from the administration depending on their individual and family situation will be implemented. The digital system will allow citizens to anonymously assess their situation and receive transparent information on social aid they are entitled to. It is a strategic project related to the implementation of the future municipal emergency income tax that will reform the entire system of the current social assistance. New digital tools to support employment and social services will be deployed.

- **Digital currency to implement citizens income and access to municipal social services** One key project in this social policy area is the evaluation of the implementation of a digital card and digital currency to provide basic income to families in difficult economic consitions.

3. CITY DATA COMMONS

Access to and control over data has become a strategic asset for cities. While the platform economy has a clear potential to generate huge economic impact, there are several important issues that need to be resolved (first and foremost, around ownership, control and management of personal data). The current digital ecosystem and IoT landscape is highly fragmented, with a multitude of non-interoperable vertical solutions, all offering their own set of devices, gateways and platforms, and means of data handling in data "silos". This fragmentation makes data unmanageable and end users ultimately lose control over it. This status quo arises because small SMEs, startups and other innovators cannot see a clear value proposition in offering open, horizontal, interoperable components and data-driven solutions. The cost of engineering such solutions from scratch makes them unaffordable.

Cities should aim to disrupt this data accumulation, making data available across vertical silos experimenting with decentralised data infrastructures and distributed ledgers such as blockchains and proposing new frameworks and business models that rewards and incentivise openness enabling data discovery, transaction and secure data sharing. Cities could also design new legal, economical, governance schemes and commons standards to foster collaborative behaviours by individuals to contribute to digital commons, including those involving personal data.

Today cities have more data than ever before (90% of the data that currently exists did not exist 3 years ago). It is information that is neither organized nor accessible. Part of it is on the web, and the other part is divided between the multiple departments and companies that compose a city hall. Citizens live in all types of hyper-connected virtual spaces and generate and use real-time information, accessing remote databases and participatory crowdsourcing. Knowledge is distributed, not centralized.

One key reason cities and municipalities have so far failed to foster local data-intensive business that can compete with Uber and Airbnb is missing access to raw data. Cities should foster and demonstrate local open and decentralised data platforms, where people can use contextual data to guide meaningful decisions and actions.

Cities should explore how to build a commons-based sharing economy that is data centric but where data that is generated and gathered by citizens, IOT, sensors networks and open city level data, and is available for broader communal use – with appropriate privacy protections. As a result, **a** mass of innovators, startups, SMEs, NGOs, cooperatives, and local communities can take advantage of that data to build apps and services that are most relevant to them and the wider community.

Barcelona wants to build the most dynamic, effective and privacy-aware data ecosystem in the world. City Data is a key part of the urban infrastructure. Barcelona will use data to make better, more democratic and faster decisions, empower people, incubate innovation and drive socio-economic growth, as well as improve public procurement and public services. This will help to ensure that public resources and assets are managed and distributed for the collective good.

Barcelona must remain at the forefront of the data revolution, putting data into the public domain, as the basis for a new social and economic growth, and with special emphasis on preserving people's privacy and data protection as a citizen right to self-determination in the digital age. Thus, this Plan aims to develop a public, open and distributed City's data infrastructures, while developing a data strategy involving citizens, developers, SMEs, companies, communities and universities, with a clear data policy that democratizes its access and ownership. This aims to create a decentralised innovation ecosystem that will attract a critical mass of innovators able to shift the

current centralised data-driven on demand economy towards a decentralised, sustainable and commons-based economy. Barcelona Data Commons puts agency and data control in the hands of citizens, to improve citizens' well-being for the collective benefit of all.

Main Actions:

- **Open Public City Data Architecture- CityOS:** A transversal open-standards based platform for the management and analysis of the city data will be launched as part of this plan. It will also integrate Sentilo and the different analytics dashboards. Its modular architecture and its construction based on open standards and source software will make possible the creation of a large community of users and its replicability and adoption by other Cities.

- **Public Digital Identity:** Digital authentication and identification (Mobile ID) will allow citizens access to different digital public services. The service will be updated using open source software and open standards and extended to a wider range of public digital services, such as e-Bicing and the participatory platform Decidim. At the same time it will be offered as an authentication service to access customized services from third parties. Digital identity solutions need to preserve trust, privacy and data ownership in today's big data environments. The MobileID solution will be coupled with strategies to manage data as commons, data protection, consent and licensing, tools for citizens to control data, and terms of services. It also integrates strategies such as privacy by design and trust and ethical frameworks. Finally anonymity, cryptographic tools and encryption such as Attribute-based encryption, decentralisation and blockchains will be taken into account.

- **Open Data Ecosystem:** Barcelona will encourage the creation of city open data creators and users to promote the use and discovery of new data sets, create storage infrastructures and support tools as well as new data-driven services. New legal economic and governance schemes will be designed to promote co-operation between individuals to contribute to the common good, and a citizen Data dashboard will be deployed. The open data portal will be renewed, expanding the data available in standardized and open digital formats, promoting "Linked Data" and following a clear structure that allows its reuse and amplify the social impact.

- **Data Sovereignty:** Through the EU funded DECODE project, Barcelona will deploy a distributed data infrastructure that devolve data ownership and control to citizens, provide a privacy-aware and flexible identity management and IoT data sharing solution, while fully protecting citizens' privacy. This infrastructure, based on blockchain technology, will be built with the active participation of citizens, social entrepreneurs, hackers and creators. Once it starts functioning, innovators will be able to build solutions on top of the platform through workshops and challenges.

- **Data Analytics Office:** Barcelona aims to create a permanent City Data Analytics Office. City-scale data analytics can help improve public services, deliver social value, boost local collaborative economy and significantly improve the quality of open data. The Mayor, together with the government team will have a dashboard for high-level decision-making and operations and other Departmments will have specific dashboards for the management of urban services. Finally, decision-making dashboards will be put at the disposal of the citizens through the Barcelona portal of transparency and open data. **Big data pilots for the common good** will be run in strategic areas, such as housing and tourism, mobility and energy. The results will help determine public policies and launch new public services

tailored to the needs of the society in Barcelona. The programme's ultimate vision is to bring data-driven city government to BCN with a clear public value and emphasis on better decision-making and enhancement of social policy within a democratic and inclusive governance framework.

- **Hackathons and Apps challenges based on open data:** Standardised and open APIs will facilitate access and sharing of city data for the creation of useful applications. This line of action will promote workshops and competitions together with innovators and other stakeholders in the city to foster the development of services of public interest in the form of web services and mobile applications that contribute to solve the social challenges that we face.

4. GROWING THE POSTCAPITALIST COLLABORATIVE & CIRCULAR ECONOMY: DIGITAL SOCIAL INNOVATION, MAKERS MOVEMENT, PLATFORM COOPERATIVES & STARTS (Science, Technology and the Arts)

The economic activity has a direct impact on the lives of people and the local business ecosystem. Both the degree of economic dynamism and the foundation on which this dynamism is built decisively influence the opportunity to develop, generate, and redistribute wealth, reduce inequalities, ensure opportunities for everyone and weave a society committed to the environment and a better quality of life of people. Barcelona advocates a plural economy to generate more and better quality jobs that put the economy at the service of the people, while using as efficiently as possible the natural resources, democratise owenership, and generate minimal waste and pollution. The city digital transformation has a key role to achieve this objective.

"Barcelona Digital City" Plan wants to promote and strengthen the digital innovation fabric, working with all the complexity of the innovation ecosystem, with large companies, SMEs, and start-ups, but also including academia, science and technology research centers and civic initiatives. This will encourage the creation and development of innovative companies and digital projects in specific sectors, as well as their promotion both locally and internationally, especially through innovative events and Fairs that bring economic and social impact to the City.

Digital technologies have transformed many areas of business – from Google and Amazon to Airbnb and Kickstarter. Huge sums of public money have supported digital innovation in business, as well as in fields ranging from the military to espionage. But there has been much less systematic support for innovations that use digital technology to address social challenges. And they are an emerging area with little knowledge of who the main characters are: social and digital innovators and organizations and activities that use digital tools for social change. As defined by the EU project http://digitalsocial.eu *"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".*

Despite this lack of support, there is a growing movement of innovators in the civil society, social and technological entrepreneurs who are developing digital solutions to solve social challenges such as improving health, democracy, responsible consumption, use of money, transparency and education. The development of digital infrastructures (open data platforms, knowledge co-creation, wireless sensor networks, decentralized social networks, free software, open hardware) can create the conditions needed to promote this line and foster collective actions.

Thus, one of the priorities of the "Barcelona Digital City" Plan will be to support these initiatives and encourage the so-called Digital Social Innovation and collaborative platforms, as well as the relationship between technology and the world of arts and culture, a field where potential opportunities are huge. We will promote new funding mechanisms, new regulations and norms that favour open standards, open source software, open hardware and bottom-up networking, as well as new ways of making (Ateneus de fabriació, FabLabs, Makerspaces, distributed manufacturing) and collaborative economy initiatives. Links between science, technology and art will be promoted.

Main actions:

- **Promoting a symbiotic digital innovation ecosystem with social and public returns:** The identification and mapping of the local innovation ecosystem **(**SMEs, start-ups, incubators, innovation clusters, technology parks, digital research stakeholders key to the Catalan economy) should be the starting point. Projects that help strengthen this ecosystem and make it grow must be also defined and fostered. Initiatives of incubation, acceleration, and support of local initiatives are included here. Working with large local or global technology companies headquartered in the city to influence the social return of their activity, either through Corporate Social Responsibility or through their daily activity. Promoting projects with large corporations regarding the local ecosystem and technological projects with direct impact on the local community, projects to promote education, social and gender inclusion, and encouraging that these companies provide technology for social projects and support dissemination projects.

- **Investing in Research & Innovation (Quadruple Helix):** The Plan will foster the implementation in the city of a research and innovation environment to solve the main urban challenges taking advantage of the talent of local entrepreneurs and research centres. It will recover the Urban Lab programme (experimentation and testbed facilities that allow companies to pilot their solutions) expanding its functionalities and will foster its use among SMEs, linking it with innovative public procurement. In addition, research projects will be defined in co-operation with universities, research centers and technology centers, with links with innovative public procurement.

- **Encouraging new financing models:** More participatory and innovative ways of funding will be experimented, both in terms of creating new Funds for projects in specific fields (like Digital Social Innovation, makers, and the collaborative economy) and promoting new funding models that provide better and more democratic opportunities to access and share resources (seed funding, crowd-funding, match-funding).

- **Grow a Digital Social Innovation network** in Barcelona (DSI4BCN) following the European model (digitalsocial.eu). The social innovation ecosystem in the city is very rich, but it lacks elements of coordination and co-operation that facilitates interaction and enables a better development of this phenomenon by networking. This will be done by launching a DSI Platform and a DSI Fund to invest in digital innovation projects with social impact associated with external investors in order to let initiatives grow and scale in this field.

- **Support the Maker Movement:** Design and implement programmes to "bring manufacturing back home" and encourage the use of digital technology for the circular city. Promote the pilot project in Poblenou as a manufacturer district of the new digital age (“Maker District”), facilitating the interaction between a very active local community in the field of the Maker movement and other economic activities and citizens' initiatives (joint

community of workshops, makerspaces, Fab Labs, universities, research institutions, restaurants, businesses and active social movements) fostering new sustainable, social and cooperative values for Barcelona. Grow the "**Makers Faire**" event and connect it with other events in the city, such as Sonar and festival of Science and Technology.

- **Promotion of platform cooperatives for the collaborative economy:** This government has a clear priority in promoting a more plural economy that includes cooperative social and solidarity economy, in addition to the commercial companies and the public administrations as economic agents. Barcelona Activa is especially focused on promoting and boosting collaborative commons economies and technology plays a key role in this type of economy. This includes actions to create a network in the frame of collaborative economy with local impact like BarCola and encourage new ways of incubation and support to plural economy.

- **STARTS - Science, Technology and Arts:** Connection between projects in the world of technology and culture through calls for innovative solutions based on social and cultural challenges or on the participation in events that promote this interaction (STARTS), among others (eg. "Repte canòdrom" or Sonar+D).

7. TECHNOLOGY, AUTOMATION AND THE FUTURE OF EDUCATION AND WORK

The Robot economy is already here. According to Brian Arthur this "second economy", where machines transact only with other machines, could replace the work of approximately 100 million workers globally. There is a wide consensus that the process of automation pushed by highly productive labour-saving technologies will replace a good share of jobs. Of course, technology also creates new opportunities and new industries, and while it's rapidly automating more routine and task-based jobs, other activities such as creative jobs, care and affective labour, and other jobs that depend on human interactions are harder to automate and they are increasingly acquiring a central importance in current cognitive capitalism.

According to the European Commission, by 2020 the number of jobs for highly qualified people will increase by 16 million, while the number of jobs held by low-skilled workers will be reduced to around 12 million and this kind of economic balance can only be achieved by improving digital literacy and education, in particular, by promoting the integration of science, technology, engineering, art and math (STEAM). The new generations are our future and even though they are digital natives, not everybody has the same opportunities to approach and use technology. Moreover, scientific and technological careers have suffered a decline in recent years. Thus, we must work to bring technology to schools, children and teachers and we must reduce the digital divide that exists in the female sector; we must make sure that the knowledge and use of technology reaches everybody.

Secondly, to have a stable and quality employment is one of the basic variables to guarantee a decent life for everyone, and a great tool to reduce inequalities. Barcelona has put employment at the centre of the municipal policy and has designed a strategy to fight unemployment, agreed and shared with the social stakeholders of the city and seeks to create quality employment opportunities for everyone, especially for the most vulnerable groups that includes in a transversal way the gender perspective and reflection on the distribution of jobs available, as well as on the territorial balance, approaching services to the territory and the people needs.

And we cannot forget that regarding technology, society is constantly changing and the professional world has been forced to adapt to it. Improvements in technology and changes in communication and everyday relationships, among others, have created new types of jobs. Today employers choose not only according to previous work experience or education, but there are a wide variety of skills and technologies that young professionals can use in works that did not exist in the past decades. Thus, the digital skills have taken considerable importance in the field of talent.

The "Barcelona Digital City" Plan wants to ensure that there is a specific focus on fostering new jobs and educate and empower citizens, from children to professionals, in the so-called "the jobs of the future" or employment in the 21st century.

To have a range of actions for technology and digital training at all levels, from the classrooms to unemployed people or working professionals, with an emphasis on ensuring that it is customized to the needs of each group will be a priority of this line of action, that will have two distinct and complementary focus:

-The education and training programme aimed at empowering citizens, especially children and young people in the use of new technologies in the context of Ateneus de fabricació or municipal equipments.

-Training and education programmes that want to be inclusive create employment or improve professional profiles.

Main actions:

- **Strengthening the Network of "Ateneus de fabricació":** Promotion and deployment of the current network of "Ateneus de fabricació", municipal public spaces open to everyone where people can learn and experience the world of digital manufacturing, equipped with qualified staff and the latest technology (3D printers, laser cutters controlled by computer, etc) with an open and collaborative philosophy. We will reinforce networking with educational programs and digital empowerment in schools, as well as consolidate and export the Lab model of Digital Manufacturing for industrial promotion in the Barcelona Technology Park.

- **Open and creative technologies in the classrooms:** Promote across the city learning programmes based on the concept of "learning by doing" (project-based learning). It is about strengthening the central and active role of boys and girls and promotes the pleasure of learning, while encouraging their passions and unique abilities. A customized model that uses creativity, teamwork and solutions of trial and error, that encourages risk taking without fear and learning from mistake, in tune with real world and preparing them for commitments that they will have to take as citizens, university students and professionals in the 21st century.

- **Technology to train and empower teachers**: A key factor in are teachers, that in this model that transforms the environment completely act as mentors, working, discovering and guiding the progress of their students individually. This programme aims to be at the service of this group, offering adhoc programmes that enable research, create and share all the possibilities that technologies give to transform the classroom. Its gotal is not only that participants acquire skills and knowledge, but also to create a permanent community in which the teacher's experiences are valued and they are used to guide educational practices.

- **Technology for socio-digital inclusion and gender equality:** Although today more and more girls and women are daily users of technology, relatively few of them are playing a key role creating it or are styding STEAM (Science, Technology, Engineering, Arts and Mathematics). Women are still underrepresented in this sector, particularly in technology. It is in this area where we will find the best opportunities for social, personal, professional and economic fulfilment, so fighting the digital divide can play a key role in the future of women. This initiative aims to implement programmes, skills and resources that inspire and empower girls and women, that contribute to correcting gender imbalances, promote equal opportunities and empower women as agents of social and economic change.

- **Bring emerging technologies to citizens:** Dissemination of activities and conferences that will bring emerging technologies closer to citizens, because of major technology events in Barcelona such as Smart City Expo, MWC, IoT Congress, In(3D)ustry, STEAMConf, Maker Fair or others, such as cycles aimed at disseminating and experiencing all aspects, features and applications of cutting-edge technologies. The objective is to help empower citizens, to make them have interest and skills towards technology and give tools and arguments to favour conscious, active and participative citizens.

- **Digital training and the future of work**: Barcelona Activa is the municipal agency that leads the employment policies of the city. During this mandate we want to work to ensure that work is a priority in all the municipal areas, customizing policies for different groups and territories. In this sense, we will work of digitalization policy for employment, with specific programmes to address this issue both in advice policies and guidance for professional development. Barcelona Activa also offers free technology training to people looking for a job, entrepreneurs, companies and professionals.

8. DIGITAL DEMOCRACY AND CITIZEN EMPOWERMENT

The economic crisis came together with a strong political crisis that put into question the current democratic system. This has been reflected in a lack of confidence in institutions and their political representatives, which has been worsened by a slow but steady retreat of the State in terms of social rights. We are therefore in a crisis that is not only economic but also social and political, that has made a clear public demand for democracy emerge, what has increased the demand for information and transparency, better and more sovereignty in the ability to define our ways of life, territories and infrastructures, as well as some community practices of service, resource and commons management.

Therefore the new government is convinced that other ways of governments are possible that put citizens in the centre and are subject to shared responsibility and co-production of policies between technicians, politicians and citizens. The challenge we have today is to develop and create spaces and mechanisms that enable this collective and democratic administration of the public and common.

It is therefore an urgent need to rethink politics and democracy. The complexity of contemporary problems and the new possibilities open to active citizenship, the new technologies and the revitalization of social spaces, open a new scenario that requires new democratic infrastructures, and this City Council wants to research and develop new operating models in all its layers and

innovate procedures, devices and mechanisms for participation in the city. Barcelona, taking advantage of the potential offered by technology, wants to use technology as a facilitator of an active democracy, and standardize and develop new models of participation in digital environments (open, secure and free) that facilitate participatory democracy and collaborative coordination, while developing tools for communication, co-operation and internal participation in the City Hall. The development of new ways and methods for citizens participation through the Platform "decidim.barcelona" will serve as example for the creation of citizen democratic laboratories and other dissemination activities.

Main actions

• **Development and large-scale use and promotion of participatory platforms:** Develop platforms that serves as infrastructures both for participation processes promoted by the City Council (PAM, development of rules and regulations, etc.) and for processes led by citizens (popular initiatives, community development, collective projects and so on). Decidim.barcelona is the main participation platform of the City, developed using open source software and a modular architecture based on open standards that will allow the Council to implement large-scale participatory processes regarding city's policies. Furthermore, this platform allows city organizations to run their own autonomous participatory processes, such as open budgeting and policy co-creation projects.

• **Creation of citizen labs:** It is oriented towards the design and creation of an open and participatory lab on democratic innovation and collaborative practices.

9. SOVEREIGNTY, INFORMATION SELF-DETERMINATION, AND DIGITAL RIGHTS

Technology has burst into our lives and there is still too often an important part of citizens who do not know their potential and is not aware of their rights and freedoms in this field. This government wants to increase the digital sovereignty of the citizens of Barcelona, not only by enabling but also by increasing awareness and dissemination of citizen technology, while defending their freedom and their digital rights.

In order to increase technological sovereignty, of governments and citizens, a debate will be stimulated on the use of technology in the city. Economic and social agents, academia and citizens in general will be offered the possibility to discuss and make proposals on the city technological strategy, fostering the creation of open spaces for debate, specific tables, working groups and conferences.

Main actions

- **Barcelona Initiative for Technological Sovereignty- BITS:** Through BITS, Barcelona will stimulate a global debate about the changing meanings of sovereignty and explore the ways in which various types of sovereignty – of citizens, cities, nation states, and regions – can still be maintained in today's highly technological global conditions. With a strong focus on the political effects of technological change, BITS will explore how the rise of Technology platforms and the *data extractivism* they enable is transforming governments, labour, ownership, and access to the basics of life such as water, food, housing, and energy. BITS initiatives include workshops, Symposiums, a series of monthly lectures and workshops linking researchers, grassroots, and public officials starting in 2017, and a Summer School in July 2017. Regular content will be produced and shared, including research briefings and news digests pertaining to the questions addressed by the initiative.

BITS seminars, work streams, and research lines are geared towards the co-production of public policies. Its members and audience include prominent academics, journalists, researchers, social movement activists, campaigners, entrepreneurs, and public officials from municipal and national governments in attendance. Thus, while BITS raises awareness and stimulates robust theoretical discussions, it also brings in and encourages concrete examples and suggestions for specific policy interventions in the political context.

- **Campaign on Ethics, Data Protection and Digital Rights:** The City will promote a large-scale campaign to create awareness on the new rights and freedoms that should be affirmed as part of the Information Society. The freedom to access, share, and own common knowledge must be recognised in a knowledge society. Free speech should consist not only in rejecting all new forms of censorship, but also in recognising 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). Considering the protection of personal data, as an autonomous fundamental right – other than the conventional right to privacy – is an essential component of contemporary freedom, thus avoiding societies resting on control, surveillance, classification and social selection. Ethical standards and legal principles should converge on setting out the framework safeguards required to prevent a highly dangerous type of social, political, and institutional control.

Towards a Smart, Sustainable, and Democratic City

Technological Sovereignty Policy Toolkit

Project Outline

The Technological Sovereignty Policy Toolkit is an introductory guide for policy makers who want to know about the smart City and suggest alternative policies to support a shift towards technological sovereignty. It offers a mix of theory, examples, practical guidance and links to further information.

The Toolkit will be designed in collaboration with BITS (Barcelona Initiative for Technological Sovereignty) and supported by the Rosa Luxemburg Foundation. In terms of content it will draw on the Study "Beyond the Smart City: towards non neoliberal alternatives" co-authored by Francesca Bria and Evgeny Morozov and it will be based on content produced by the BITS Network that includes experts, academics, activists and policy makers around the world.

The toolkit will be divided into three parts:

Introduction to the Smart City and its alternatives: Important concepts, latest thinking and debunking common myths.

Introduction to City Digital Policies & Instruments: Simple user guide to institutions, policies, actions, regulations to deploy a consistent digital policies and actions in Cities.

Tradecraft for Smart City policy-makers – a prototype: Drawing on emergent practices from Barcelona and other Cities, this practical guide offers planning tools, checklists and case studies of how Cities can support and implement alternatives to the smart City, moving towards technological sovereignty.

People will be able to download each guide separately. They will also be able to access online video boxes on the following topics delivered by a variety of high-level academics and policy makers. These videos are going to be used as training modules focused on key aspects of digital technology policy for public officers at the city/regional level, which can then also be shared/reused widely elsewhere (at the party level, etc). Ideally, this will be the basic know-how needed to run a non-neoliberal smart city or to create a "non-Uberized" version of the sharing economy in cities/regions where there is enough momentum and political will to look beyond the ready-made neoliberal solutions.

We will design a pilot project -- a handful of short lectures mentioned below recorded in English and then subtitled in German/Spanish and run on a MOOC platform that can be developed with the support of BITS. Should this prove successful, we can think of expanding it by adding more courses/languages, depending on the budget. The Toolkit will be composed by the following 10 to 12 videos that will be a mix of interviews, case studies and additional material based on concrete policies examples. They will mainly follow the structure of this report, while integrating interviews of experts across Europen and globally on different subjects.

1. An alternative brief counter history of the Smart City
2. The political economy of the Smart City: A Global perspective
3. Smart City Infrastructures: Connectivity, IoT, Big Data & AI
4. Taking back control: Re-municipalisation strategies in Cities
5. Agile Digital Transformation of the City Government
6. Open sourcing the Smart City
7. Open and Ethical procurement framework
8. City Data Commons
9. Policies for the Sharing Economy
10. The Maker City
11. Digital Democracy and Digital Rights
12. Digital Roadmap towards Technological Sovereignty: The Barcelona example