# Unplugging the City

## The Urban Phenomenon and its Sociotechnical Controversies

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# Introduction

## From Shared Wheels to Controlled Spaces

Cities are the quintessential technological arrangement of modernity. Modernity has entrusted technology with such power that it tends to be seen as an autonomous entity, with its own manners and morals, as if technology was an entity in itself, one which became so powerful that molds the world around it. Contemporary cities rely on an assortment of technological systems, old and new, simple and complex, which range from centuries-old sewage systems to wireless and sensorial communication networks. These systems are simultaneously part of a live archeological legacy and the present evidences of the continuous construction of space through time. Centuries-old technological infrastructures shape our urban life as much as brand new technologies. Sometimes in such intricate ways that one cannot tell one apart from the other. Cities are technological amalgamations.



Pervasive urban technologies define where and how we create human settlements, and which will thrive or be more successful than others—ranging from access to drinkable water supply as a key feature of public health to high-speed information and communication technologies as a condition for global businesses. Technological infrastructures are at the same time the underlying condition to the permanence of humans in a certain location—having guaranteed water supply even far from springs, wells, or rivers enabled the construction of cities—and the promoter of longer, broader, and constant movements—from railroads and the expansion of commerce to the Internet and the ubiquity of communication and information exchanges.

In this context, thinking about the technological artifacts that shape cities as inanimate objects would risk downplaying the social forces that determine their form, functionality, and role within the urban world and in society. Each technological artifact is the result of scientific, industrial, and ideological endeavors. Each technological artifact bears social, economic, and cultural causes and consequences. Labor organization, economic forces, market interests, and political decisions are encapsulated in each and every technological artifact ever idealized and built by human societies. This is not to say that technologies are simply the technical result of social arrangements, what

would be a social determinism of technology. But technology does not have a life of its own, as it is intertwined with broader aspects of society. Yet, once a specific artifact becomes part of a larger system, once it fits perfectly into a broader technological gear, its form and functionality, its causes and consequences tend to remain unquestioned for long periods in history. In Science and Technology Studies, with some variations across different disciplines and approaches, this process is explained by the concepts of closure and stabilization, which will be engaged with in later parts of the book.

Think of large infrastructural systems: in order to function optimally, cities rely on water supply networks, sewage systems, road infrastructures, and energy grids. All these large technological systems are based on infrastructures capable of carrying sustained circulation of matter and energy—water, sewage, vehicles, and photons move in continuous flows, which means that any interruption in the infrastructure that supports these flows damages the overall functioning of the system. If a water pipeline is pierced, water leaks out, interrupting the downstream supply. Blackouts are commonly caused by the outage of energy transmission lines. In both cases, the continuity of flows has to be preserved, which requires continuous infrastructures. On the other hand, precisely for being continuous, when such infrastructures cover areas without being used, capital and operation costs tend to increase. It is cheaper to provide drinkable water closer to the treatment stations; therefore it is more efficient to serve as many people as possible closer to the treatment station, without having kilometers of water conduits not serving any household. Likewise, it is more energy and cost effective to have as many passengers (or goods) as possible using a transport infrastructure, especially on more express and expensive modes of circulation. Functional technological infrastructures are vital for cities; unused technological infrastructures are rotten carcasses.



Of course there are optimal thresholds in every system—more users than a certain calculated limit might disrupt the system. But in general terms, high population densities are good for infrastructures. However, there are people who can afford and are willing to pay more in order to have the privilege of using an infrastructure below its optimal functioning point. Thus, those thresholds above which an infrastructure would underperform, or collapse, are technological saturation points, which are determined by technological features. As it happens with the previously mentioned examples, some systems only work with continuous flows. Therefore, overall these infrastructures tend to be more efficient when they serve higher density of users, needing less capital and operating expenditures. It is not accidental, thus, that the boom of the modern urban world with dense cities sprouting all over the planet has an underlying characteristic: continuous technological systems.

A major disruption in the pairing of continuous infrastructures and high density came with private motorized vehicles and asphalt-paved highways, which triggered urban sprawling and, as argued by Glukstad (2007), it led Americans to "throw caution to the wind, abandoning reason for passion (public transportation for the automobile)". People could live in low density

condominiums or smaller and bucolic small towns. Yet, they have to endure daily and hours-long traffic jams at peak hours along highways connecting such almost pastoral areas with cities, where most commerce and services are located, intensifying the major role of large infrastructures to sustain contemporary urban life. The mammoth malls peppered alongside highways in the United States, the epitome of sprawling urbanization induced by cars, do not have the centripetal function, or the intention, of creating urban areas. If they save drivers the burden of going downtown, they reinforce the suboptimal use of an infrastructure.

For millennia humans have collected water from wells, for centuries cesspits have been used for discharges, solar energy is available everywhere and can be produced locally. The fact that our cities are built over continuous technological systems is a matter of choice, not destiny or lack of alternatives. It is a matter of sociotechnical choices. A choice made based on several social, economic, and political interests, as well as on scientific and technical decisions. As in any decision process, other options are always available. Furthermore, as in any decision process, the choice is not a matter of finding the perfect technical solution or the most beautiful and efficient design, but the optimal one that coalesces a myriad of interests and disputes.

Once this optimal technological solution has been chosen, and as long as it helps to maintain the overall functioning of a certain sociotechnical arrangement, its endurance and stability is guaranteed. All other concurrent solutions are put aside, forgotten, dismissed. The chosen technology tends to remain unchangeable—or better, further changes must happen synchronically and sympathetically with all other elements of this sociotechnical arrangement, for all of them (social, economic, political, scientific, and strictly technological), are now interdependent. The common-sense idea that the history of technology is a series of disruptive innovations is hardly true. Disruption indeed occurs, but the cost, the sociotechnical cost of it, is high—which makes it even more overwhelming. Thus, a technological change is not simply a matter of replacing an artifact for another, but of reframing a sociotechnical arrangement. A technological change is not a question of improving a device or artifact, but of rearranging networks and associations of people, reframing interests and visions, reorganizing alliances, and settling and bursting disputes. Likewise, technological solutions might serve as sociotechnical glues—they are stable because a certain sociotechnical arrangement has been achieved, and their stability helps the endurance of this sociotechnical arrangement. Here, profiting from Ignacio Farías's (2010) discussion of the interchangeable use of arrangement and assemblage (sometimes also ensemble), we prefer the former in order to emphasize the French term *agencement*, which presupposes instability and permanent negotiation—which also makes Latour use the translation "assembling". As we will argue throughout the book, any technology is the result of complex negotiations of multiple actors, negotiations that do not end even when one particular technology seems to be dominant.

The early twentieth century experienced an aviation rush, and blimps were the frontrunners. Blimps had been flying since the mid-nineteenth century and had transported thousands of passengers before an aircraft made the first commercial flight. Inflated with hydrogen, they were lighter and dozens of times larger than any airplane, with a higher capacity to transport people and supplies. Fatal accidents happened to both airplanes and blimps. But when the Hindenburg crashed, killing approximately forty people in Lakehurst, New Jersey, investments in blimps stopped. At the time, the science and technology behind airplanes were already well developed and evolving at a fast pace. Airplanes seemed to be safer and faster to transport people and cargo, and moreover to be used as a war machine, than moving around with a blimp full of hydrogen, a highly flammable gas. It took almost a century for the blimp industry to regain the interest of major global aviation industries and government agencies. Using helium, a non-flammable gas, and advanced technologies, blimps have been receiving special attention since the terrorist attacks on the World Trade Center in New York, on September 11, 2001. Although advertising companies had been using blimps before, after 9/11 the U.S. Department of Defense, the U.S. Army, as well as European homologues, turned to blimps as an alternative surveillance airship. Requiring lighter structures, using less fuel, and transporting hundreds of times more cargo than any airplane, the ML86X blimp can carry up to five hundred tons, whereas the Antonov 225 Myria holds the payload capacity record with 280 tons (Laskas, 2016). Furthermore, now blimps are experiencing a rush to regain the global cargo market. The history of blimps shows how a technological artifact emerges, is dismissed to the point of virtual disappearance, and re-emerges based on a varied combination of scientific, technical, economic, and political interests.



The history of science and technology is full of similar examples, including urban technologies. Studies that unveil the wide array of acting parts that directly and indirectly influence the development of a single artifact, as well as how infrastructure technologies are first established and later become an intrinsic condition for social, economic, and territorial arrangements, mark the history of urban technologies. Examples range from Wiebe Bijker's (1997) concept of social construction of technologies and the focus on single artifacts, such as the bicycle or the fluorescent light bulbs, to unveiling the social complexity behind their creation and stabilization as a consolidated technology; Thomas P. Hughes's (1998) discussion of the creation of ARPANET and the collegial endeavor of scientists, managers, and engineers, working on a joint venture of university, military, government, and industry; or Graham and Marvin's (1996) work on how changes in the telecommunication market in the 1980s and 1990s contributed to the shape of uneven geographies everywhere across the globe, but more specifically in poor areas and developing countries, where such telecommunication technologies had barely arrived yet.

In this book we explore the sociotechnical dynamic underneath the emergence and establishment of urban technologies as well as how accepted technologies become a central part of certain sociotechnical arrangements within which cities can thrive. We also explore urban transformations intentionally and unintentionally triggered by such technologies, from city form to urban governance. Finally we address some vested interests in the stabilization and promotion of some of these technologies.

Although important, such an approach would simply add another volume to the existing literature of science and technology studies focusing on urban technologies. Our argument here, though, is that when an artifact is well settled as part of a broad technological arrangement, it becomes the tangible component of a conceptual and moral framework of certain social and urban arrangements. For instance, bicycles became a central artifact in designing sustainable cities, either by creating and improving cycling infrastructures, or by developing bike-sharing programs. Any criticism of this artifact is understood as a criticism of values such as healthier behaviors and sustainability, which acquired the status of collective moral standpoints. Therefore, this counterargument would knock down any criticism towards bike-sharing programs. In this case, one particular artifact embodies equally urban design principles and moral values. Yet, not long ago, bicycles were often viewed merely as children's toys or a sports artifact; and when it first inundated the cities in the early twentieth century, the bicycle was portrayed as a danger to pedestrians.



Richard Sennett (1994: 263–264) has depicted the intrinsic moral values of technology and movement, demonstrating that within the metaphor body and city that enlightened planners used, "motion has helped desensitize the body", and that the "medical imagery of life-giving circulation gave a new meaning to the Baroque emphasis on motion", with the Enlightenment planner making "motion an end in itself". Ultimately, Sennett argues, it has led cities to succumb to the "dominant value of circulation". Or, as Michael Sorkin (2001: 299) puts it, there is "a system of rights that awards access to speed (and space) differentially", where the efficiency of flows prevails over any other aspect of the use of space—cities torn apart by highways are the most outstanding aspect of it.

Therefore, by questioning why an artifact is organized as it is, as well as understanding its consolidated role in the city, we can untangle the complex social, political, scientific, and economic network that form this artifact, and, at the same time, is knitted by it.

We devote a section of this book to urban mobility. One chapter is dedicated to bike-sharing systems, which became a staple in contemporary and sustainable transportation plans. Although welcome, the prominence of bike-sharing systems around the world in the beginning of the twenty-first century is impressive. Bike-sharing systems have been adopted in countries where bicycles had never been truly welcome (such as in the United States)

to countries where the use of bicycles is already pervasive (such as India). Therefore, what we discuss here is not the bicycle renaissance, but the adoption of almost a single system everywhere.

Motorization and electrification allowed the growth of cities to unprecedented scales. Consequently, moving in cities, and between cities, became a crucial aspect of the modern life. In Chapter 3, we discuss Bus Rapid Transit (BRT), a transportation system praised worldwide, based on the combination of buses and land use privileging high densities. Curitiba is a Brazilian city recognized as the pioneer of BRT, which became a benchmark on BRT projects. But rather than recounting its success story, which usually follows the linear narrative of constant improvements, we argue that Curitiba's BRT owes its most impressive innovations to its strongest competing modal type, rail systems, which were continuously proposed to replace the buses but failed to be implemented.

We close this section discussing what is thought to become a major disruptive technology for cities: driverless cars. If cars once reshaped the cities and arguably the whole world, driverless cars are considered a major innovation in the car industry and, more importantly, the potential cause of major changes in the functioning and form of cities. Without the burdens of driving, some argue that drivers will prefer to live even farther from city centers, others that driverless cars could return home after dropping their passengers at the workplace, reducing the need for parking spaces, which could be converted into parks; and others imagine cities without any traffic lights. Add to that formula the sharing potential of autonomous technologies, and we will have to consider the possibility of, for instance, significant reductions in the numbers of cars in cities and all the spatial consequences it might have to urban dynamics. On the other hand, free from drivers and with energy supply cheaper than paying for parking spaces, driverless cars can keep moving around the city the whole day, making traffic worse. Although speculative (after all, driverless cars have not yet replaced ordinary cars), this chapter discusses which factors are taken into consideration in the driverless cars endeavor that are beyond technical aspects of the automobile industry.



Another section of the book is dedicated to surveillance technologies and the territoriality of slower moving urban dynamics. The terrorist attacks of 9/11, the same ones that were responsible for the shift in the airship industry, bringing back attention to blimps as surveillance devices, were also a shake-up in the way urban spaces are conceived, organized, and experienced by citizens and city-makers. New land use regulations, specific enforcement powers to authorities in public spaces, urban design principles, and a set of new technologies emerged or at least became more prevalent as part of a general state of permanent surveillance. One example, which will be discussed in-depth here, surveillance cameras and other security apparatuses, are everywhere in private and public open areas to the point that it became part of the post-9/11 urban landscape—almost as imperceptible

as the ubiquitous streetlights. Streetlights, as well, were initially deployed to increase safety in public spaces. Their ubiquity has made streetlights virtually invisible: they are taken for granted. In any urban context, they are expected to be there. Nobody notes them unless there is a power outage. However, beyond safety, streetlights brought deeper changes to cities, such as adding another temporal scale to the urban life. Lit shop windows became an attraction on main streets, now occupied by strollers. A safe, lit, and lively urban scene boomed in cities.

The number of surveillance cameras has also increased significantly in recent years under the crime prevention discourse. Countries such as the UK have special units in the police force trained to give advice to architects and planners on how to design out crime (which is exactly the name used by the British law enforcement bodies), including how to use surveillance technologies to monitor flows and access to open areas. Such discourse is so overwhelming that often the pervasiveness of surveillance cameras goes unnoticed. The artifact is framed within certain social moral values and is simultaneously used to reinforce such values.

Cameras became an important part of the real estate market, as a must-have security component of today's architecture, but also as a representation of power relations in the construction of urban territories—reinforcing visibility and the mentality of governing as important elements of Foucault's notion of governmentality (Dean, 1999). In this way, surveillance and territorialization are the filters used to explain socio-technical arrangements on both sides of the cameras. Territories, or the possibility to control parcels of the urban space, become a central idea and, as such, a filter to understand and explain the relations between power, control, cities, surveillance and securitization strategies, and digital technologies. We take the cases in which private surveillance and security systems are being used by ordinary citizens, private security firms, and real estate agencies to impose new kinds of territorial layers upon portions of the public space in cities. We also describe public CCTV systems operators (watchers) as one of the examples to understand how this urban technological artifact works beyond the materiality of the glass lenses. Finally, in our last example, surveillance is put aside and we explain how physical territories are being used to connect control, governmentality and informational space in the case of WikiLeaks and Julian Assange.



With the metaphor of disconnecting the wires that make some urban technologies work, and with the sarcastic image of unplugging the city, besides indirectly implying that we are underlining a phase in the urban technological development when everything tends to be wireless, we intend to discuss the morals and concepts that ground and are fostered by some urban artifacts. The meaning of unplugging here is different, for instance, from a more literal interpretation given by Calzada and Cobo (2015: 24) who assert that:

> Unplugging is a subtle notion that is emerging as a contestation to the dominant technocratic mode of urban governance (Kitchin, 2014: 9), that is, the so-called Smart City model that demands a transition to overcome the social tensions and misalignments caused by hyper-connected societies.

It is not our intention to advocate for an urban life without technology, through the classical nostalgic impression that life in the country is better than life in the city—actually, we accept that contemporary cities, as well as their inhabitants, are essentially technological constructions/beings—neither is it to map all the social, economic, political, and scientific components behind these artifacts, although we acknowledge the crucial contribution of such studies. But it is by "unplugging" some artifacts that make cities as we know them that we can understand how they are connected to different social aspects, and how they have been constantly rewired to keep their centrality in particular sociotechnical frameworks.

In order to ground and foster morals and concepts, a particular urban technology has to be successful and has to endure. Three aspects are important in this process. First, a successful technology is one that has become prevalent in a certain urban context. Within a given spatial and temporal context, it is the technology that has been selected among others to structure an array of functionalities and behaviors in the city—even when, and sometimes on purpose, competing technologies cannot be identified or have been erased from the record. Second, and despite eventual controversies, a successful technology is one that is generally well accepted in the social and cultural context where it was developed or implemented. Every technology has its backlashes—the invention of the ship is the invention of the shipwreck, as pointed out by Paul Virilio (1999)—but successful technologies bind together so many economic, social, political, and scientific values that all parts work in tandem to maintain such technology in place. To be successful, the automobile industry needed highways, which needed to follow precise engineering standards, but also the lobby for more government investment in this kind of infrastructure; the oil industry relied on the increasing motorization, but oil needed to be cheap, which was possible through scientific and technological research, and so on. The vehicle is one element, perhaps the most visible one, of a series of complex sociotechnical arrangements. Finally, a successful technology is the one that not only plays a functional role in a larger technological system, but also consolidates social and cultural values, and serves as a metonym of a social and cultural context. Challenging, substituting, or criticizing a given technology is often taken as critique to a broader social context. But it is also a way of seeing that technological artifacts are much more malleable than we usually think: sociotechnical arrangements learn from ever-changing social, scientific, economic, and cultural contexts, and adapt themselves and their technological artifacts accordingly. Furthermore, by adapting themselves, technological artifacts keep their centrality within sociotechnical arrangements.

In the fourth section of the book we move from the scale of artifacts to city planning and design. As we mentioned here, and is quite well known in the field, modern cities are the apex of the industrial revolution, when networked distribution of energy and large infrastructures made it possible for cities to expand in space and time—electricity enabled cities to function normally regardless of cycles of natural light, and generation and use of energy were disentangled. Urbanists understood these transformations and have envisioned how modern cities should be. Historical and critical compendiums of these proposals include books by Françoise Choay (1965) and Peter Hall (1988). But inspirational to our approach in this book is an article by Eduardo Aibar and Wiebe Bijker (1997), where they analyze the plan for Barcelona designed by Ildefonso Cerdà in 1855. Aibar and Bijker understand Cerdà's plan as a technological artifact, for it involved discourses regarding hygiene and mobility as well as scientific and technical solutions to address these issues, demographic growth and social distinction dealt in parallel with urban form and zoning. In the end, Cerdà's plan became a tool to guide the development of Barcelona with clear rules, but rules that emerged from multiple micro-struggles and compromises between different actors and different contributions from other proposals to the city expansion. In the end, what is considered to be Cerdà's plan is, in fact, an amalgamation of a possible consensus after disputes and conflicts over what was proposed primarily by Cerdà, but also by other engineers and architects.



Following this argument, we focus on two approaches to city design. In the first type, we look into prescription as a form of city-making. Brasília and Masdar were designed and built in two phases of modernity, and are landmarks of the urban thinking of their respective times. Brasília, inaugurated in 1960, is the quintessential example of the modern city, encompassing the fundamental principles of urban and architecture modernism. Masdar, conceived and built in the transition to the twenty-first century, advances principles of sustainability combined with high-technology solutions. In both cases the city, as a technological artifact, is built in values, design, and technological choices that are far beyond their respective urban scales. Brasília and Masdar embody ideals of the future of urban life, and in this process select specific viewpoints, values, technologies. Both are statement cities. Furthermore, both of them are prescriptive cities, which try to push ahead urban values expressed in their design. Their plans establish model cities, as if they could serve as templates for the urban societies to come.

Second, we turn our attention to provocation. In parallel with built cities there are imagined urban solutions, where technologies also play a central role, but in a more critical way. Different from Brasília and Masdar and their prescriptive approach to urban design, here we focus on a mix of built and unbuilt interventions, ranging from small proposals to general urban systems which are not restricted to a particular site, in what we call provocative cities. Evidently, despite the importance of such a creative

and critical approach, one must be fair to recognize that in such cases the proposals were not constrained by the specificities of one particular site, by technological and economic feasibility, by political disputes, and by the actual use of the city by its population (often forgotten in urban analysis). Brasília and Masdar, despite any criticism, have had the audacity to be built. Furthermore, time might be cruel to audacity—before it ostracizes or turns it into monuments. Nevertheless, Archigram, Rem Koolhaas, and Senseable City Lab appropriate contemporary technologies to advance their understandings and proposals for how they see the city of the future. As Olivier Coutard and Simon Guy (2007) argue, when urban researches take technology into consideration, they tend to depict catastrophic, hopeless, and dystopian scenarios—perhaps no one can overstate Paul Virilio's pessimism, for instance, whose brilliant and dystopian arguments on technologies and cities were built intensely on the somber side of technological societies. On purpose, in this chapter we select architects and urban designers that have approached technology critically, although open-mindedly.

In the epilogue, we close the book with two essayistic chapters, where we use a less rigid structure to make our point about how technologies are ingrained in the way we imagine urban futures, and how we could tell the history of technologies from the perspective of the transition from things to artifacts—and this transition was shaped by and shaped humans. Using some science fiction movies we show how art has been projecting ideals and fears of an urban world where technologies are formative of the way humans shape space and build social relations. Finally, it was not long ago that Mark Weiser envisioned an entirely connected world where artifacts would communicate between them and reconstitute the urban realm. By unplugging the city, Weiser has been a constant source of inspiration and here we render a simple tribute.



Unplugging the city has three purposes: one is to discuss social, economic, political, and scientific elements that frame some urban technologies to the point that they seem to be unquestionable; two is to show which broader urban morals and concepts rely on the success of such technologies; and three is to argue that by understanding urban technologies as part of complex sociotechnical arrangements with movable, fixed, mutable, and interdependent parts, we can better interpret the hidden under-layers of the multifaceted fabric that forms urban places and defines urban territorialities, and this might help practitioners, academics, and activists to have a more zealous role in the associations, choices, policies, and technological design that constitute today's city-making activities.

Although crucial to studies of technologies, in particular the Social Construction of Technologies (SCOT), we argue here that the concepts of closure and stabilization are never realized in their entirety. Both concepts assume there is a final shape of a fact or technology, although they can be viewed differently according to different social groups. Actually, it is not only a matter of flexible interpretation. Closure and stabilization are

temporary states of any technological arrangement, and moreover, any sociotechnical arrangement. Endurance of certain facts and artifacts is not an ultimate state, but is only achieved through constant adaptations and concessions of the original setting (or design) towards the acceptance of improvements, revisions, reimaging, and negotiations with changes in social and cultural values.

Therefore, closure and stabilization only occur through the distant eyes of positivist criticism, through the biased point of view of designers and policy-makers, and through the one-sided interpretations of those who have some sort of financial or power advantages.

By making unplugging the city a statement, we want this book to participate in the emerging body of studies that does not discuss the impacts of technologies in cities, but understands cities as sociotechnical arrangements.

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