

Inaugural lecture

Prof. dr. Anique Hommels

Maastricht University, 13 September 2024

Transforming Cities in Times of Turmoil Obduracy, Sustainability and Experimentation





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Transforming Cities in Times of Turmoil

Obduracy, Sustainability and Experimentation

Inaugural lecture

Delivered upon the acceptance of the appointment as Professor of Sociohistorical Technology Studies with a focus on sustainable urban sociotechnical transformations (Special Chair)

Maastricht University, 13 September 2024

By Prof. dr. Anique Hommels

Madam Pro-Rector,
Esteemed colleagues and students,
Dear family and friends,

Transforming Cities

This building¹, where I accept my appointment as a professor, has a long and turbulent history. Constructed almost 325 years ago, it started out as a church and a monastery. At the end of the 18th century, during the French occupation, the church was closed, and all its possessions were confiscated. In this period, the church building served as a storage space for stolen furniture and artworks, while the monastery's premises had various temporary uses: for education, as storage space, for archives, and as a shelter for homeless people. In the 19th century, the monastery was turned into a prison and the church into a barracks for soldiers, and a courthouse. In 1866, a fire devastated the structures, after which they had to be completely rebuilt. During the Second World War, this building temporarily served as a prison for the political prisoners of the German occupier. When in the postwar period the courthouse needed a larger building, it was moved to the former Annadal hospital building nearby. In the 1990s, the university bought this building for housing its executive offices. It was completely renovated, while also some of the historical features of the building were restored. The building is now listed as a state monument. So after serving as a site where priests and friars lived, homeless people found shelter, political prisoners were kept in custody, and judges and lawyers issued legal verdicts, this building now serves as a site where scholars engage in the rituals of PhD defenses, as well as inaugural and farewell lectures (Evers, 1999). This building, in other words, has persisted in times of turmoil. It survived several wars and a big fire. And time and again, it managed to serve the needs of new users.

It is not always easy to transform buildings and urban spaces or infrastructures to new uses, changed standards of comfort, new sustainability considerations, or different ideas about cultural heritage and aesthetic value. Oftentimes, as I have argued before, urban structures will develop a certain degree of obduracy, or resistance to change.²

1 The location of my inaugural lecture is Minderbroedersberg 4-6, Maastricht.

2 See Hommels 2005. As Selin & Sadowski (2015) phrased it: "Cities are complex, dynamic patterns, yet also immobile and stable, opposing change in numerous ways" (p. 218).

A well-known example of such a troubled transformation process involves insurance company Centraal Beheer's main office in Apeldoorn, designed by Herman Hertzberger. This famous Dutch architect designed the building in the 1970s according to a structuralist design. One of the core ideas of his design was its flexibility: the spaces were created with the idea of future adaptability in mind. A recent documentary³ tells the history of the passionate attempts to change this building and adapt it to new sustainability standards. By the 2010s, the insurance company had left the building, after which it sat empty. One of the plans to sustain the building for the future was to transform it into a housing complex. This plan, however, met with the obduracy of the building. Obviously, it did not conform to the new technical standards of sustainability: it had single pane glass, asbestos was discovered inside the building, and its single-stone outside walls made it a challenge to insulate the building. Furthermore, it came with many interior corridors and spaces without windows or daylight. This limited the building's suitability for housing, while it also reduced its commercial appeal for investors. They expected to see less profit from the building due to its large spaces with little financial promise. In addition, Hertzberger himself, who was deeply involved in the redesign plans, wanted to stick to some of his basic design principles. His ideas were highly valued by both the city and the investor who ultimately bought the building. There were also plans to get it listed as a monument. All these factors contributed to the building's obduracy, which in turn severely complicated the effort to transform it and find new uses for it. Yet I do not want to argue here that monumental buildings are obstacles for sustainable urban transformation. Rather, my point is that sustainability goals, cultural heritage values and commercial considerations can conflict in urban transformation planning, and that it can be quite complex to establish the different trade-offs for stakeholders.

A key focus of my research has been to understand the mechanisms involved in urban change, as well as how urban infrastructures and buildings obtain and maintain their obduracy. Why can it be so difficult to change cities once these infrastructures are in place? How do choices made in the past, continue to influence the present and future of a city? These questions are pertinent in particular at a time when much importance is attached to transforming cities by paying attention

3 Documentary "The Proof of the Pudding" (2022) by Patrick Minks, Jaap Veldhoen & Wouter Snip.

to sustainability. The United Nations Sustainable Development Goal number 11 holds that cities and human settlements have to be made inclusive, safe, resilient and sustainable. Currently, over half of the global population lives in cities, and the expectation is that this will go up to 70 per cent by 2050. Globally, 1.1 billion people live in slums, or slum-like urban conditions, and this number is projected to increase to 2 billion in the next thirty years. In 2022, only half of the world's urban population had convenient access to public transportation. Moreover, urban sprawl, air pollution and limited open public spaces are persisting problems in cities.⁴ It is clear that cities in the global south disproportionately suffer from these conditions, but global north cities also face considerable sustainability challenges. In discourses about urban sustainability, key aims often are: making cities climate-proof, reducing CO₂ emissions, improving the accessibility to and affordability of public transport and housing, reducing pollution (noise and air), and protecting the urban ecology. In the efforts to transform cities toward more sustainable places, it is of crucial importance to better understand the urban dynamics that can support or obstruct these changes. In this lecture, I will argue that the research and governance of urban sustainability need to be grounded in an understanding of the role of obduracy in urban change. Or, as Selin and Sadowski (2015) argue “obdurate systems should come into the equation, and be brought from the background to the foreground” (p. 218). Given the turbulent developments in our cities, this research agenda, I will argue, has a lot of potential for interdisciplinary research, combining Science and Technology Studies (STS), history of technology, and critical approaches in geography and urban studies.

Sociohistorical Technology Studies

My research has been part of a wider academic effort to bring insights from STS to the city. Back in the 1990s, STS scholars argued that cities are large “sociotechnical artifacts” (Aibar & Bijker, 1997; Hommels, 2005), where technologies and infrastructure for water, ICT, waste, mobility and energy intersect and co-evolve with cultural values, politics, economics and society. Cities, culture and technology are deeply interwoven, while infrastructures and technologies are obviously fundamental to how cities function. Taking a bird's-eye view of a city, shows how it is in fact embedded in a larger spatial environment, built on multiple infrastructures. And not all of those are even visible.

4 <https://unstats.un.org/sdgs/report/2023/Goal-11/> accessed April 30, 2024.

Increasingly, the interrelated technologies are hidden underground or in the air. In STS, the argument has often been made that “such obdurate structures are pushed to the background but nevertheless are resistant to change and only seem to attract attention when they fail” (Selin & Sadowski, 2015, p. 218).

In this area of research, STS and history of technology scholars, including myself, have sought collaboration with urban studies and geography scholars, to establish a shared research agenda around urban sociotechnical development. These scholars have shown that infrastructures linked to water, energy, transport, roads and telecommunications are fundamental to how cities function. And, as such, these technologies are deeply intertwined with cultural, economic and political values (Graham & Marvin, 2001; Hommels, 2005; Wiig et al., 2022, p. 2).

A lot of fruitful work has been done over the past thirty years, and my research agenda for the period ahead attempts to build on this, integrating sociological and historical technology studies⁵ of the city more closely in a common, interdisciplinary research field. The idea is to bring STS to the city and urban studies to its infrastructures, or, put differently, to make STS more spatial and urban research more technological. My further aim is to focus my efforts on a key societal challenge: that of urban sustainability.

Scholars in the fields of STS, urban studies, transition research and sustainability have pointed out a number of problematic assumptions underlying current sustainable urban transformation models. One of these assumptions is that technological innovation is always a good thing, and that technology will ultimately solve our sustainability challenges. Current debates on sustainable, smart and resilient cities are often dominated by techno-optimism and an over-emphasis on novelty (Markard et al., 2023). In these discussions, it is usually not acknowledged that sustainability can and will in fact mean different things for different people: there is no consensus as to the meanings of

5 The name of this chair, “Sociohistorical Technology Studies,” is based on Wiebe Bijker’s chapter in the first STS Handbook: Bijker, W. E. (1995). Sociohistorical Technology Studies. In S. Jasanoff, G. E. Markle, J. Petersen, & T. Pinch (Eds.), *Handbook of Science and Technology Studies* (pp. 229–256). Sage. I read this chapter as an undergraduate student and it sparked my interest in STS research.

sustainability for particular groups or in specific contexts (Krueger, 2023). Linked to this, there is a lack of understanding and acknowledgment of sustainability trade-offs. In negotiations on urban change, as I mentioned already, sustainability values will often be pitted against other values, such as economic or cultural values. Furthermore, the debate often assumes a too linear and rationalist model of governance and policymaking. Participants will believe that if certain pre-defined steps of policy- and decision-making are followed, a more sustainable city will automatically follow. There are also ethical aspects involved, in the sense that sustainability transformations can be abused by politicians who mobilize a rhetoric of crisis to convince people that change is necessary. And finally, there tends to be a disregard for the past as well as for the future in current urban sustainability debates (Moss, 2016; Markard et al., 2023; Van der Straeten & Weber, 2023).⁶

In the remainder of my lecture today, I will do two things: First, I will revisit some of my earlier research and also discuss more recent work by colleagues on urban obduracy and transformation. I will filter out those insights that are particularly relevant for the debate on urban sustainability transformations. Discussions about sustainability transformations seem to capitalize on three strategies: first, to foster innovations that promote sustainability; second, to accelerate the decline of unsustainable configurations by phasing them out (Koretsky et al., 2023); and third, and more recent, trying to block or evade the introduction of new unsustainable technologies (Markard et al., 2023).⁷ While these are valuable contributions, in the following I will discuss *alternative* perspectives in support of sustainability transitions that appear to be better suited to an urban context and that include a sensitivity for history and temporality. I will highlight three key perspectives on urban obduracy and change that can deepen our understanding of what is needed for such sustainability transformations: 1) reviving

6 For these reasons, some scholars have argued that in fact, sustainable urbanism is a failed project. As Krueger (2023) points out: “sustainable development, in general, and sustainable urban development, in particular, are failed projects of modernity” (p. 31). He also criticizes the uncritical use of the word sustainability: “[E]veryone is for sustainable development. It means everything and nothing. The word tends to be used by everyone, but it can have different meanings and connotations” (p. 33).

7 This perspective focuses on technologies that make our societies less sustainable. For this, sustainability researcher Jochen Markard and Maastricht colleague Harro van Lente (2023) use the term “unsustainability.” This refers to technologies, institutions and practices that make or keep societies less sustainable, and that undermine ongoing sustainability transitions. Space tourism and SUVs are two of their cases (Markard et al., 2023).

sustainable technologies of the past; 2) understanding the relation between crisis and transformation; and 3) fostering transformation through experimentation. Second, based on this, I will set out a research agenda on urban sustainability transformations for the duration of my chair, showing how research on urban obduracy and change can inform sustainability transformations in cities.

Perspective 1: Reviving Past Sustainable Technologies

Sociologist of technology Elisabeth Shove (2012) is one of those arguing that in research of technological transitions, there is a dominant conceptual and empirical emphasis on novelty. She draws our attention to the possibilities of reviving old, almost obsolete technologies with a more sustainable potential, as “pockets of persistence”: “Better understanding of obduracy – as an enabling as well as a constraining aspect of innovation – promises to be relevant for resurrecting dormant but yet not ‘dead’ remnants within and as part of more sustainable systems of the future” (Shove, 2012, p. 372). As an example of this, she refers to the “replacement” of cycling practices (as dormant but not dead sociotechnical practices) by car use. And indeed, as established by our own research in the city of Maastricht (Dijk et al., 2021), the thesis that the car has replaced the bicycle needs nuancing. In our historical study of car and bicycle use in Maastricht during the period 1950-1980, we found that those in the city actually relied on the practices of walking, cycling and driving interchangeably. This co-existence of – old and new – practices that can be considered more and less sustainable adds important nuance to the claim that less sustainable technologies will simply replace the more sustainable ones of the past.

Geographers Alan Latham and Peter Wood (2015) make a similar point in their analysis of cycling practices in the city of London. For cyclists, the car-dominated infrastructures of London are a big challenge, and Latham and Wood looked at how cyclists navigate this “hostile” environment. The obduracy of the existing road infrastructure that was devised chiefly for car traffic plays an important role in the various ways in which the bicyclists negotiate their movements through the city: “There are a whole range of ways in which the existing streetscape is ill suited to, challenges, or is in conflict with the kind of movement cyclists are trying to practise. At the same time, through inhabiting London’s road infrastructure, cyclists are involved in altering and reinterpreting that infrastructure in many small and often subtle ways” (Latham & Wood,

2015, p. 303). While not being able to overthrow or radically change the obduracy of London's car-based infrastructure, the cyclists' practices of rule-bending and rule-breaking add to a subtle breach of the power balance between different travelers in the city. Latham and Wood argue that more attention for these subtle appropriations of urban space by different users can teach us how to improve and transform them, with more attention for the needs of "sustainable travelers."

This research agenda requires a nuanced view on the myriad relations between and co-existence of various older and newer practices. And this, in turn, calls for analysis of developments in a longer-term historical timeframe. One critique of current sustainability research is that scholars tend to disregard both the past and the future (Moss, 2020; Van der Straeten & Weber, 2023). Getting rid of "unsustainabilities" and understanding the decline of sustainable practices is one thing, but "reviving" more sustainable options from the past may prove to be fruitful as well. When it comes to enhancing sustainability, as the argument goes, sticking with old technologies will sometimes be more productive than inventing new ones.

A slightly provocative example of this perspective is architectural historian Daniel A. Barber's "After Comfort." In this essay, he studies the role of cultural values in urban transformations for climate change. According to Barber, we urgently need to adjust our imaginations and expectations about comfort in the urban environment. In the face of climate change, we have to help make "comfort" go away. Architects play an important role in "producing a scarcity of comfort." This involves a conscious redesign of the built environment – one which is hard to achieve according to Barber: "it is nearly impossible ... to design for discomfort" (Barber, 2019, p. 46). The new ambition should be to condition humans to be "uncomfortable." Although he is aware that most people will not like this idea, Barber still believes this should be feasible. Disregarding the obduracy of our urban environment, he says: "The world is contingent. It was built according to specific socioeconomic conditions, collective desires, and cultural interests; it can be unbuilt and rebuilt according to new conditions, new desires and new frameworks" (p. 49). He acknowledges that a new urban environment based on the value of discomfort does not only require changes to the material infrastructures of buildings, but also involves a "reimagination of our relationships to resources, economy, exchange

and equity” (p. 49). As this example suggests, creating a new built environment based on discomfort will also entail the creation of new imaginations of the future.

Historians and sociologists of technology and infrastructure in particular have developed highly refined perspectives on the relations between the past, present and future in sociotechnical change. As historian of cities and infrastructure Timothy Moss argues: “The temporal categories of past, present and future may appear distinct, but in reality ... their boundaries are fuzzy and their interdependencies hugely significant” (Moss, 2020, p. 310).⁸ Taking the temporalities of infrastructure and technology more seriously also leads to calls for attention for the later phases in the lifecycles of technologies. Historians Jonas Van der Straeten and Heike Weber (2023) claim that “in analogy to materiality or spatiality, temporality is a fundamental condition of technology that cannot be understood in isolation from its other qualities” (p. 262). Although historians are used to “situating technology in time,” Van der Straeten and Weber make the point that they also have to “situate time in technology” (Van der Straeten & Weber, 2023, p. 262). Bringing further nuance to the claims discussed earlier, that new and old technologies and their interrelated practices can co-exist, these historians say that in fact the same technology can be “new” in one setting and “old” in another. This is because “(t)he temporalities of a specific technology are never universal but relational, conditional and site-specific” (p. 262).⁹

To further the sustainability research agenda, Van der Straeten and Weber propose to focus on how technologies of the past have been unmade, for example by studying technologies that are abandoned, demolished, ruined, dismantled or disposed. They are also interested in the role of technologies that take a long time to decay, such as radioactive materials, or toxic chemicals. Cities are exemplary for the co-existence of technologies and infrastructures of various ages. Many cities rely on old technologies, such as century-old sewer systems. As an example, they refer to the recent digitization of telecom systems

8 A similar argument is advanced by Jochen Monstadt, who states that infrastructures typically bridge timelines, from past to present and from the present to the future, and that urban infrastructures play a crucial role in enabling or constraining what he calls “socio-material rhythms.” These rhythms, in turn, are important for understanding urban temporalities and urban change” (Monstadt, 2022, p. 2).

9 They call this phenomenon “heterochrony” (i.e., the heterogeneity of technology’s respective temporalities in different settings) (Van der Straeten & Weber, 2023).

in Germany that is still based on copper cables from the era of analog telephony. Engineering is increasingly engaged in “repairing” the effects of past technological decisions (e.g., car catalysts and phosphorous recovery in wastewater) (Van der Straeten & Weber, 2023).

In this way, analysis of the different ways in which old and new technologies can co-exist in a long-term process of transformation (lasting several decades or more) reveals that sociotechnical transitions are non-linear. Alternative technologies may emerge and become incorporated in a sociotechnical configuration for some time, after which they may be discarded “only to reappear decades later in a modernized form” (Moss, 2016, p. 570). To describe this phenomenon, Moss speaks of “careers” of technologies that are characterized by phases of openness and closure, or “conjunctions of continuity and change” (Moss, 2020, p. 23).

To conclude, we have seen that to enable urban sustainability transformations, it is important to look not only at new innovations, but also at old, existing, mature technologies that may be more sustainable after all. A potentially interesting avenue for sustainable transformation is to revive them or to make sure that they do not completely fade out (thus maintaining their obduracy as pockets of persistence) and that they can exist side by side with newer technologies. A deep understanding of connections between past, present and future, including the development of new sustainable future imaginaries, is needed to support such strategies. Having discussed one of the three key perspectives of urban obduracy and change that can deepen our understanding of what is needed for such sustainability transformations, I will now address the second perspective: understanding the relation between crisis and transformation.

Perspective 2: Turmoil and Transformation

It is a common understanding in STS that big crises and disasters can lay bare the inner workings of particular infrastructures, including the inequalities and injustices embedded in them. Such predicaments will often reveal our dependence on urban technologies that would otherwise go unnoticed. A potentially positive byproduct of urban crises or calamities is that they give rise to desperately needed transformations.

Historians and sociologists of technology and cities have extensively analyzed urban infrastructural responses to disasters. While some

cities never managed to overcome their multiple infrastructural crises or breakdowns, other cities have been able to transform in the wake of disaster. Historians of technology have demonstrated, for example, how specific innovations emerged in the aftermath of disasters. Case-studies of big fires in London and Hamburg have revealed how the post-disaster reconstruction process entailed a radical modernization of the city's infrastructure. In Hamburg, for example, the fire of 1842 destroyed buildings along seventy streets, leaving 20,000 residents homeless. At the instigation of the British civil engineer William Lindley, it was decided to change the size of building blocks and the width of streets. He designed the roads such that future fires would spread less easily, while the wider roads would also accommodate the increased traffic volume. Significantly, in this case, the local leadership also "turned the state of emergency into an opportunity," as Hamburg became "the first city on the continent to install a comprehensive water and sewage system" (Schott, 2002, p. 187). A modern pipe-water provision system was put in to prevent water shortages in the case of future fires. Based on his experience in London, Lindley provided Hamburg with the latest technology in the field of public health. As a result, as argued by Schott, Hamburg was in "the vanguard of urban water management for many years to come, almost thirty years before a similar system was built in Berlin." (p. 187) Schott's study underscores that Lindley's plan improved fire protection and public health at the same time, and as such, actually responded to two different kinds of disasters.

If particular crises can bring about favorable urban transformations, the opposite is true as well: urban transformations can also bring about crises. Crises can actually reveal deep-rooted inequalities and injustices in the sociotechnical layout of cities. The historian Richard Keller, in his book *Fatal Isolation*, has analyzed the devastating Paris heatwave of 2003 (Keller, 2015). In his compelling analysis of the heat wave, which caused 15,000 fatalities, he shows how historical decisions about the layout and architecture of Paris buildings resulted in a specific spatial distribution of vulnerability. According to Keller, there is a link between this disaster and Hausmann's remaking of the city in the late 19th century, which embedded an architecture that reinforced economic inequalities. In this way, Hausmann's urban design "contributed at least partially to exacerbating a vulnerability (...)" (Keller, 2015, p. 101). In particular, Keller refers to the role of the "*chambre de bonne*" (or the maid's quarters). In a typical pre-Haussman Parisian building, the spaces

become smaller and the ceilings lower toward the top floors. On the top floors, three apartments will easily take up the same square footage as one apartment on the first or second floor. As Keller puts it: “[P]overty increases as one ascends the staircase” (p. 103). Haussmann’s project entailed a massive displacement of around 300,000 residents. In the wake of this large-scale urban intervention, the poor who remained in central Paris and who occupied these new upper-story apartments, were typically domestic servants who worked for the well-to-do residents living in the larger apartments on the lower floors. Keller concludes that “the *chambre de bonne* is a sign of the persistence of desperate poverty amid unimaginable wealth” (p. 106).

Keller makes clear that several material and spatial factors contribute to these rooms as sites of vulnerability today. One of them is the increased heat load on the upper stories of buildings, whereby these places act as a heat shield for the apartments below. Moreover, because these tiny upper-floor apartments often come with only one window, the rooms are difficult to cool on a hot day, also given the more common absence of showers and baths. As the upper-story apartments tend to be small, they offer the least expensive form of lodging in Paris. Given the city’s immense housing shortage, the city’s poorest residents are likely to live in such tiny spaces. As Keller argues: “The *chambres* are thus a key site in a long history of poverty, marginalization, and disenfranchisement in contemporary Paris. They are an artifact of deep economic inequalities in the city, reflected in powerful health inequalities” (p. 112). Over time, these crowded upper floor apartments turned into quite risky places, particularly for the elderly. As Keller concludes: “Neither Haussmannization nor the *chambres de bonnes* produced the disaster. But the long-standing inequalities they both reflect and reinforce contributed significantly to shaping the heat wave’s horrific outcome” (p. 114).

This example reveals a few important points about the difficulties of making our cities more sustainable in the face of the climate crisis. As established by Keller, design decisions taken in the 19th century can have far-reaching negative impacts in 2003, the year of the heat wave. In other words, such decisions can have very long-term effects.¹⁰ Moreover,

10 See Millington & Sheeba (2021) for a compelling global south example of how the urban water crisis in Cape Town, South Africa, was governed. Analyzing water scarcity as a slowly unfolding disaster, they show how this crisis was shaped by long-term historical path dependencies. In their analysis, they reveal the inequalities that resulted from the way the water crisis was governed.

there is politics involved in spatial processes, when political decisions become embedded in spatial structures that will reinforce existing inequalities. Disasters, in turn, can make such underlying inequalities and vulnerabilities visible. As argued by Selin & Sadowski (2015): “even in those cases where citizens might welcome decay or destruction because it allows a fresh start, urban structures... remain built to last” (p. 222).

That disasters can bring about positive change may sound counter-intuitive and perhaps politically naïve. But more scholars have advanced this argument, for example in studies analyzing the urban responses to power blackouts or the September 11 attacks in New York City in 2001. Aseem Inam (2005) has argued that the collapse of the Twin Towers allowed for new viewing corridors in the city, while some parts previously blocked from view seemed less isolated and easier to access in the new situation. He also saw ample opportunity “to rebuild Lower Manhattan into a more attractive and humane neighbourhood” (Inam, 2005, p. 200).¹¹ My own case-study of the rebuilding of Roombeek, a neighborhood in the Dutch city of Enschede, after a devastating explosion in a fireworks storage facility, also revealed a strong rhetorical connection between disaster and vulnerability, and notions of resilience, optimism and a better future. This discourse was actually shared by a wide variety of actors involved (Hommels, 2018).

Another highly relevant strand of scholarship focuses on the precarity or vulnerability of infrastructures themselves. Instead of emphasizing responses to disasters, these perspectives concentrate on the ways in which cities respond to conditions of infrastructural precariousness. Often situated in the global south, scholars have argued that it is important to focus on the incompleteness of infrastructure, rather than failed infrastructure (Guma, 2020), as well as on practices of maintenance and repair to support piecemeal changes rather than big transformation. As Vanesa Castán Broto and Harriet Bulkeley (2014) argue: repair and maintenance can help to keep obduracy in place and this can also be better for sustainability purposes. These examples underscore the point I highlighted earlier: that rather than

11 See also historian of technology David Nye, who convincingly argues that power blackouts in American cities were not only negative, disturbing events, but also allowed for improvisation because they “redefined the potential uses of public spaces” (Nye, 2010, p. 81). People were sitting or lying on the sidewalks and new social interactions occurred because their normal routines were disrupted. As such, “a blackout provided new possibilities” (p. 82).

focusing on big innovations and novelty in addressing sustainable urban change, it can be more fruitful to focus on the small-scale level and on local practices such as maintenance and repair, which actually enhance the obduracy of infrastructure. Furthermore, this scholarship counterbalances an important bias of Western scholars that is based on particular modernist ideals and assumptions about the proper meaning of well-functioning technology.

To sum up my argument thus far: a focus on urban crises and disasters can contribute in fruitful ways to my research agenda of urban sustainable transformations. Crises can lay bare the existence and persistence of spatial inequalities and injustices, and this understanding can activate people to transform in more just ways. Another aspect of urban crises is that they may elicit a particular transformation that would not have been possible without them. A focus on crisis also entails attention for slowly unfolding disasters, such as those caused by climate change. This draws research on the precarity of infrastructure into the limelight, by focusing on practices of maintenance and repair. Such practices may help to keep things obdurate, as a more desirable strategy from a sustainability perspective. Having discussed the first and second of my three perspectives, I will now introduce the third perspective: fostering transformation through experimentation.

Perspective 3: Urban Experimentation and Transformation

We have now looked at obduracy as a factor that makes quick urban transformation hard to achieve. As I discussed, crises and disasters may be the result of urban transformation decisions made in the past, but they may also lead to new opportunities for urban transformation. As indicated, radical change or innovation is not always necessary or even desirable in our efforts to achieve a more sustainable city. Another strategy for initiating urban transformation is through experimentation. This is of course a more deliberate approach to provoking urban change.

Urban experiments involve piecemeal and iterative rearrangements of the urban fabric, often including the active engagement of citizens and “learning by doing” about user practices, cultural preferences and policy implications. While experimentation in the natural sciences often takes place in laboratories, cities also have a history of experimentation whereby the city itself is conceived as a laboratory (Dierig et al., 2003). Although there are obvious differences between laboratories in the

natural sciences and the city as a laboratory, both can be productively understood as “deliberately constructed sites of knowledge production” (Karvonen & Van Heur, 2014, p. 385).

According to Andrew Karvonen and Bas Van Heur (2014), the more recent examples of urban laboratories and experimentation are characterized by three distinctive features that set them aside from other forms of urban development: their situatedness, change-orientation and contingency (Karvonen & Van Heur, 2014, p. 379). Urban experiments are “intentional sites of urban innovation” (p. 388), where stakeholders try to open-up new development trajectories and processes of urban transformation. The notion of laboratory suggests that cities are continuously made, un-made and re-made. In their focus on change, contemporary urban labs often aim at including diverse societal stakeholders in the lab’s design and development. In this sense, they draw on broader societal and scientific developments such as citizen science, trans-disciplinarity and living labs. As urban labs often have an open experimental design that can be influenced by diverse stakeholders, the outcomes are also uncertain. However, the fact that the outcomes of urban experiments are contingent does not mean that the impacts are less powerful. “Testbeds are performative,” as is argued by STS scholars (Engels et al., 2019). Experiments raise expectations among participants, while ideas and agendas become more aligned and investments and agreements about how to embed new infrastructure are negotiated. In this way, urban experiments may lead to the emergence of new path dependencies in urban development.

The notions of “urban experiments” and “urban laboratories” are often charged with ideas about the prospects of new technology in creating transformative change. Yet they are also applied in contexts that are more mundane. For example, in our Embedterlabs project, we developed small-scale urban interventions in three European cities: Stockholm, Gdansk and Maastricht. Street experiments in Stockholm involved temporarily changing local regulations and the physical design of streets as a key urban infrastructure, to learn about and transforming urban mobility and public space. Streets were closed off for cars, new street furniture such as benches and planter boxes were installed to allow for different uses of the space. In Maastricht, we experimented with the greening of university parking spots, and we tried to lure university employees who would normally come to work by car into a more

sustainable commuting alternative. Our experiments relied on low-cost and scalable interventions (urban furniture, street markings, flowerpots) and policies, and this approach has become more widespread as a form of “tactical urbanism.” This is currently being used by a wide range of actors, such as governments, businesses and nonprofit organizations, citizen groups, as well as individuals who engage in open and iterative development processes, efficient use of resources, and use the creative potential unleashed by social interaction (Lydon & Garcia, 2015, p. 2). City governments across Europe and North America introduce small-scale interventions such as temporarily closing off streets for motorized traffic, sometimes as trials before permanent change, in an ambition to make them more sociable or allow for children’s play (Bertolini, 2020).

Today, urban experiments are often promoted as a promising way to instill transformative urban change toward sustainability, yet various scholars also point to several shortcomings in this regard: the relative lack of up-scaling, formal learning agendas and impact on wider policymaking in the cities where they are conducted (Dijk, De Kraker, & Hommels, 2018; Eneqvist & Karvonen, 2021).

Others question the very idea of urban experimentation and warn against urban development becoming guided by a patchwork of experiments without guidance of a coherent idea about the future city. Moreover, the ideals of co-creation, based on cultural values such as inclusivity and accessibility, often seem to be at risk of being overtaken by commercial and economic interests (Levenda, 2019). In addition, geographers point out a “dark history” of experiment, in how they are often legitimized by referring to a narrative of crisis. This crisis can be the climate crisis, a demographic crisis or a political crisis, but the main purpose of the narrative is to use the crisis to convince relevant stakeholders of the need to experiment and bring about urban change (Caprotti & Cowley, 2017). For urban experimentation to find its proper place in the governance of cities, city governments need to enhance their capacity to steer them toward sustainable transformation while also being attentive to issues of legitimacy and accountability (Eneqvist & Karvonen, 2021)

STS scholars Cynthia Selin and Jathan Sadowski (2015) argue that obduracy should play a more central role in such processes of public participation about urban transformation. They say that publics are often asked to imagine the future, but there is not enough attention for the embedded structures in place that might be hard to change:

“The wholesale relinquishing of obduracy shields critical analysis from having to robustly look at ‘the future’ and how it maps onto what already exists” (p. 219). They argue that obduracy, while being quite relevant to processes of public engagement and technology, has not received sufficient scholarly attention. Public engagement exercises will be more balanced and much stronger in their impact if they take more seriously the various ways in which the past persists into the present. But also the future should get more attention in such processes, they argue: “the obduracy of the past – the concrete entanglements, dynamic inertias, sticky ideologies and clashing frames – make it so that futures are already in the making” (p. 231). Politics play a role in shaping possible futures, but once these politics have materialized, their impacts are difficult to overturn or overwrite: “efficacy requires seriously accounting for obduracy – that is knowing what we are pushing up against – and what’s pushing back” (p. 232).

As an example of how the past plays into the future in urban transformation, I would like to revisit one of my earlier case-studies: the reconstruction of the highway through Maastricht. This highway was built in the 1950s, as part of a large-scale international infrastructure network between Amsterdam and Genova in Italy. When car traffic grew in the 1950s and 1960s, it became more and more of a burden to the city. The growing levels of noise, air pollution and congestion, as well as the fact that the highway cut the city in two, troubled local residents and policymakers alike for fifty years. Although engineers involved in the design and construction of the highway considered the idea of a tunnel as of the early 1950s, it took until 2016 before the tunnel actually opened for traffic. In my earlier work, I analyzed fifty years of debates and negotiations around the tunnel plans in Maastricht. One episode in this history involved a so-called “Infra-Lab” experiment, where citizens were invited to imagine alternative futures of the highway and come up with creative solutions for the problems it caused. The tunnel remained the dominant imaginary for a long part of this history – in fact, one can argue that the tunnel gained obduracy as a desired future long before it was implemented. To nuance Selin and Sadowski’s argument, I would like to add that aside from taking the obduracy of existing structures more seriously in participatory processes, it is also important to realize that even not yet existing imagined futures can gain a form of obduracy and performativity.

To conclude, urban experimentation in laboratories has many downsides, but it may also have much potential. I argue that not only obdurances resulting from the past but also imaginaries of the future should play a more important role in urban labs. Although it is possible to argue that these labs can only make small contributions to much-needed urban transformations toward sustainability, it is also true that starting small may help to transform bigger. My research agenda includes attention for studying how these urban experiments can gain in impact. Furthermore, as Martin Emanuel and I argue, historical cases can serve as a source of inspiration and as exemplars of experimentation in times when participatory ideals were stronger.¹² A better understanding of such successful historical cases can be used to make historical knowledge actionable toward future decisions and developments in co-creative urban experimentation.

Toward a Research Agenda

In this lecture, I have argued that STS, the history of technology, and studies of cities and infrastructure have a number of vital contributions to make to the current debate on urban sustainability transformations. I have shown the city to be an important strategic research site for studies of sustainable transformation. Building on existing historical and sociological research on urban technology and infrastructure that I discussed today, I want to expand and further develop my research agenda around the three perspectives that I outlined. My research agenda focuses on how a better understanding of the dynamics of urban obduracy and change can inform sustainability transformations in cities. In this lecture, I have highlighted three key perspectives of urban obduracy and change that can deepen our understanding of what is needed for such sustainability transformations: 1) reviving sustainable technologies of the past; 2) the relation between crisis and transformation; and 3) transformation through experimentation. In this part of my lecture, I will explain the nature of my research agenda in more detail by building on, refining and expanding those perspectives.

From the first perspective, we have learned that to enable urban sustainability transformations, it is important to look not only at new

12 Parts of this section are based on a forthcoming chapter written by Martin Emanuel and me: Hommels, A. & Emanuel, M. "Histories of urban technology: Infrastructures, imaginaries, experimentation" to be published in "A Cultural History of Technology" edited volume, Bloomsbury.

innovations, but also at old, existing, mature technologies that may be more sustainable after all. Reviving them or making sure that they do not completely fade out may serve as interesting avenues for sustainable transformations. A better understanding of the myriad connections between past, present and future, including the development of new sustainable future imaginaries, is needed to support such strategies. Questions relevant for this line of research are: How do technologies get redefined as (un)sustainable, and how do these definitions vary historically and geographically? How can we better understand value trade-offs in urban sustainability transformations? How do stakeholders deal with the legacies of the past (i.e. urban obduracy) when they make future plans for a more sustainable urban environment? How can temporary infrastructures and pockets of persistence be made more productive in the attempts to make more permanent sociotechnical change possible?

From the second perspective, the relation between crisis and transformation, we learned that crises can make the existence and persistence of spatial inequalities and injustices visible, and that this understanding can potentially activate urban stakeholders to transform in more just ways. Another aspect of these urban crises is that they can bring about transformation that would not have been possible without them. A focus on crisis also necessitates attention for slowly unfolding disasters. This makes research on the precarity of infrastructure highly relevant, as well as focusing on practices of maintenance and repair. Such practices may help keeping things obdurate, as, in some cases, a more desirable strategy from a sustainability perspective (cf. perspective 1). In this context, seeking dialog with global south scholars and their research on these topics will feature as a particularly useful research avenue. Questions to be addressed include: How do crises (including war and disaster) impact on processes of urban sociotechnical change? And which inequalities and injustices emerge from decisions on urban infrastructural change toward sustainability?

My third perspective, which addresses experimentation and transformation, revealed that urban experimentation in urban living labs comes with downsides, but that it also has much potential. I argued that this perspective can be enriched by further research on the relationship between obduracy and future imaginaries. This line of research has a clear potential for action and intervention. One might contend that

these labs can only make small contributions to much-needed urban transformations toward sustainability. This is why I also propose to study how these urban experiments can gain in impact. Furthermore, we need more historical cases as a source of inspiration and as exemplars of experimentation in times when participatory ideals were stronger. A better understanding of such successful historical cases can be used to make historical knowledge actionable toward future choices and developments in co-creative urban experimentation. Relevant questions here are: How can urban experiments be designed in such a way that they have more impact? What can we learn from historical cases of urban experimentation for experiments of today? And how can we embed our knowledge of past obdurances as well as future imaginaries in processes of urban transformation toward sustainability?

My research agenda comprises a new approach precisely through the combination of the three perspectives. Focusing on the various roles of obduracy, crisis and experimentation in urban sustainability transformation moves away from a few other approaches toward this challenge. Understanding obduracy and change as interconnected phenomena allows us to avoid the trap of an overemphasis on both novelty and change. Moreover, it provides a much sharper focus on the agency of historically embedded urban infrastructures and their impact on the capacity to transform. Furthermore, linking research of urban sustainability transformations with the notion of crisis allows us to study crises or disasters not only as phenomena impacting on the city, but also as vehicles for revealing urban vulnerabilities and inequalities. In addition, crises can help unsettle a long-standing urban status quo and can thus act as vehicles for experimentation and transformation. This also involves an acceptance (if not an embrace) of failure and uncertainty in the process of urban transformation, and an effort – also on the part of societal and governmental actors involved – to learn from this.

This should contribute to an actionable research agenda and generate deeper insight into the room for change in cities. Aligned to one of the most challenging societal issues of today, urban sustainability, this research has a clear societal engagement and impact. Developing new and creative ways to co-create and communicate our findings with and in society is a challenge I would like to take up in further developing this chair. This also involves doing research at various temporal and geographical scales: historical studies of long-term transformations

and path dependencies, as well as research closer to the present. I also propose doing local research, for example here in Maastricht, as well as linking local urban developments to global transformations. While perhaps not as well-known or widely researched as Paris, London and Berlin, similar processes of change and obduracy take place in smaller cities. And while cities may at first sight seem highly locally bounded, they are in fact, through their multiple infrastructures, important nodes in global networks and flows of materials, knowledge and people. To conclude, my research agenda for urban sustainable transformation in times of turmoil, tries to strike a balance between past and future, obduracy and change, and local and global developments. Bringing together historical and sociological approaches of technology, I hope to contribute to the development of new interdisciplinary perspectives for the research and governance of sociotechnical urban transformation.

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