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Ways of seeing: landscape-infrastructure as critical design framework to analyse the production of Paris's Boulevard Périphérique

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ABSTRACT

When studying change in urban infrastructure landscapes, technical, political, and aesthetical choices are often considered in isolation. Yet, large-scale infrastructures such as urban motorways are the crystallisation of design entanglements. The decisions taken by an engineer—to build an elevated highway instead of a tunnel, to erect soundproof walls, to destroy a church instead of a housing block—are the expression of technical knowledge, cultural prejudices, socio-political frameworks, and value-based opinions reframed as expertise. This paper will be focussing on the 'social imagination' of the designers, by calling for a recontextualisation of design choices within their professional and cultural discourses, practices and imaginaries in order to question these infrastructural artefacts as socially produced. This paper will illustrate the relevance of applying a critical design framework to study infrastructure landscape change by focussing on the Boulevard Périphérique of Paris, and specifically on the emergence of noise from road traffic as nuisance.

The highway […], very much like a piece of architecture or industrial design, lies in an order of precision where scientifically determined functional limitations leave the designer considerable freedom to give the object intuitively a more refined and unique expression, beyond the bare minima of utilitarian standards. The moving eye perceives the form of the highway not as an engineering problem, but as an aesthetic entity, a piece of sculpture or architecture, built of earth, asphalt, concrete, steel, shrubs and trees. (Tunnard & Pushkarev, 1963, p. 170)

Introduction

It is commonplace to describe cities as intertwined accumulations of temporal and physical layers, as palimpsests. The analytical process of unearthing and analysing these layers offers a dense, nigh infinite research path for urbanists and historians (Schama, 1995). Yet, such historical approaches to the study of urban space can sometimes consist of somewhat simplistic expressions of crude historical determinism. This seems to be especially the case when studying post-war modernist infrastructure networks and their role in reshaping urban landscapes

tormented by the destruction of World War II, as urbanism programmes in Europe rapidly shifted their ambitions from 'reconstruction' to 'modernisation'.

When studying infrastructure in urban landscapes, technical, political, and aesthetical choices are often considered in isolation. Yet, large-scale infrastructures such as urban motorways are the crystallisation of *design entanglements*[1]. The decisions taken by an engineer—to build an elevated highway instead of a tunnel, to erect soundproof walls, to choose between the destruction of a church or a housing block—are the expression of technical knowledge ('The calculations confirm this bridge will stand.'), cultural prejudices ('This building is not worth saving.'), socio-political frameworks ('There is not enough budget to build underground.'; 'This Mayor's demands are unrealistic.'), and value-based opinions reframed as expertise ('Residents' complaints regarding noise are irrelevant.'; 'This road does not constitute a physical obstacle for pedestrians.'). Depending on the socio-political contexts (e.g. political institutions, influence of civic groups, role of public and private sectors, etc.), such decisions are also the results of negotiation with a number of stakeholders. The accumulation of these elements (e.g. artefacts, technologies, practices, ethics, etc.) over time and space thus constitutes design entanglements. To approach these decisions in isolation results in a partial and biased understanding of the socio-technical choices that supported the development of any infrastructure in an urban landscape and its change.

Using the Boulevard Périphérique of Paris as exemplar, and building upon the notions of infrastructure in science and technology studies (Allen, 2011; Hommels, 2008; Picon, 2018), and landscape analysed as 'ideology' in cultural studies (Barrell, 1980; Berger, 1972; Lefebvre, 1974; Mitchell, 1994b), this paper aims to offer a critical design framework that emphasises the importance of aesthetics, representation and symbols to analyse diachronically the design of large-scale urban infrastructure networks in relation to urban landscape. By diachronicity, I mean to study situations of change, unfolding over a long period of time, instead of focussing on specific processes (designing, retrofitting, destruction) at specific moments in time (synchronicity). By critical design framework, I mean a coherent ensemble of theories enabling students of landscape infrastructure to analyse design choices carried out by designers of infrastructure. In this paper, I specifically wish to address Matthew Gandy's regret that, as one considers the many overlaps between the notions of landscape and infrastructure, 'much of [the] emerging literature [on landscape and infrastructure] lacks historical perspective: an overriding emphasis on "policy relevance" has ironically precluded many possibilities for critically rethinking the role of landscape and infrastructure in the contemporary city' (Gandy, 2011, p. 57). In doing so, this paper aims to contribute to a wider debate on infrastructure landscape (Bélanger, 2017; Castán Broto, 2019; Gandy, 2014; Robin & Castán Broto, 2020) by foregrounding the 'social imagination' (Picon, 2018) of designers, as well as notions of aesthetics and representation.

I will start by developing the critical design framework that I already introduced briefly before applying it to studying the Boulevard Périphérique of Paris, and more specifically the emergence of noise from road traffic as nuisance.

Theorising a critical design framework to analyse change in infrastructure landscape

In this first section, I propose a critical design framework to analyse diachronically the design entanglements infrastructure constitute in relation to landscape, and more specifically urban motorways. This critical framework pertains to design in the sense that it is meant to equip students of landscape infrastructure with tools to critically analyse design choices, no matter the domain such design choices are initially associated with—aesthetics (e.g. beauty, an unpleasant sound), technical (e.g. the technical feasibility of building a bridge), policy (e.g. the adequation of a design in relation to a political project), economics (e.g. the financial cost of building a

road). I do so by relying extensively on science and technology studies (STS), specifically the works of Hommels (2008), Picon (2018) and Allen (2011) that enable us to demonstrate that no design is 'purely' technical. I then link this literature to Henri Lefebvre's 'spatial triad' (1974) by way of landscape as 'ideology'. I conclude with a short synthesis of these two parts highlighting their articulations, accompanied by some elements of methodology.

Foregrounding the aesthetics of infrastructure as political

Science and technology studies (STS), especially research by Anique Hommels (2008), Barry Allen (2011) and Antoine Picon (2018), allow us to study technical function in relation to aesthetics whilst engaging with notions of professional practices and cultural mindsets.

Anique Hommels focuses on developing STS in relation to urban change with the notion of 'obduracy' that she defines as 'the clash between new ideas about urban development and the opinions and politics embedded in the urban structures that are already in place' (Hommels, 2008, p. 7). She does so by building on notions of 'technological frames' (Aibar & Bijker, 1997; Bijker, 1995) and the comparable concept of 'professional worldviews' (Ellis, 1996), i.e. artefacts' interpretative flexibility—or lack thereof—by dominant socio-professional groups, such as architects and engineers, or community groups. The 'closure' of interpretative flexibility or 'fixity' of meaning 'result in technology's obduracy' (Hommels, 2008, p. 23). An example of such obduracy is for instance when it is considered impossible to reorganise roads to accommodate the traffic of bicycles because 'roads are meant for cars.' In a comparable enterprise, architectural historian Picon proposes the notion of 'social imagination' to analyse the role engineers play in cities via their design of infrastructure. He does so in an effort to merge infrastructure's 'two orders of reality […]: infrastructure as object or technical system, or infrastructure as a set of social behavioural patterns' (Picon, 2018, p. 263). He defines 'social imagination' as 'mean image-based systems of representation and values that are shared by various collective stakeholders concerned with infrastructure, including politicians, administrators, operators, maintenance technicians and indeed users (their visions coinciding on some points and diverging on others)' (Picon, 2018, p. 264).

'Obduracy' and 'social imagination' focus on internalised socio-cultural constructions in relation to technical artefacts—the latter focussing on the systems of representations, the former on the inherited qualities of artefact as produced by such systems of representations. In *Artifice and Design* (2011) philosopher Barry Allen further deconstructs technical functionality as a 'fallacy', and prevents us once and for all to 'boil down [engineering design processes] to rational calculations' (Picon, 2018, p. 264). Allen argues that there is an *a priori* when it comes to analysing highly technical infrastructure, such as bridges and roads, that is often presented as 'common sense'. This a priori is the idea that such artefacts are the result of *technical reason*. And that technical reason, being commanded by the necessities of fulfilling a function whilst abiding by the laws of science, has necessarily *maximised efficiency* and does not leave room for any aesthetical consideration beyond mere ornamentation. Analysing projects and writings by prominent engineers of the nineteenth and twentieth centuries, Allen deconstructs this a priori by pointing up the correlation between bad aesthetics and bad engineering. He concludes that 'good technical design (good engineering, the best work) is at once aesthetic and structural/mechanical, because the look and feel of a structure or device […] is as much part of the design problem as its structure or mechanism' (Allen, 2011, pp. 146–147). Allen shows that there is no such thing as a purely functionalist form and that there is no obstacle a good engineer cannot circumvent (though, there might be other issues at stake, like financial cost, or the opinion of a client). Allen's demonstration takes apart the reality of an *absolute* function. In essence, Allen demonstrates that technical reason is *social*. And should be analysed as such:

> There is ultimately no distinction between a technological solution and a social, political, even aesthetic solution, because what 'works' is conditioned as much by available or invented technology as by the

political, economic, historical, and aesthetic contexts that ultimately define any 'technological' problem, as well as the scope of acceptable solutions. (Allen, 2011, p. 19)

A critical take on infrastructure in relation to roads and the fallacy of technical reason reviewed above lead us to foreground the cultural and aesthetical aspects of infrastructure in order to enrich our understanding of their technical, social and political dimensions. To develop this argument further, this paper will now focus on the notion of landscape as 'ideology' in relation to Henri Lefebvre's 'spatial triad' of space as 'lived', 'perceived' and 'conceived'.

Landscape as ideology and Lefebvre on the 'production' of Parisian space

Within the—transparent, obvious, familiar, reassuring—notion of landscape is a construction, a training of one's eye. Beauty, nature, a pleasurable prospect that is worth painting or photographing—and by extension, the pleasure of walking by the sea, picnicking by a tree, hiking in the mountains—are cultural artefacts, social constructions that have evolved with time (Corbin, 1994). These concepts, experiences, cultural traits are 'ways of seeing' (Berger, 1972).

Art critique (Berger, 1972) and cultural studies (Cosgrove, 1985; Fitter, 1995; Said, 1978; Williams, 1973) have explored a 'darker side of landscape' (Barrell, 1980), by analysing landscape as 'ideology' or 'social hieroglyph': as 'an emblem of the social relations it conceals' (Mitchell, 1994a, p. 15). For instance, in her study on seventeenth-century Dutch landscape paintings historian Ann Jensen Adams (2002) demonstrates that the 'sudden' awareness of Dutch painters for landscape was not necessarily the culmination of a spiritual civilisation journey but the 'naturalisation' of political, spatial and economic events: the enlisting of 'nature' in the legitimisation of modernity, the encapsulation of socio-political phenomena within one's perception of space as 'given', or 'natural'. The perception of space, of 'nature', as well as the representations that reify and perpetuate such perceptions are socially 'produced', social hieroglyphs in need of deconstruction.

The works on an 'ideology of landscape'[2] cited above resonates with that of philosopher and sociologist Henri Lefebvre. On the modern city, he writes that

> Painters, architects, theoreticians [of the Italian Renaissance] have devised a representation of space, the perspective, from a social practice, itself the result […] of historical changes that modified the relationship 'city-countryside'. Horizons and vanishing points […] have determined a representation at the same time intellectual and visual, leading to the dominance of the gaze in some kind of 'visualisation logic'. This representation, developed over centuries [from the Italian Renaissance to the 19th century] has been invested in the architectural and urbanistic practice: the *perspectives*, the code.[3] (Lefebvre, 1974, p. 51 original emphasis)

Lefebvre's magnum opus, *La Production de l'espace* (The Production of space), published in France in 1974 and translated to English in 1991, is the culmination of a series of writings on space, and specifically urban space, whose publication-span roughly matches his tenure at Nanterre University from 1966 until 1973 (Lefebvre, 1968, 1970a, 1970b, 1972a, 1972b, 1974). Interestingly, Lefebvre developed his 'science of space' within the physical and temporal space of the Boulevard Périphérique, exactly at the time of its construction. From his home in the Marais district (Central Paris), Lefebvre crossed the Boulevard Périphérique to teach in Nanterre (a suburban town, 5 km west of Paris), as the Boulevard Périphérique was being built (1956–1973).[4] His philosophy of space is wired in his observation of post-war *aménagement du territoire* in France (in Paris where he lived, but also in his home country of Béarn), the impact of urbanisation and spatial planning on rural space, the rise of automobile, the relegation of working classes and immigrants from the city centres to the *banlieues*. In the foreword he writes in 1985 for the third edition of *La Production de l'espace*, Lefebvre proceeds to his autocritique and shares that: 'this book has missed a chance to describe in a direct, precise, if not pamphletary

way, the production of the suburbs, ghettos, isolates, fake "ensembles"[5,6] (Lefebvre, 1986, p. XXVII).

One of the structuring theses of Lefebvre's book is a spatial triad enabling urbanists to 'decipher' the space produced by a society. Lefebvre's triad analyses space as 'perceived' (*perçu*), 'conceived' (*conçu*) and 'lived' (*vécu*). Perceived space is the 'secretion' of a society's 'spatial practice' that 'closely associates the everyday reality (the daily schedule) and the urban reality (the journeys and networks connecting workplaces with "private" life, and leisure). A surprising association as it includes within it the most extreme separation between those places it links'[7] (Lefebvre, 1974, p. 48). This first notion of 'perceived space', a passive one, merges both temporal and spatial elements as it reflects on the quotidian of urbanites and the relationship between times of the day, activities, and disjointed locations such as work, home, places for leisure but also roads, train stations, airports. The second element, conceived space, is about the 'representations of space', the space of 'savants, planners, urbanists, technocrats that "cut" and "arrange" […] It is the dominating space in a society'[8] (Lefebvre, 1974, p. 48), one organised around numbers, norms and 'canons'. This is the space of the dominating class: the bourgeoisie, the technocrats. It is related to design, to conception, and as such it is the only active notion of the triad. Finally, the lived (*vécu*) space is the 'spaces of representation […] through images and symbols', in other words: culture, and even mysticism. For Lefebvre it is the 'dominated space, therefore imposed, that imagination tries to modify and appropriate'[9] (Lefebvre, 1974, p. 49).

Articulating landscape infrastructure as critical design framework

The European Landscape Convention signed by the Council of Europe (2000) that defines landscape as 'an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors' (article 1a) has set a significant milestone in the appreciation of space as 'social', and specifically acknowledging the relationship between landscape, sustainable development, democracy and human rights (Council of Europe Landscape Convention, 2018). It is a demonstration of the journey the notion of landscape has achieved, overcoming the limits of aesthetics and art critique to become an expansive concept that is now well-used in policy.

The two sections of this critical design framework somewhat stand on two different levels. Within the context of landscape infrastructure change, the former is more interested in the notion of infrastructure, the latter in that of landscape. Indeed they are grounded in very different theoretical settings: one in a 'neo-marxian' reading of landscape (Gandy, 2016), the other in sciences and technology studies; themselves made of a very large and disparate intellectual community[10]. For instance, I have not addressed some fundamental intellectual differences in the corpora I have mobilised, such as their respective approach to 'social construction' (see Hacking, 1999).

The literature mobilised in this critical design framework form a coherent whole that can be put to practice in analysing data—as I will show in a moment with the case study of the Boulevard Périphérique. The Lefebvrian 'spatial triad' is inspiring, yet somewhat difficult to mobilise when analysing datasets from fieldwork research. Meanwhile, concepts of 'obduracy' and 'social imagination', help building bridges that take us back to the offices of designers, the prosaic processes of 'decision-making', as well as community planning workshops. Indeed, together with Allen's dissection of 'technical reason', these concepts invite us to consider a scope of possible sources: maps, blueprints, administrative correspondence; professional periodicals, schools syllabi; when possible, interviews; as well as cultural artefacts enabling students of landscape infrastructure change to position a given topic within a cultural, and/or socio-professional mindset. Taken together, the works by Picon, Hommels, Allen offer to researchers a 'practical'

internalisation of
socio-cultural constructions
personal preferences,
value-based opinions
reframed as expertise

concept of landscape
focus on aesthetics,
symbolic, representation

concept of infrastructure
focus on technical function,
maximisation of efficiency

① production of space
Lefebvre, 1974 [en, 1991]

② invention of landscape
Clark, 1949
Gombrich, 1955

③ poetics of infrastructure
Larkin, 2013
Kaika, 2006
Kaika & Swyngedouw, 2000

④ obduracy
Hommels, 1998

⑤ social imagination, technological frames
Picon, 2018
Aibar & Bijker, 1997
Ellis, 1996

⑥ landscape as ideology
Mitchell, 2002 [1994]
Jensen Adams, 2002 [1994]
Cosgrove, 1985
Berger, 1972

⑦ völkischen Landschaft (Seifert)
Alonzo, 2018
Zeller, 2007

⑧ fallacy of functionality
Allen, 2011

⑨ engineers as practical sociologists
Law & Callon, 1988

⑩ artefacts as politics
Winner, 1980 ; 1986

⑪ social construction of technology
Bijker, 1987 ; 1995

references part of the framework but not specifically discussed in the paper

references part of the framework and specifically discussed in the paper
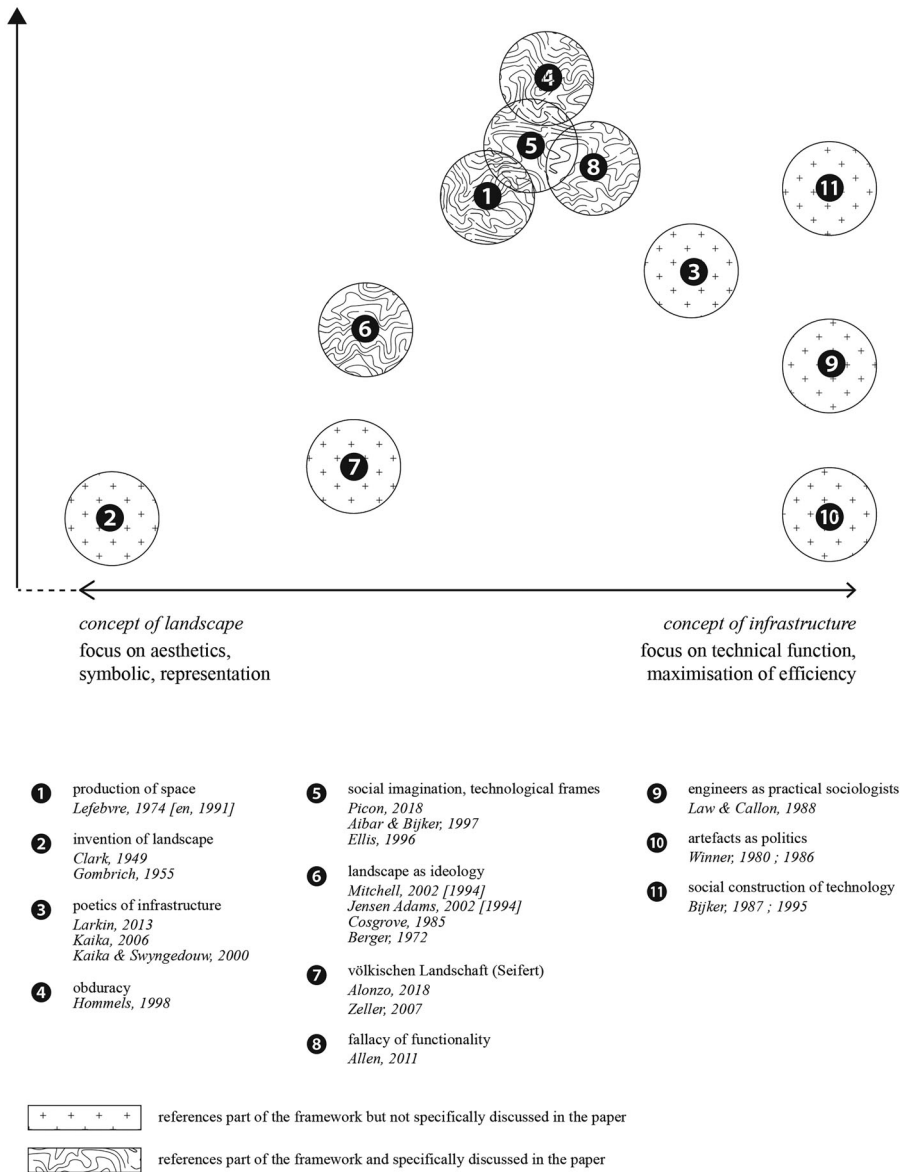
Figure 1. Visual synthesis of the landscape-infrastructure critical design framework.

path to study Lefebvrian space, as an extension to Lefebvre's theory. Their complementarity is at the core of the critical design framework proposed in this paper (Figure 1).

To articulate and illustrate the coherence of the critical design framework I am proposing here, I will offer a possible methodology arising from this framework in the second part of this paper that engages with the Boulevard Périphérique of Paris, and specifically on the emergence of noise from road traffic as a social issue.

The notion of *landscape* infrastructure is used in this paper in relation to sound, without developing a specific body of literature on sound as part of the critical design framework. In a typical display of 'ocularcentrism' (Jay, 1988), this framework was initially developed with 'seeing' in mind.[11] My analysis explores empirically how sound challenges such ocularcentric perspectives on space, and to what extent the framework proposed can accommodate a multi-sensorial reading of the infrastructural landscape (on listening to infrastructure, see for instance El Hajj, 2020; Miyazaki, 2017; Ouzounian, 2020; on 'soundscape', see for instance Belval, 2020; Cobianchi et al., 2021; Schafer, 1969). I will demonstrate with the following case study that (a) it is precisely 'seeing' that dominated other forms of knowledges (sound, smell, touch, taste), and as such it is interesting to embrace 'ocularcentrism' in order to critique it; (b) that the framework is flexible in the sense that it remains relevant to analyse discourses and design choices that are motivated by other senses, and not necessarily by 'seeing' alone.

Case study: the Boulevard Périphérique

The Boulevard Périphérique of Paris is a perfect example of a fetishised construction of cultural significance and socio-technical artefact whose analysis should not be blinded by the fallacy of its technical functionality. The critical design framework outlined in this paper already gives us much depth to go beyond linear, flat, traditional narratives that analyse the Boulevard Périphérique of Paris as an 'inert' artefact whose design and position in the urban landscape are the results of 'pure' technical decisions on one hand, and an uncritical obdurate apprehension of historical discourses on the other.

The 'concrete belt' of the Boulevard Périphérique (constructed 1956–1973), built mainly during the Fifth Republic (1958–) consists in a 35 km road infrastructure, built as viaducts and tunnels, in trenches and at surface level, presented as the busiest road section in Europe (Calvet, 2019). A symbol of the gap between 'walled-in'[12] Paris and the *banlieues*, the Boulevard Périphérique is often analysed as a hard border, the concretisation of the city's disdain towards its suburbs (Ronai, 2004). Indeed, the ring road was built in a historically dense space on the edges of Paris proper and as such, is presented as the 'logical' continuation of the hard borders that preceded it (Tribillon, 2015) (Figure 2). Yet, what the literature presented thus far teaches us, and especially Allen's and Hommels's work, is to constantly challenge the notion of 'common sense' in relation to technology. Form does *not* follow function.

This case study will specifically focus on the emergence of noise from road traffic as a social issue, on the reaction of the designers of the Boulevard Périphérique to claims by residents that noise was a nuisance, and on the socio-political elements that eventually impacted the design of the ring road. I will start by a contextualisation of noise from road traffic in the 1950s–1990s and the way it was understood by road engineers, before presenting a short methodological section, followed by the analysis per se.

The emergence of noise from road traffic as nuisance

The emergence of noise from road traffic as a nuisance in late 1960s Paris provides an illustration of such design entanglements this paper has attempted to theorise, that sit at the crossroad of technical knowledge, socio-political frameworks, and value-based opinions reframed as expertise.

As Nathan Belval explains, the notion of noise as a nuisance timidly emerged in France in 1955, when a decree dated 22 October mentioned that housing must be equipped with 'sufficient sonic insulation' (Belval, 2020, p. 33). The topic of urban cacophony, and policies regulating 'unpleasant' noises in the city was not *new*—it is certainly as old as urbanisation (Rozec & Ritter, 2003). Yet, with the rise of automobile, the sounds of traffic (engines, horns, rubber friction on

Figure 2. Map of the Boulevard Périphérique featuring the now-destroyed Fortifications of Paris (also known as Thiers Wall) built in 1844 and destroyed in 1932. The Boulevard Périphérique was built on the space of the former fortifications, from 1956 until its full inauguration in 1973. (2022, Courtesy of the author).

road surface) came to dominate the 'soundscape' of cities. This was the case from the 1930s in the United States (Ouzounian, 2020) and from the 1950s in France (Rozec & Ritter, 2003).

Guidelines, decrees, laws, were developed at an accelerating pace from the early 1970s. The Ministry for Equipment (*Ministère de l'équipement*) rebranded as Ministry for Environment (*Ministère de l'environnement*) in 1971, created the same year a commission B.R.U.I.T. ('*bruit*' meaning 'noise', that stood for *Groupe d'étude du bruit des routes urbaines et de ses implications techniques* or Study group on the noise of urban roads and its technical implication). The guideline was designed to be a 'compromise' among different disciplines (road engineers, architects, urban planners) in order to 'introduce a normalised and shared language that would enable, so to speak, the trading of decibels'[13] (Groupe B.R.U.I.T., 1972, pp. 5–6). The guide formalised tools, protocols, and units to measure noise, and proposed mitigation techniques to be implemented by architects, engineers, and urbanists. It focussed on a quantitative understanding of noise (levels of decibels), not a qualitative one.

As Belval explains (2020, p. 33; 366), the development of a legislative and reglementary framework was concomitant with the wider availability and miniaturisation of portable sound recording devices[14]. The *Loi Bruit* ('Noise Law') voted on 31 December 1992 was a milestone in the regulation of noise in urban and rural spaces, especially in relation to the impact of infrastructure (road, railway, airport) on human health and the environment.

Methodology

To study design entanglements in the Boulevard Périphérique and the decisions by the engineers in charge of its design to acknowledge, ignore, act upon, or mitigate against the noise created by the Boulevard Périphérique, I used the archives of the Department for roads of the

Préfecture de la Seine[15] held by the Archives de Paris (call number 2276 W) and the correspondence from Deputy Mayor Christian de la Malène (1977–1983) held at the Bibliothèque Administrative de l'Hôtel de Ville (folder Ms 1542, p. XCI). I have consulted with the archivist of the Department for roads and the Archives de Paris, to identify the relevant call numbers to carry out this research.

The archives of the Department for roads are especially rich. It is of course always difficult to identify what is missing from a fonds, what has been left out, but in the hundreds of boxes available we find copies of all correspondence between departments, and different rungs of the hierarchy; between the civil servants and the Prefect; between civil servants and elected officials. For a large majority of these documents, the archives feature the different drafts of the letters— starting with the handwritten originals, to a series of versions that were reviewed, commented, and edited by hand by all stakeholders, before a final version was approved.

This correspondence shows the design process of the ring road. By design, I do not necessarily mean the drawings, blueprints, calculations, but the administrative correspondence that dictated such design processes.

In analysing these sources, we are reaching the core of Lefebvre's 'conceived' space in the making. At the same time, we are not far from the temporality of 'perceived' space as we engage with notion of speed in relation to commuting, and 'lived' space with the ring road as space of representation of modernity, progress.

Administrative correspondence does not have the malleability and specific quality of interviews.[16] This might appear as an obstacle in the research, especially as we analyse social imagination, but the wealth of information contained in the correspondence, the vocabulary chosen, the language and the tone of the replies, analysed in light of the historical contexts briefly introduced above, offers us in fact a dense dataset. The correspondence from Deputy Mayor de la Malène provides us *the other side*, that of the politicians. The archive is poorer, in terms of the quantity of documents available. Yet, it is also less constrained by the protocol of civil service. The correspondence is more direct, bolder, cruder. It does not have the restraint of a civil servant writing to their superior.

Analysis

Administrative correspondence between civil servants and elected officials, complaints they received from residents, the way they handled them and acted upon these complaints, reveal the emergence of a new social issue in relation to road traffic: noise as a nuisance. I will use several examples to illustrate and analyse this change and its impact on the design of the Boulevard Périphérique.

Complaints started as soon as the first sections of the urban motorway opened. In 1964, the representative of a union reached out to complain about the negative impact of the 'racket' (*vacarme*) caused by road traffic as well as the 'toxic and foul-smelling emissions' on a nearby high school and social housing block:

> In an era when top health authorities acknowledge the threats created by noise on individuals, and the great distress that results from it in the long-run, and when the same authorities are looking at the issue of air pollution in urban centres, it is undisputable that a serious inquiry on the living conditions of those […] living next to the highway, deserve the Public Authority's full attention.[17]

The answer provided by the engineer in charge of that section of the Boulevard Périphérique in a letter dated 1 December 1964 is disparaging. He rebuffs the complaint, stating that road surfacing is in pristine condition and that the road design has already minimised the possible impact of noise on the neighbours of the ring road. The letter concludes irrevocably by mentioning that the routes for the Boulevard Périphérique predated the permits granted to the buildings the complaint letter referred to.

In another letter filed in the archive folder, dated 6 December 1968, the residents of a social housing estate near Porte de Vanves (14th arrondissement) remind the Prefect of the Seine that a communication campaign initiated by public authorities, 'Against the Noise' (*Contre le bruit*), has been omnipresent on national radio and television in the past few weeks. They take this opportunity to denounce the 'unbearable Noise' (written with an uppercase 'N') caused by the ring road nearby that

> shakes the nerves of the adults, disturbing continuously their rest day and night, weekdays, weekends and holidays and is often the cause, for their children's poor health[18]

They then regret that the impact of noise has not been taken into account early on in the design of the ring road. And after acknowledging they accept it would be unrealistic to cover the ring road at this stage, they ask for noise barriers to be installed. The cabinet of the Prefect has to call again several times on the engineers of the Department for roads so that they provide an answer to the petition.[19] Their answer eventually states that the residents' claims cannot be fulfilled—though they remain open to testing noise barriers.

In an earlier draft of the answer to the petition, the section acknowledging the 'absolute pertinence' (*entièrement fondées*) of the residents' complaints has been crossed out in red. It did not make it to the final letter.

The internal correspondence between the engineer of the ring road in charge of drafting the letter and the Prefect's staff acknowledges that, 'technically', it would not be impossible to cover this section of the ring road, but that it would be costly (seven million Francs, or close to nine million in today's Euros adjusted for inflation). On noise barriers, the engineer replies his department has no experience with this technology. He concludes his letter:

> Like it has been done with previous complaints, we are sharing with you a draft letter rejecting the request from Mr. P***.[20,21]

In the 1960s and early 1970s, engineers of the Corps of Bridges and Roads[22] in charge of designing, building, and operating the Boulevard Périphérique regularly rejected all claims regarding the negative impact of noise on residents' lives. The reality of noise as a nuisance was dismissed as a necessary externality of technical progress. Furthermore, the responsibility for soundproofing was deflected, rejected on other stakeholders, for instance social housing providers. In a handwritten note stuck on a letter dated 8 July 1970, a civil servant writes that the best solution would be to soundproof housing units 'even though this only works when the windows are closed, and it will be unpleasant during the summer'[23]. They then mention that noise barriers are only a 'palliative solution that is not satisfactory when it comes to architecture nor efficiency'[24].

In the 1960s, noise as a nuisance had already emerged as a social issue, as I demonstrated with the brief historical context section, and the letters cited above show the growing awareness of residents, public authorities, and elected officials to these issues. The topic of noise from road traffic was not yet established as a genuine issue for the engineers of Bridges and Roads, and logically the tools (sonometers have to be purchased), norms (classification of levels of decibels are not available) and institutions (the first tests are performed by the municipal Laboratory for *Lighting*) were not immediately available. On the other hand, concerns for the negative impact noise barriers could have on the *visual* aspect of the ring road are omnipresent in the correspondence: noise walls are described as 'ugly' (*laid*), 'totally unaesthetic and therefore inacceptable' (*totalement inesthétiques et donc inacceptables*), unsafe, and as 'a technical and architectural inconvenience' in a letter by the engineer in charge of the Northern Section dated 16 June 1970, in response to yet another complaint by neighbours of the Boulevard Périphérique.

The situation evolved significantly in 1977. For the first time since the Paris Commune of 1871, the City of Paris elected its executive government. Indeed, from 1871 until 1977, Paris was governed by a *Préfet*, a civil servant appointed by the Central Government. Parisians could

Figure 3. Sound walls 'Maryse Bastié', near Porte de Choisy, built in 1989 (2017–2022, Courtesy of the author).

already elect their municipal council, but councillors had virtually no power. Conservative candidate Jacques Chirac was elected in March 1977. The correspondence of Christian de la Malène, First Deputy Mayor from 1977 until 1983 in charge of finances stands witness to the fast-paced change motivated by the new administration. This new government was much more *political*. Unlike civil servants, they regularly sought (re)election and ambitioned to reach the country's highest elected posts.[25] Elected officials' correspondence revolves around political gains and financial cost for the public purse, more than design issues. They identified the topic of sonic nuisance created by the Boulevard Périphérique as a low-hanging fruit that would allow them to secure residents' votes. 'It is good that the City demonstrates visibly the overall effort that it has engaged for protecting the neighbours of the ring road from noise.' writes la Malène in a letter dated 9 May 1980,

> It is a topic on which we have been regularly criticised for some time now, it is a topic on which we are a bit weak. Any disposition that will allow to strengthen our position is welcome.[26]

The correspondence over several years between the different rungs of government (the Mayor of Paris, the city's administration, the Prefect, the newly created regional government) demonstrates how the topic is now taken seriously. Engineering issues are now relegated as mere cost issues—e.g. the covering of the entire ring road is dismissed as financially unrealistic by all parties. But the noise barriers, brushed off as eyesores, inefficient and technically impossible ten years prior, were eventually installed—often by the same engineers—from 1983 onwards. An ambitious programme voted in 1985 also included the soundproofing of more than 20 000 windows, and nearly 4 km of the ring road being partially or totally covered (Gourlet & Lebret, 1987) (Figure 3).

Within fifteen years, the situation evolved from one where noise from road traffic as a nuisance was dismissed as negligible and subjective, as an issue that should not disturb the *visual*

aesthetics of the Boulevard Périphérique; to one championed by elected officials, at the core of the ring road's future, necessitating significant modifications of the original design, leading to a considerable impact on the architecture of the urban motorway. This evolution can be explained by the concomitant emergence of noise as a social issue, the development of technical knowledge on road traffic and acoustics, changing professional worldviews, and the shift from a technocratic to a mayoral governance for Paris.

Discussion and conclusion

This paper had three main objectives: one, to propose a multi- and transdisciplinary critical design framework enabling students of urban space to make sense of the *design entanglements* infrastructure landscape constitute. The aim of this critical design framework is to be a 'practical', easily mobilised research framework to analyse concrete examples that expand the Lefebvrian concepts of 'production of space' and 'spatial triad'. The second objective was to illustrate the practicality of the proposed infrastructure-landscape critical design framework by devising a possible methodology, that I used to study the design of the Boulevard Périphérique in relation to noise. Finally, a third objective was to contribute to the fast-emerging literature on sonic urbanism with a case study that demonstrated the intricate relationship between ways of *seeing* and ways of *hearing* infrastructure landscape, moving away from the ocularcentrism that dominates landscape studies.

There is a double ambition in order to enhance our critical understanding of changing landscape infrastructure: first, to go past dominant narratives that analyse large-scale post-war modernist infrastructure landscape as historically determined, 'path-dependent', 'inert' artefacts; second, to enrich a literature often working in silos by proposing a critical design framework able to critique design choices related to infrastructure.

The case study of the Boulevard Périphérique enables us to mobilise the spatial triad of Henri Lefebvre: the 'perceived' space of the Boulevard Périphérique (the automobile traffic associated with post-war urbanism that clashed with the resting time of the infrastructure's neighbours), was in conflict with the 'conceived' space of the technocrats that initially dismissed noise as a necessary externality of modernity, and the 'lived' space where visual aesthetics and sonic experience also came in opposition. The mobilisation of the concepts of 'social imagination' as well as the 'fallacy of technical reason', to analyse the design choices of the engineers, take us back to the designers' offices, via their administrative correspondence. A critique of their professional cultures dominated by the sense of 'seeing', allows us to analyse their 'technical' choices with more depth.

Whilst this paper specifically developed a historical approach, the critical design framework proposed in this article and the case study of the Boulevard Périphérique do not need to be restricted to the study of past events. The perception of the role of the Boulevard Périphérique has evolved significantly since the late 1980s, in parallel to that of automobile in Paris and a renewed interest to build a metropolitan government for Paris (Cohen & Lortie, 2020; TVK, 2008). The debates around the future 'disappearance', 'removal' or 'invisibility' of the ring road represent a key controversy that has been gaining momentum since 2001 (see Atelier Parisien d'Urbanisme, L'Institut Paris Région & Forum Métropolitain du Grand Paris, 2019; Tribillon, 2015).

The infrastructure-landscape critical design framework presented in this paper is devised as an intellectual interchange that taps into the varied epistemological traditions of social sciences, aesthetics, and engineering. The diversity of disciplines allows to engage with a number of analytical inputs that would seem irreconcilable otherwise. This diversity also reflects the relational character of urban infrastructures and their heterogeneous configurations (Castán Broto & Robin, this issue). It provides tools to analyse the aesthetic culture of engineers and technocrats, to dissect infrastructure landscapes as representations of modernity, to engage with technical

decisions in relation to socio-economic elements, but also to analyse stakeholders' sensual reaction to urban infrastructure landscapes (from the visual pleasure of freshly-built concrete, to the inconvenience of noise from car traffic). It redefines the key settings of the controversy: in the case of the ring road of Paris, the debate is not about (dis)agreeing if, yes or no, the Boulevard Périphérique is an 'eyesore' but about questioning the politics of aesthetic preferences, different 'ways of seeing': Whose eyesore? Whose ugliness? Whose pollution? It resituates the design of the Boulevard Périphérique within the specialised knowledge of its time, as well as critically enrich our understanding of the forces that enable such infrastructure to change over time. The critical design framework proposed and used in this paper allows students to engage with multiple sources, varied discourses, in order to dissect the design entanglements constituted by infrastructures in relation to a changing urban landscape.

Notes

1. I found inspiration to use the concept of 'entanglements' in the reading of Anna Tsing (2017).
2. See Gandy (2016) on a wave of 'neo-marxian scholarship' in relation to landscape.
3. All the citations are the author's own translations. Original citation: 'Peintres, architectes, théoriciens toscans ont élaboré une représentation de l'espace, la perspective à partir d'une pratique sociale, elle-même résultat […] d'un changement historique modifiant le rapport " ville-campagne ". […] La ligne d'horizon, la fuite et la rencontre " à l'infini " des parallèles déterminèrent une représentation à la fois intellectuelle et visuelle, entraînant le primat du regard dans une sorte de " logique de la visualisation ". Cette représentation, en cours d'élaboration pendant des siècles, s'investit dans la pratique architecturale et urbanistique : *les perspectives*, le code.'
4. The biographical elements are from the foreword to the 2009 edition of *Le Droit à la ville* [The Right to the city] written by Hess, Deulceux, and Weigand (2009).
5. In French, post-war Modernist social housing, especially high-rise architecture, has been named *Grands Ensembles*, which translates to Great Ensembles (of buildings). Yet, *ensemble* also means 'together', and Lefebvre plays on the double-entendre here.
6. Original citation: 'Indication auto-critique : il manque à ce livre d'avoir décrit de façon directe, incisive, voire pamphlétaire, la production des banlieues, ghettos, isolats, faux " ensembles ".'
7. Original citation: '[la pratique spatiale] associe étroitement dans l'espace perçu la réalité quotidienne (l'emploi du temps) et la réalité urbaine (les parcours et réseaux reliant les lieux du travail, de la " privée ", des loisirs). Association surprenante car elle inclut en elle la séparation la plus poussées entre ces lieux qu'elle relie'
8. Original citation: 'Les représentations de l'espace, c'est-à-dire l'espace conçu, celui des savants, des planificateurs, des urbanistes, des technocrates "découpeurs" et "agenceurs", de certains artistes […]. C'est l'espace dominant dans une société […].'
9. Original citation: 'C'est l'espace dominé, donc subi, que tente de modifier et d'approprier l'imagination.'
10. Or even communities. Barry Allen is a philosopher, Antoine Picon a historian of architecture and technology (trained as an engineer), and Anique Hommels an urbanist. They would not necessarily consider their intellectual practices to be part of STS.
11. I would like to thank the anonymous reviewer who pointed this out and introduced me to Martin Jay's concept of 'ocularcentrism'.
12. To this day, Parisians talk of Paris '*intra-muros*'. The literal translation of *intra-muros* from Latin is 'walled-in', the idiomatic translation would be Paris 'proper'.
13. Original citation: 'Le guide borne explicitement ses ambitions aux circulations denses et à la recherche d'un compromis entre diverses disciplines (route, bâtiment, occupation des sols). Pour cela, il introduit un langage normalisé et commun qui doit permettre, en quelque sorte, les échanges de décibels […].'
14. E.g. The NAGRA II, commercialised in 1953, weighed about 20 kg—an achievement at the time. In 1958, the NAGRA III, was only 5 kg.
15. The Préfecture de la Seine was the administrative entity in charge of governing Paris from 1790 until 1968. At its head the *Préfet*, appointed by the Central Government. The most famous Prefect of the Seine is arguably Baron George-Eugène Haussmann (1853–1870).
16. I have tried to track the civil servants who wrote these letters. I could not find one still alive.
17. Original citation: 'À une époque où les sommités médicales reconnaissent les dangers que fait encourir le bruit aux individus, et les très graves troubles qui à plus ou moins long terme en résultent, où, ces même autorités se penchent sur le problème de la pollution atmosphérique dans les centres urbains, il est incontestable qu'une enquête sérieuse apporterait la preuve que la situation des élèves de l'annexe du lycée

BUFFON et celle des locataires des immeubles directement riverains de l'autoroute, méritent que les Pouvoirs Publics s'y arrètent.'

18. Original citation: 'les locataires [...] victimes du Bruit (à la longue) insupportable provoqué par la circulation incessante des véhicules automobiles qui ébranlent les nerfs des adultes, trouble continuellement leurs repos de jour comme de nuit, aussi bien en semaine, que le dimanche et les jours fériés et est souvent la cause, pour leurs enfants d'un état de santé maladif.'

19. When they receive a letter, the Cabinet of the Prefect asks the Department for Roads to draft a reply. A first draft is usually produced by the engineer in charge of the geographical area of the ring road the letter refers to, it is then reviewed by the Director of the department, before being forwarded to the Cabinet of the Prefect who provides the official reply signed by the Prefect.

20. Original citation: 'Comme cela a été déjà fait lors de réclamations précédentes, nous adressons un projet de réponse rejetant la réponse de M. P***.'

21. While the sources I am using to write this paper are publicly available, I have chosen to anonymise those who do not write in an official capacity (i.e. civil servants, politicians, etc.).

22. The Corps des Ponts et Chaussées [Corps of Bridges and Roads] is an elite civil service corps in charge of designing, building and operating bridges and roads in France. It was replaced in 2009 by the Corps for Bridges, Waters and Forests.

23. Original citation: 'Il est certain que dans des cas comme celui-ci l'insonorisation la plus efficace [...] présente l'inconvénient de n'être efficace que lorsque les fenêtres sont fermées ce qui doit être désagréable l'été.'

24. Original citation: 'L'écran [...] n'est qu'un palliatif qui n'est pas satisfaisant tant du point de vue architectural que du point de vue de l'efficacité'.

25. Jacques Chirac was, among other prestigious political positions, head of the leading conservative party (1976–1994), Prime Minister (1986–1988), President of France (1995–2007), as well as Mayor of Paris (1977–1995).

26. Original citation: 'Il est bon que la Ville fasse apparaître globalement l'effort qu'elle fait pour la protection phonique des riverains du boulevard périphérique. C'est un sujet sur lequel nous sommes critiqués chaque année depuis longtemps déjà, c'est un sujet sur lequel nous somme un peu faibles. Toute disposition qui permet de renforcer notre position est la bienvenue.'

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Disclosure statement

Notes on contributor

Justinien Tribillon is a PhD candidate at The Bartlett School of Planning, University College London. His research examines the Boulevard Périphérique of Paris as a socio-technical artefact, the role of technocracy and Corps of Bridges and Roads in its design, its changing position in the metropolitan landscape of the Greater Paris. Justinien is also a critic of photography and architecture, and editor of *Migrant Journal*.

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