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GLOBAL FLOWS, LOCAL CONFLICTS AND THE CHALLENGE OF URBAN GOVERNANCE: MANAGING THE URBAN-AIRPORT INTERFACE IN LONDON AND THE SOUTH EAST OF ENGLAND

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ABSTRACT

Whilst often taken for granted, transport flows, airspace and urbanisation at 'ground level' are deeply intertwined. This dissertation situates London's current controversy regarding airport expansion and aircraft noise and within new understandings of urbanisation and the role of transport flows within the urban realm, analysing the contested spatial relations stretched across the three-dimensional terrain, where the urban-rural, global-local and public-private spatial divisions are polarised by the negotiation of aircraft noise. Drawing from empirical evidence related to existing noise pollution issues and the expansion of aviation infrastructure in the South East, this text interprets airspace as part of the transformation and extension of the urban fabric above the built environment of the urban region, comparable to peri-urban extension and dispersal of the urban across the earth's surface. This study draws from empirical qualitative evidence of London Heathrow Airport, Gatwick Airport, and the local places which experience noise pollution emanating from the various, changing flight paths to and from these airports within and surrounding London's urban boundary. Theorised in this text as the relational, interscalar urban-airport interface, the constructivist approach employed here focuses on the constellation of public and private institutions and actors who co-constitute this interface and manage aircraft noise in the context of on-going airspace modernisation, the intensification of aircraft activity and pending airport expansion.

Chapter 1

Introduction

1.1 Purpose: Towards a three-dimensional conception of urban transport flows, relational space and interscalar negotiation

Far from being as is often said, 'supermodern non-places' (Augé, 1992), this dissertation will show that airports are in fact, very central places within the process of contemporary urbanisation, in that uneven power-laden institutional relationships across three-dimensional space, and between powerful public and private forces in our society move through, rely on and co-constitute these infrastructures. Airports are places in the urban region where multiple, complex and powerful interscalar connections converge. This is space that is shaped by global flows as well as the local, regional and national and international scale. Meanwhile, the local communities that happen to surround these airports are drawn into and internalised in this far-reaching process of urbanisation.

The study of this social process is grounded in the enduring spatial negotiation of aircraft noise, within the socio-spatial context of London and the South East of England, and considers the governance of this issue is part of the broader process of urbanisation here. Urban governance is thus interpreted as a process with overlapping technical, social and political elements. In spatial terms, this project will consider how the urban-airport interface is quite literally a three-dimensional realm of the urban periphery where various powerful, interscalar forces within the urbanisation process are arranged by altitude. Noise pollution will be shown to reveal spatial relations, which are otherwise hidden in airspace infrastructure.

The intention of this project is to develop a way of comprehending the negative sides of airport infrastructure and airspace, and to understand these infrastructures as part of and central to the blurry boundaries of the 'urban'. I will show how, in practice, the nexus between urban geography and transport geography brings together many central elements of urbanisation in contemporary urban regions. Thus, analysis of *how* and *why* airports and airspace are transformed will contribute to our understanding of the process of urbanisation. This connection to emerging processes and the shape of urbanisation, and particularly the

role of flows here, and socially constructed rationales and methods of legitimization of such locally undesirable global infrastructure. Rather than simply attempting to prove that aircraft noise pollution should be taken seriously, or to illustrate that the local impacts of noise are significant and under-theorised (whether it be on health, annoyance, or property values), this project begins from the perspective that noise is already a volatile and controversial externality of the aviation industry and local airport proximity.

The 'management' of aircraft noise can thus be seen as the interscalar, spatial negotiation of a "contradiction between the global (the capacity to conceive of and deal with space on a wide scale, even on a world scale, as in the cases of computer science and the geopolitics of air transport) and the fragmentary (the subdivision of space for purposes of buying and selling) intensifies at the strategic level", which according to Lefebvre, often creates a tension between "units of production (firms) or units of consumption (households)" (1991, p. 365). From a geographical perspective, this project analyses ways in which aircraft noise pollution is continually negotiated, by public institutions, local campaign groups, and the aviation industry. The global-local urban-airport conflicts found in these pages also show that space in return also influences this negotiation. Space "is not neutral; the production of space is contested and conflictual in so far as social relations and spatial formations are mutually constitutive" (Dikeç, 2016, p. 5). Rather, the production of aviation infrastructure remains an under-theorised three-dimensional element of the urban realm.

With this in mind, actions such as the aircraft noise mitigation measures proposed the airports, or the public pressure levied by campaign groups against existing and proposed uses airspace can be seen as concrete strategies in the interscalar, adversarial negotiation and governance process. In that airport expansion inevitably has different negative consequences for different sectors of society, important decisions about megaprojects such as where, or *if*, to build a new full-length runway within a growing urban region. These are inevitably political decisions with 'winners and losers' that reveal a core, unresolved tension between externally oriented flows and local interest.

I wholeheartedly agree with Adey, Budd and Hubbard (2007) in their plea for a more critical and qualitative assessment of infrastructure and technology, because "while geographers are beginning to consider the technically-infused production of airspace, there remains more that could—and should—be said about the relations between these technologies and the social

practices which animate them (p. 775). With respect to airports and airspace in particular, I concur, "many of the key debates pertaining to aeromobility are too important to be left to transport geographers alone [and these issues] deserve more socially and culturally nuanced interpretations" (Adey et al., 2007, p. 787). By situating airports within part of the urban realm – even when they are beyond the 'city limits' – and within the broader process of urbanisation, I aim to contribute insight into the challenge of the spatial integration of airports, and to understanding the relationship between flows and space, and furthermore, to "clarify the role of urban places and their ability to attract, manage and redirect flows in such networks" (Hesse, 2010a, p. 75). Studying the challenge of planning and control of this space provides an opportunity for urban geographers to learn from and analyse the forces behind the development of infrastructure and material flows, and to contribute with a greater understanding of how more abstract logics and forces such as connectivity and globalisation are internalised, materialised and geographically distributed within the existing urban-regional realm.

The crucial point to note here is that different interests and elements of the urban realm cannot be fully understood outside of their geographical context, and the spatial relations between machines and people, between the city and the countryside, or between ground level and airspace are, indeed, all intertwined in broader processes of spatial integration and fragmentation. Rather than studying airports or cities per se, this project focuses on spaces in-between, and the negotiation of aircraft noise pollution and the implications of airport expansion. Urban governance thus becomes a lens to analyse the various public and private organisations and rationales, which struggle to influence and unevenly manage the urban-airport interface.

Specifically, this project analyses the location of proposed new runways at both Heathrow or Gatwick airports, and the governance process that determines the location of the routes which aircraft adhere to as they travel between the existing or new runways and 7,000 feet above sea level, where local efficient, direct flight paths are 'balanced' with aircraft noise concerns. Foregrounding aircraft noise pollution as lens to uncover three-dimensional spatial relations between airspace and the urban fabric vis-a-vis and the management of (1) noise in particular, (2) problematizes how uses of space are arranged vertically, and (3) foregrounds the lived experience. Thus, in order to make sense of the governance process drawn into this interface and the negotiation of space (through the metric of aircraft noise pollution), I suggest

applying a relational view of space to the three-dimensional airspace infrastructure, which cannot be represented on a conventional map in the convention of Cartesian or Euclidian geography. Instead, this project constructs a conceptual framework that highlights flows, concentration and negotiation and conflicts across airspace.

London's airport controversy demonstrates the complex role of transport flows within a process of urbanisation, which continually carves out new, sometimes unexpected spaces for activity and growth (see Figure 1). Airport expansion and the intensification of the spatial mismatch seem to be a fundamental element of 'the urban' in global city-regions, revealing the changing – increasingly vertical – shape the urban fabric of London and the South East of England. In other words, understanding the three-dimensional geography of the urban-airport interface is connected within this project to the emerging, local spatiality of global transport flows within the process of urbanisation and the transformation of the urban fabric.

Figure 1: A three-dimensional representation of flight paths above London and the South East (NATS Ltd., 2016).

In more concrete terms, this project analyses the management and proposed extension of aircraft activity between the ground level (such as the existing and proposed runways) and approximately 7,000 feet above sea level, where aircraft noise is not considered to a nuisance. This includes the timely, pending question of where to expand the UK's airport system with a new runway *somewhere* in the South East, and *how* to arrange the flow of aircraft in a manner that balancing concentration with dispersal, and noise mitigation with fuel efficiency.

These topical, practical spatial decisions will be analysed to investigate how the spaces and scales of global flows are spatially integrated within the urban realm, and to explore the role of infrastructure as an enabling and constraining element of urbanisation processes.

The lens of urban governance and aircraft noise pollution demonstrates that 'managing' the urban-airport interface has been a process of interscalar negotiation. In the context of the world city, 'challenge of the negotiation of place is shockingly unequal' according to Massey (2005, p. 169). When it comes to flows of airspace, the negotiation of space does not end once plans are implemented. Rather, flight paths and noise contours are continually negotiated in a fairly adversarial and public relationship. As I will demonstrate, the decades-long quandary over airport expansion in London and the South East, as well as the local, lived experience of day-to-day 'noise shadows' from repetitive aircraft flows reveals fundamental tensions between the urban and that which is considered 'non-urban', and between local, regional, national and global rationales and logics with specific agendas to promote or resist urbanisation at the regional scale.

The production of aircraft flows are shaped by forces and organisations that extend far beyond formal politics. With this in mind, the scope of this research includes not only political decisions, but also the wide constellation of relevant actors and all forms of governance and decision making regarding noise pollution. Findings demonstrate that a significant degree of influence has remained in the hands of the technocratic, managerial, and public realms of governance, although that is not to say that aircraft noise conflicts are in any way post-political either. In their nuanced discussion of airport expansion during the previous runway proposal for Heathrow Airport from a political science perspective on the ideological, discursive and political landscape during the previous third runway proposal, Griggs and Howarth contend that the aviation industry in the UK successfully provided the New Labour Government in the early 2000s with the rhetoric of "sustainable aviation", which they suggest provided "ideological cover" to pursue airport expansion and additional runways at Heathrow and Stansted airports without appearing to sacrifice credibility on environmental matters in terms of either global climate change or local emissions (2013b). Instead, "by articulating a fantasmatic narrative in which the growth of aviation and environmental protection were both possible", Griggs and Howard suggest, "the zero-sum game of airport expansion or environmental protection could potentially be re-framed as a positive-sum game" for New Labour (2003b, p. 130).

In contrast, Oosterlynck and Swyngedouw describe the relationship between aircraft noise pollution from Brussels Airport and the local environment as "the colonisation of the space of the political by policy making, by technocratic – managerial governance, thereby disavowing or foreclosing the political dimension" (2010, p. 1580). This article helpfully introduces the term "technocratic-managerial governance" to describe what the authors view as a problematic manner to address a political problem, a situation they refer to as a 'post-political quandary'. This recalls the Coalition Government's strategy to de-politicise an inherently political decision by assigning an economist, Sir Howard Davies, and perhaps connects Harvey's reflection on the "real power to re-organise urban life so often lies […] within a broad coalition of processes within which urban government and administration have only a facilitative and coordinating role to play. The power to organise space derives from a whole complex of forces mobilised by diverse social agents", while "urban government and administration have only a facilitative and coordinating role to play" (1989, p 6).

It is through the governance of the urban-airport interface, and specifically through airport expansion and the production of airspace, that three-dimensional, otherwise 'empty' space above the urban region becomes entangled within and part of the broader process of urbanisation which also extends across the region and beyond through countless material and non-material flows and in the lived experience of the residents of London and the South East (Allen et al., 1998). Like other parts of the urban realm, airspace is not simply a "passive receptacle", as described by Lefebvre. Conflicts over the use of airspace become extremely polarising once attention is brought to them:

> The theory of space refuses to take the term 'space' in any trivial or unexamined sense, or to conflate that space of social practice with space as understood by geographers, economists, and others. To accept any such conception of space, whether in the original form or as redefined by a particular discipline, is inevitably to view space as a tool or passive receptacle for the planners, with their talk of 'harmonious development', 'balance, and 'optimum use'. (Lefebvre, 1991, p. 420)

It is because planes are not silent, and flight paths and housing areas regularly overlap, that aircraft noise pollution reveals itself as a contested manifestation of such global-local trajectories. Conflicts over aircraft noise pollution give this invisible infrastructure a degree of obstinacy: spatial negotiation continues *after* the formal planning of this space has been

conducted and implemented. Sometimes airspace trials are withdrawn early, other times flight paths seem to change overnight.

The object of this project then is not the severity of aircraft noise, how it affects people from a health perspective, or how to manage noise pollution, but the negotiation and management of airspace infrastructure within the urban-region. This provides an opportunity to study spatial relations between many powerful forces in contemporary society, namely national government and UK-level aviation-related organisations, airports, airlines, local/county government, local town planners, and especially the privatised airports and companies within the aviation industry, non-governmental organisations and civil society.

1.2 Choice of case study and research interest

Global aviation flows and hub airports continue to present the challenge of spatial governance and integration of an environmental externality of connectivity. Of course, this foregrounds negative local lived experiences of proximity to these aircraft flows, opposed to, for example, business and real estate opportunities for airport adjacent areas. Applying the case study method to London and the South East may help to understand the reasons behind the contested relations across three-dimensional space through this extreme example, and can also help us to understand such new and unresolved conflicts and mismatched yet converging trajectories of globalised urbanisation.

As geographers we may be uniquely positioned to shed a light on the complex relationship between local socio-spatial patterns and the adverse effects of global transportation flows. There is of course an argument to be made that 'ordinary cities' (Robinson, 2002) are an under-appreciated object of urban research that in reality outnumber the well-known global cities such as London. However, London and the South East, an Alpha-level global city (Derudder & Witlox, 2014) and urban region spatially constrained as it is by a rigid spatial planning regime, in addition to its location on the south-east corner of an island, presents an extraordinary case of global connectivity in terms of both material and non-material flows.

The current debate surrounding the perceived need to expand the capacity of London's airport system provides an especially compelling and timely case study of a powerful, growing global urban region and its infrastructure, given London's status as the financial

capital of Europe, and a central, major international hub in the global aviation network, said to be a reflection of London's rank – along with New York, Paris and Tokyo - at the top of indexes of centrality and importance in both systems of economic flows and air travel network numbers (Grubesic and Matisziw, 2012). London's history of urban agglomeration, linked to external links and its former status as a centre of empire also provide many interesting connections to the current airport debate. Likewise, London's six commercial airports can be geographically connected to powerful political-economic dynamics of the city and the South East, as London's prominence as a global city and subsequent population growth has reinforced its position as a node and destination in flows of passengers and cargo. Likewise, the urban region is home to an economically successful and influential citizenry with often unspoken social and political capital with an interest in preserving the character and sense of place of their home.

Not unlike London itself, neither of London's two busiest airports present an 'ordinary' (Robinson, 2002) experience of the existing effects of aircraft noise pollution or the implications of airport expansion. Both Heathrow and Gatwick represent extreme, concentrated case studies of the concentration of global and inter-city infrastructure and associated airspace. The former is the busiest two-runway airport in the world, and likewise the latter is the world's busiest single runway airport (Heathrow Airport Ltd., 2017; Gatwick 2017). Inevitably this means that the flight paths leading to and from these three runways are some of the busiest in the world. When combined with the other four commercial airports providing access to the urban region; London City Airport, London Stansted Airport, Luton Airport and London Southend Airport; London's airport system becomes by far the busiest in the world, connecting London and the South East to over 100 countries and 370 destinations, and processes more than 150 passengers per year through over one million flights (DfT, 2017, p. 8; Redeborne & Lake, 2016, p. 23). Over 75 million passengers pass through Heathrow Airport each year, and over 43 million travel to or from Gatwick, followed by the other four London airports; 24 million at Stansted, 14 million at Luton, 4 million at London City Airport and even Southend Airport near the Thames Estuary is back up to 874,549 passengers (CAA, 2017). Meanwhile, the Civil Aviation Authority maintains that it expects "to see significant noise improvements arising from normal fleet renewal exercises as airlines switch from older types to the latest aircraft" (CAA, 2014, p. 29) which create less noise and are more fuel-efficient. However, as I will explore later in this text, the technological benefits

of new aircraft may be diminished by the sheer increase in the number of aircraft flowing through an expanded airport.

The existing literature on globalised urbanisation and spatial planning provides an opportunity for original scholarship that connects urban governance in the global city to urban planning and airport development, and that conceptually relates such potential case studies within the realm of urban-regional governance. "The task of a renewed global city scholarship, then, is to reconcile the appreciation of the political texture of these metropolises with wider international processes while not reifying the city and its limits" (Acuto, 2013, p. 172). Such global cities often seem to be "overwhelmed" by "transnational flows and networks that define the 'global' nature of these cities, the mundane experience of the individual subject in the global city is often side-lined in much of the literature" (p. 186). As a case study, the socio-spatial context of this relatively dense corner of Britain and its congested airspace becomes a space where we can learn about how such powerful societal forces are spatially arranged when they seem to be stuck in an unenviable, intractable 'wicked problem' (Griggs & Howarth, 2013a). Nevertheless, just as some of the technological advances to the aircraft technology measures that are developed to resolve London's context-specific urban-aircraft constraints, to the design of the Airbus A380 for example, which also have benefits everywhere this aircraft lands, the contribution of this text is to push forwards our understanding the socio-spatial interaction between global flows and urbanisation and between aircraft flows and lived experience, which may be of use elsewhere.

Flight paths could be compared to other LULUs, locally-unwanted-land-uses that are part of city-region's footprint, like a landfill or a highway. However, I suggest a more productive comparison would be, to borrow some key terms the planetary urbanisation theme of research problematizes, such as 'operational landscapes' and 'extended urbanisation' (see Brenner, 2014). These words imply distance from the city but are fundamental to contemporary urbanisation. Except in this case, of course, flight paths are obviously neither land, nor that far from the urban region directly below. In this respect, airspace is a global-local elevated *urban* infrastructure, a noisy layer of flows arranged vertically and imperfectly above the built environment. Theresa Enright, for example, has made a significant contribution to urban geography with her study of the ways that "infrastructures of transport are linked to processes or urbanisation in the contemporary era, and [highlighting] the constitutive tensions in the

coproduction of mobility and the metropolis in the 21st century" (2015, p. 174). Following this idea, the study of the urban governance of airports provide a window into the complex, often adversarial spatial relations across the realms of the global-local, the urban-non-urban, human-machine and places-flows, and also a very practical, unresolved spatial dilemma for urban governance.

1.3 Urban governance and the process of urbanisation

Through the lens of urban governance and the urban fabric, aircraft noise is seen here as part of the three-dimensional and turbulent extension of the built environment at the urban-regional scale. This project looks at the subject of urban 'governance', which "emerges as a complex array or assemblage of relations and rationalities" (Healey, 2017, p. 269) to analyse the process of urbanisation and the forces that extend and intensify urbanisation. With this conceptual framework in mind, the project looks at the urban-airport interface as both a physical space and governance process – both co-constituted by various actors and ways of thinking, a constructivist approach to qualitative spatial analysis.

Global cities and regions such as London and the South East clearly comprise a complex built environment with highly complex internal flows, as well as an extraordinary level of global interconnectedness. Across a range of themes, London consistently highlights that "globalisation is made in places. The global is grounded. And one of the key localities where financial globalisation was invented and orchestrated was London" (Massey, 2007, p. x). In that global cities now exhibit a new "spatial articulation of dominant functions" supported by nodes and hubs within global flows and networks (Castells, 1996, pp. 442-443), research of urban governance in global cities has the potential to reveal the complex dynamics between the urban and the global contexts, and the place-based dynamics of "interscalar relations and transformations" (Brenner, 2000, p. 368). Thus, London and the South East of England comprise a complex global city and urban region, where the various forces that produce space, and wealth, confront each other through space, in the corner of a small island and amid a rigid planning regime. Here, the motivations of both sides are internalised, not in a top-down manner, but through the intentional concentration of and protection from new development, and through use of new technology, public consultation materials and industry PR. Here, countless small decisions gradually shape space and our experience of it.

> "The city is everywhere and everything. If the urbanized world now is a chain of metropolitan areas connected by places/corridors of communication (airports and airways, stations and railways, parking lots, and motorways, teleports and information highways) then what is not the urban? Is it the town, the village, the countryside? Maybe, but only to a limited degree. The footprints of the city are all over these places, in the form of city commuters, tourists, teleworking, the media, and the urbanization of lifestyles. The traditional divide between the city and the countryside has been perforated. (Amin & Thrift, 2002, p. 1)

With such a multi-layered context, governance here is inevitably an inter-scalar process constituted by countless overt and unspoken intentions.

The city, as well as the airport, then, exemplifies the degree to which globalisation is dependent on both flows and urban agglomeration, an urban condition imagined as the "product of dense interscalar networks linking disputed geographical locations" (Brenner, 2000, p. 366). The complexity of these interscalar networks is matched by an equally complex local constellation of interests and motivations in the direction of growth and/or preservation of the urban realm, which often plays in fragmented, antagonistic conflicts and negotiation over particular projects, rather than a truly long-term democratic debate about a vision, direction and purpose of urbanisation.

Although air travel is increasingly seen as "the dominant mode of global networking and travel has had a profound effect on the territorial logics" of the local scale, according to McNeill (2014 p. 2296), "airport development cannot be understood using a singular logic, or indeed by conceptualising the airport as a singularity in itself. It may be better to speak of airport territories" (p. 2999). Building on the relational approach to geography developed by Massey and others, Healey develops an approach to urban and regional spatial planning as complex projects which require an understanding of the "multiple webs of relations that transect and intersect across an urban area" and advocates "moving beyond an analysis of spatial patterns organised in two-dimensional space, the space of a traditional map.

Instead, the relational approach to geography demands attention to the interplay of economic, socio-cultural, environmental and political/administrative dynamics as these evolve across and within an urban area" (Healey, 2007, p. 30). Healey supports making sense of urban projects in the context of "policy communities across diverse arenas; of the logic of formal

laws interacting with logics of immediate interests and the logics embedded in evolved practices and discourses" (2007, p. 269-270). For global cities especially, the imperatives of connectivity are internalised in the form of normative planning frameworks that highly value 'connected infrastructure' (Floater et al., 2014). Airport areas may often be understood as a reflection of their respective cities, and the great degree of internationalisation and their global functions of top-tier global cities such as London (Sassen, 1991). According to Sassen, the increasing importance of international air passenger travel is a reflection of this expanding network and the concentration of corporate services, headquarters and related activities (2012, p. 198). Similarly, former centres of empire and the highest-ranking world financial centres in 1780, such as London, Paris and Amsterdam, for example (Engelen, 2012, p. 253), remain dominant in the sphere of global airport hub operations today.

Grubesic and Matisziw suggest that major global hubs such as Heathrow "provide a crucial component of the necessary infrastructure for the 'command and control' functions of global cities and economic competition and prominence", and as such, research of these infrastructures may "contribute to our understanding of the degree of interconnectivity between global cities, as airports themselves provide the territorial materialization or tangible manifestations of relationships between urban agglomerations" (2012, p. 113). These large infrastructures also have major implications for their immediate surroundings, as well as for the growth of the urban region. The contemporary airport can be seen as part of the strategic, collective project of urban governance to strategically position cities within a network of global cities through the international commercial aviation system. Debates surrounding airport development and expansion can be seen to exemplify the inter-scalar environment in which urbanism is negotiated in the contemporary global city.

As the central nodes in the dominant hub-and-spoke networks of the airline industry, these major international hub airports have even been likened to nodes in an imperial system, which, perhaps, 'contemporary society increasingly resembles' (Urry, 2014, p. 34). As cities become as "externally-intertwined and "porous" as ever (Massey, 1998, cited in Amin, 2002, p. 391), unrestricted global circulation through aviation networks has become increasingly important as the places through which these flows of capital and influence can pass through. These flows in turn, become essential, constitutive elements of the process of urbanisation. Normative narratives such as the need for a 'world-class airport', competing as a 'global city' and enabling 'connectivity' seem to have had a great degree of influence in terms of

discourses on urban development. As a critical urban geographer I consider it vital to question these normative ideals, concepts and growth models, especially with respect to which actors employ which narratives, appeal to an understanding of the position of cities and regions in the global economy, and connect growth and development plans to inter-city competition. Indeed, "cities and nations continue to exist as territorial units" according to Amin, although "with different external orientations" (2002, p. 387). Today, these structural changes have been interpreted as a product and strategy of these "multiple overlapping political-economic processes" (Brenner, 2000, p. 365). Global cities, then, are not solely influenced by globalisation, but are also the places from which the most influential economic and political forces in this process base their international operations and concentrate their capital and influence.

To Jacobs, a "dominant articulation of relational thinking in geography has been to think beyond the city-as-territory. This variant of relation thinking has reshaped urban geographical scholarship in profound ways, not least bringing into view novel conditions of rationality, or what we can think of as new topographies of rationality" (pp. 412-413). This is most evidently expressed through urban geographical scholarship that concerns itself with flows and relational networks between city entities", Jacobs writes, which is not "networked urbanism, but something far more dissipated and emergent (2012, p. 413). For urban governance the challenge remains to,

> deal specifically with the relations between process and object without falling victim to unnecessary reification. The spatially grounded set of social processes that I call urbanisation [exhibits] a perpetual tension between form and process, between object and subject, between activity and thing. […] The conception of the urban and of "the city" is likewise rendered unstable, not because of any definitional failing, but precisely because the concept has itself to reflect changing relations between form and process, between activity and thing, between subjects and object. (Harvey, 1989, p. 6)

The shape of the urban fabric has expanded beyond through processes of suburbanisation and peri-urbanisation (Dubois-Taine & Chalas, 1997), as well as beyond even the metropolitan scale through high-speed transport and information infrastructures which draw intermediate and distant places into the urban realm (Ascher, 1995), while fragmenting the local urban scale (Graham & Marvin, 2001), and perhaps even enabling urbanisation on a "planetary scale" (Brenner, 2014). Whether or not urbanisation has truly become 'planetary' in scale is

beyond the scope of this project, although its agenda offers a productive unpacking of "unproductive dichotomies such as that of the city – countryside, and urban – natural" (Katsikis, 2014, p. 8). Attention to the global scales which interact with the process of urbanisation are especially useful in that they suggest that larger forces do not only influence urbanisation, but that urbanisation is part of a broader process which is happening in not only in cities, but on the periphery far beyond 'the city'.

Following Lefebvre, the planetary urbanisation theme of research quite usefully employs the concepts of concentration and intensification, and extension and dispersion of the process of urbanisation to illustrate the blurry boundaries of the urban realm to make sense of the encroachment of the urban arena into heretofore 'non-urban' (Brenner & Schmid, 2015), and the transformation what Lefebvre refers to as "urban centres (formerly known as cities)" in *The Production of Space* (1991, p. 390). Uneven urbanisation has "instead become the very tissue of human life itself, at once the framework and the basis for the many forms of socio-spatial differentiation that continue to proliferate under contemporary capitalist conditions" (Brenner & Schmid, 2015, p. 174). Such global and planetary meta-theories and their distant 'birds-eye-view' perspectives provoke even more questions about the lived experience (Giroud, 2015) in the local places that become "basing points" for such global flows (Friedmann, 1986).

There is an argument to be made that understanding and critically assessing the transformation and growth the built environments we think of as cities or the urban realm, or the process of urbanisation remains an important and productive pursuit. Storper and Scott argue that, "given its foundations in agglomeration and its dense institutional and political overlay" cities still pose "questions that are quite specific to the urban arena both as an object of scientific enquiry and as a scale of human political and economic life" (2016, pp. 1129-1130). They also suggest that although cities, even global financial capitals such as New York, for example, are indeed constituted by external relations that reach around the world, and extend deep into the non-urban. Such "effects are virtually always assimilated into the urban land nexus as such without destroying its integrity as a complex social unit [and ultimately] there is no way undermine the theoretical notion of the urban land nexus as the critical constitutive inside of the city" (2016, p. 1131).

1.4 Structure of the text

This text has begun with an introductory chapter on the purpose, choice of case study, research interests and approach to the subject that situates this project within qualitative urban geography. Next, this text includes a chapter on the strategies and benefits of the constructivist approach to urban research employed by this project, followed by a section detailing the main conceptual dimensions of the project, and the research questions that address each of these dimensions. Chapter 3 establishes the conceptual outlook of the text, the urban-airport interface, which imagines two-way socio-spatial interaction across three-dimensional space, between the broad urban fabric and this specific form of transport flows.
By reimagining the spatiality of aircraft infrastructure as part of the extension of the urban fabric itself, and taking it out of its abstract and technocratic jurisdiction, this project posits that aircraft noise pollution can be interpreted as the revelation of interscalar social relations otherwise hidden behind the technical, managerial and political realm of airspace management.

Chapter 4 introduces the area of study, analysing London and its adjacent realm of influence (and environmental footprint) within the adjacent counties as London and South East of England. This passage structures the rest of the text as a study of an urban region created by the presence (and, at times, the absence) of transport flows and the interaction of flows and static places, ranging from airport infrastructure to commuter flows that defy the jurisdictional and socially-constructed division between London and the urban, and area beyond that, whether it be the borders of the Greater London Area, M25 London Orbital Motorway, or airspace above the urban region. Chapter 5 explored the complex saga of airport expansion in London and the South East, while Chapters 6 and 7 are dedicated to empirical evidence of the urban-airport interface of Heathrow and Gatwick airports, respectively. Chapter 8 offers a summary of empirical findings and discussion of the results of the project, while Chapter 9 seeks to develop more theoretical and generalizable insight from this project, which will hopefully be of use outside of London and the South East.

Chapter 2

Methodology

2.1 Qualitative and constructivist urban geography

The intention of this project has been to explore and make sense of the power-laded spatial relations of the urban-airport interface in the context of the broader process of urbanisation. Focusing on urban governance within this context has the potential to uncover ways that actors at all scales may interact with the challenges and benefits of global connectivity, and show that local places are not "are not passive spaces suffering the indiscriminate exercise of top-down logics" (le Gales, 2002, p. 175). I apply the methods developed in qualitative approach to urban geography and apply them to this abstract space above the city, which otherwise often belongs to the technocratic-managerial realm. In order to reconstruct and analyse urbanisation within this context, this project mobilizes a constructivist approach to makes sense of one particular aspect of globalised urbanisation.

To the extent that 'the city', regions and the urban periphery are 'summoned up' by individual actors and actively positioned by local actors within relational networks and global flows, and become "temporary placements of ever moving material and immanent geographies" (Amin, 2004, p. 34), the agency of actors here and the governance of this space within the urban region can be viewed as the geographical study of 'real world' inter-scalar spatial relations. Through case study research from this approach, this project reveals *how* urbanisation within global-city regions is not a process of 'conquered territory' (Elden, 2013b, p. 9) by forces behind the aforementioned top-down logics, but in fact is part of a complex, multi-scalar negation across space. The "goal of this constructivist approach (much like critical cartography) is to show that taken for granted concepts such as 'forest' and 'nature' are not given or natural, but are continually socially constructed. Furthermore, if these concepts have been constructed by social interaction, they can be reshaped as well in order to make a more just society" (Cidell 2008, p. 1209). Analysing the management of the urban-airport interface in the context of constructivist research perspectives can be understood as another means to overcome essentialist ideas of space, regions, and cities, in

order to acknowledge the complexity and relational configuration of activities in late modern space-time frameworks (Hesse, 2017, p. 12).

To that end, qualitative analysis (Herbert, 2010; Creswell, 2009) of the agency, perspective and influence of actors whom co-constitute this space was employed as part of this project's constructionist approach to emphasize the perception of space here by both individual, local actors (such as campaign groups) as well as the agency and discursive framing of London and its relationship to the South East by an formal and institutionalized perspective (such as decision-makers at the national level). Textual analysis of how these issues are presented to the public through official reports, plans and campaign materials (Dittmer, 2010; Waitt, 2010) reveal the stated rationales concerning key policies and positions. The approach of qualitative *urban* analysis as developed by Jacobs (2007) and Manzi and Jacobs (2008), with its inherent emphasis on proximity, concentration, density, institutionalised planning, socio-spatial relations and physical flows within the context of the urbanism and the urbanisation of space. This process takes the content of reports and interviews and ties them to specific areas of urban-airport conflict within London and the South East relevant to Heathrow and Gatwick airports. Focus is placed on the decision making, planning, rationales, and organisations involved in the negotiation of airport expansion and airspace planning, theorised as the urban-airport interface.

I analyse the stated, public positions of relevant actors, interviewed actors involved in the negotiation of this space, including planners from representing the Greater London Area and West Sussex, as well as environmental groups an and local campaign groups, in order to make sense the role the different scales, rationales, structure and agency which produce aircraft noise in London and the South East. Research for this project began with review of key reports on Heathrow and Gatwick airports and stated public policy concerning noise in London and the South East, and the official, stated rationales of government decisions found in official plans, public consultation material and other official legislation and primary sources of relevant policies. This was contrasted to research on the stated positions and rationales of local airport-oriented campaign groups and environmental organisations. The focus was narrowed to specific areas of the urban region that became central to the debate because they are affected by aircraft noise pollution and were visited between 2015 and 2017.

Next, a series of 14 customized and semi-structured key informant interviews were conducted with relevant actors including a representative from the airspace regulator, spatial planners, local campaign groups, and local experts in academia, in order to question and critically assess the rationales behind decisions concerning local-airport conflicts, the governance and spatial planning regime, and the lived experience 'on the ground' in airport-adjacent communities. Anticipated yet limiting factors included the reluctance of certain key organisations to be interviewed due to on-going public consultation although each of these actors have released a large amount of primary material: reports and 'PR' that clearly identified their positions on key issues of contention. Another constraint study this timely issue was the delay (from 2015 to 2016) in the Government's announcement of its decision on the preferred site of a new runway (and the general political upheaval in 2016 and 2017 in UK), which led to the later-than-expected publication of its rationale for its final decision through a pending Parliamentary vote on the revised Airports National Policy Statement. The reluctance of some actors and organisation (such as the Department for Transport, NATS and both representatives from both airports) to be interviewed for this project may have been influenced by the pending indecision at the political level, which ultimately may be an unfortunate 'trade-off' for studying such a timely and pressing issue. However, the public consultation process during this time produced a plethora of lengthy detailed reports and campaign literature including websites, press interview which outline the position of these public actors and are closely analysed here in lieu of direct interviews. Both analysis of plans and policies (Jensen & Glasmeier, 2010; Dittmer, 2010) as well as the use of expert interviews with actors involved illuminated the official positions on the topic, which could then be contrasted with interviews from those opposed to or impacted by such major airports (McDowell, 2010). Concurrently, interview transcripts were thoroughly and critically analysed, and contrasted with reports and literature on the subject, and key issues, recurring themes and contradictions were identified in order to take airspace, noise and airport expansion out of the technical and managerial realm and to situate this practice within an urban region shaped by complex social relations across space. A benefit of this methodology was that disparate and adversarial actors were put in conversation with each other within this text. Grounded in specific issues such as airspace modernisation and runway expansion, such rationales were juxtaposed to each other and analysed as empirical, qualitative data in Chapters 5, 6 and 7. Ultimately, the practical challenge of managing the urban-airport interface could be reconstructed, analyses and connected to the process of globalised urbanisation in Chapters 8 and 9.

Besides interview transcripts, analysis of a large number of reports and a small amount of quantitative data (local population density and land use designations in relation to airports) is analysed with respect to how existing and proposed uses of airspace may or may not be compatible with urbanisation patterns, developing a literal and metaphorically three-dimensional understanding of urban geography and the challenge of negotiating inter-scalar (local and global) spatial relationships and transport flows which co-constitute space in global urban regions.

2.2 Conceptual dimensions and research questions

Theme 1) Airports, infrastructure and urbanisation:
Research questions:
What are the practical challenges to airport operation and expansion?
How does aircraft noise pollution affect people?
How can large airports be integrated with their surroundings?

Through these research questions I seek to understand the particularities of aircraft noise and its general relationship with its surroundings. The intention with this theme is to understand how airports may differ from other infrastructures or forms of transport, which may pose practical challenges to the goal of spatial integration. Focusing on the dimension of noise, sound and silence also introduces the urban-airport interface to wider human-machine and transport-health conflicts. This aspect of the project (1) directly compares airports to maritime ports, presuming that each present distinct challenges in terms of external orientation and local integration. This subject also (2) suggests contrasts with maritime ports and established research within transport geography regarding port-related problems. Airports present unique challenges to human-machine/technology integration and compatibility, where critical approaches to infrastructure planning, existing knowledge on the local experience of aircraft noise, discourses and framing of conflict.

Theme 2) Governance, institutional management, politics and planning:
Research questions:
How are the existing issues related to aircraft noise managed?

What rationales are employed to support the intensification of air traffic flows and airport expansion?
How are national benefits balanced with local externalities?
What role do local institutions and actors play in this conflict?
How is airspace created, planned and managed?

This exploratory aspect of the project explores (1) the management of problems and pressures in London and the South East of England, and (2) the negotiation of scales and influence through (3) the issue of aircraft noise and airport expansion. This series of questions is intended to frame how the problem of aircraft noise pollution is managed in practice by formal institutions and other actors who collectively comprise urban governance space.

Theme 3) New understandings of the urban fabric, cities, regions and the role of transport flows in urbanisation:
Research questions:
Are airport expansion and urban-regional expansion patterns compatible trajectories?
How is the airport spatially integrated with surrounding communities and the broader urban fabric?

Building on the first two themes, this third element of the project (1) analyses the process of urban governance and the management aircraft noise, and then (2) connects this topic to our understanding of the city, and the built form of the urban realm and shape of the urban fabric. As flight paths are re-imagined as urban infrastructure within this project, and their noise shadows are conceived of as the three-dimensional shape of the urban realm, I pose these research questions to critically assess the challenge of spatial integration and negotiation in practice.

Chapter 3

The urban-airport interface as a lens into interscalar spatial negotiation

3.1 Transport flows and the urban fabric

Re-thinking the boundaries, periphery and extent of the urban realm naturally leads to the question of how infrastructure can be understood within this changing understanding of the urban. By employing a relational approach to the spatiality of the urban-airport interface, such as conflicts between these flows and places, I follow Massey's definition of relations as "understood as embedded practices. Rather than accepting and working with already-constituted entities/identities, this politics lays its stress upon the relational constructedness of things (including those things called political subjectivities and political constituencies)" (Massey, 2005, p. 10), and as a result, rather than seeing the global urban region through an "imagination of a world of bounded places we are now presented with a world of flows. Instead of isolated identities, an understanding of the spatial as relational through connections", according to Massey, who reminds us that "the very word 'globalisation' implies a recognition of if spatiality" (2005, p. 81). From a relational perspective, urban environments in particular exemplify spaces of complex, overlapping layers of spatial relations in their often turbulent, uneven and contested degree of "throwntogetherness" (Massey, 2005) which geographers are uniquely qualified to study:

> Cities may indeed pose the general 'question of our living together' in a manner more intense than other kinds of places. However, the very fact that cities (like all places) are home to the weavings together, mutual differences and outright antagonisms of such a myriad of trajectories, that this itself has a spatial form which will further mould those differentiations and relations, means that, within cities, the nature of that question – of our living together – will be differently articulated. The challenge of the negotiation of place is shockingly unequal. (Massey, 2005, p. 169)

This interpretation of the discipline of geography "generates metaphors of flow and network more than patterns of settlement and finds expression in icons and sketches, more than in

maps and measures. It leads towards a recognition of the complexity of the social processes through which life in movement is experienced" (Healey, 2007, p. 226). Massey's approach to space can be particularly productive when applied to urbanisation and the complex relations between different, often fragmented parts of urban regions, which Healey argues are often not; 'integrated', and rather,

> they may be in tension or severe conflict, particularly over access to, and the value of, particular places. This conception emphasises the existence of multiple networks, of nodes where networks intersect, of urban areas as 'polycentric', as well as conceptions of the urban as comprising multiple flows of people, goods, water, energy, information and ideas. (Healey, 2007, p. 29)

Yet, although we as urban geographers have become innovative in our scope and theorisation of transport flows and non-material relations between and across space, activity arranged vertically above cities often continues to exist in a "vertical blindspot" which Harris discusses in his recent article, "Vertical urbanisms: opening up geographies of the three-dimensional city" (2015, p. 602). Following Harris (2015), Graham (2016) and a growing body of research brought together at a recent academic conference in Lyon dedicated to the research agenda of "La Ville Verticale" [*The Vertical* City] and 'exploring and thinking through the vertical dimension of urbanisation in the context of globalisation and climate change' (Appert, 2015), this research analyses the rationales of aviation and their relation to the broader extension of 'the city', and connects the subject of transport flows to these discourses in urban geography which are focused on relations between otherwise *stratified* layers of the urban realm, and the increasingly vertical and literally three-dimensional urbanisation of space above the urban region. Within this context, one goal of this research is to contribute to the widening our imagination of urban geography beyond "the dominance of remarkably flat perspectives about human societies in key academic debates about cities and urban life" (Graham 2016, p. 1) in order to develop a more productive way to fully understand and then resolve urban spatial conflict.

Although aircraft are gradually becoming quieter, urban airspace is also busier than ever before due to the accelerated growth of air travel, and the flight paths they are using towards airports are increasingly concentrated. As a result, continual or repetitive aircraft noise from busy flight paths is a pressing and unresolved problem for urban planning and politics. The paradox of increasing frequency and concentration of aircraft traffic over the growing urban region exacerbates this problem – and also confronts our geographical imagination of the

shape of contemporary urbanisation, disrupting our understanding of geo-politics as a "flat", or horizontal perspective (Elden, 2013a, p. 37). Instead, the emerging critical framework of urban verticality emphasises the three-dimensional "entanglements of people, systems, rules, practices, technologies and things" (Harris, 2015, p. 612). Not unlike skyscrapers, runways and flight paths are yet another way that that the realms of urban airspace and the static built environment below are deeply entangled with each other within the broader process of globalised urbanisation and the shape of the contemporary urban region. In this respect, the development and expansion of aviation infrastructure is analogous both to outward peri-urbanisation, and the planning and governance of concentrations of central high-rise towers, in that the vertical dimension highlights the increasingly densely layered urban fabric and spatial conflicts and power relations between ground level urbanism and new uses of space above. This creates a distinctly 'three-dimensional' geographical phenomenon. And yet, "only very rarely is it considered that uneven development and the remaking of geographical scales can happen across the vertical as well as horizontal dimension", and that, as Graham asks us to remember that,

> spaces above and below the earth's surface are also being urbanised; or that these broad volumes are interconnected through a myriad of social and material relations that shape the politics of cities and urban life just as powerfully as do processes and relations organised to sustain the flat and horizontal ground levels of cities. (2016, p. 7) [1]

Graham proposes that "the continued flattening effects of both geographic and urbanistic traditions work to seriously undermine the emergence of a fully three-dimensional understanding of these crucial transformations among disciplines – urban studies and geography – that should be at the core of such project" (Graham, 2016, p. 12). To that end, Graham begins his recent book, *Vertical: The City from Satellites to Bunkers* by asserting the question, "What would happen if you took geographical thinking, and instead of putting it on a horizontal axis, you added a vertical axis?" (Paglen, 2012, quoted in Graham, 2016, p. ix).

Likewise, in his piece "Altitudes of urbanization", Pierre Bélanger (2016) connects the 'hinterlands of underground, ocean and atmosphere' to the process of urbanisation, advocating the "opening a lens on the complex urbanisation of the underground and of the

[1] Much of the preceding two paragraphs were published in: (McDonough, 2017): Flight paths as layers of the urban fabric: transport flows, connectivity and the contested urbanisation of airspace above London and the South East, *Géocarrefour, 91*(2), 1-14.

atmosphere, this association of the quantitative with the qualitative made possible by seeing sideways" (p. 5). From this perspective, the vertical hinterlands or periphery of the urban far above or below can be incorporated into our geographical imaginary. Interpreting the urban through such a three-dimensional lens, Bélanger interprets air as "thick, fuzzy, complex space" where "the conflicts between flows across different air-space—above ground, below water, or underground (aircraft flight path and bird migration, industrial fishing and fish migration, deep mining and land resources) are no longer linear or direct, but they may be better designed, planned, and synchronized" (2016, p. 5). Likewise, emerging research and theorisation of maritime geographies beyond the port itself has also provided novel contributions to our understanding of the spatiality of globalization and reveals a further blindspot, that geography remains,

> an incredibly land-locked discipline. The word geography translates to mean 'earth-writing' – and broadly – geographers have been preoccupied with the earth or more specifically the land in their studies. On the one hand this is because the oceans can be difficult, dangerous and expensive to access in order to research them. On the other hand, for a long while geographers have simply deemed other spaces more important to study – typically the spaces that are more central to our daily lives; cities, towns, and so on. (Peters, 2016)

As the urban fabric stretches far past the 'city', these researchers have made important strides in illustrating the urban dimension of airspace and maritime flows, and expanding our geographical imagination.

Meanwhile, the archetypal imaginary of the 'suburb' still re-calls post-war Levittown-modelled 'sprawl', the easily recognisable North American model of homogenous, low-density, car-dependent, self-isolating residential corporate subdivisions built on greenfields (Jackson 1985; Fishman 1987; Peck 2011). In planning theory and urban studies, this settlement type is often considered the antithesis to the ideal of diverse, compact, walkable, mixed-use and purportedly more sustainable city centres, a revered built form associated with continental Europe especially (Jacobs, 1961; Beatley, 2000). A large vocabulary exists to describe such spaces. These include "Zwischenstadt" (Sieverts 2003), "postmetropolis" (Soja 2000), "Netzstadt" (Oswald, Baccin & Michaeli, 2003), a "middle landscape" between the urban and the rural (Rowe, 1991), the "100-mile city" (Sudjic, 1992), "the next slum" (Hesse, 2010b), urban subcentres, multinucleated metropolitan regions and centre-less cities (Parker

2004, p. 83). While the diversity of suburban forms has become more widely understood (Keil, 2017), the term 'suburban' still often takes on a pejorative meaning as it continues to be frequently juxtaposed to its supposed opposite, the idealised 'city'.

This is also an out-dated term and arguably "an ideological representation of urbanisation processes" despite "the explosion of the city form" (Wachsmuth, 2014, p. 75). Moving away from this classic image, these attempts aim to refocus the lens on processes of suburbanisation in order to more accurately assess their function, importance, and socio-political economic geography. Alluding to the declining usefulness of the term 'suburb', Fishman (1987, p. 29) asks, "as both core and periphery are swallowed up in seemingly endless multi-centred regions, where can one find suburbia?" Although certain discourses within urbanism may still employ the trope of an essential binary between urban and non-urban, convincing empirical evidence suggests that these generalising definitions have lost relevance and usefulness with regards to understanding, and finding planning solutions for, the contemporary urban region. Kling, Olin and Poster (1995) helpfully introduced the term 'postsuburban' to imply a break from the previous sub-urban model.

Contemporary growth still produces new residential spaces outside of the central city, but this trajectory also includes increasingly diverse functions, including business districts, logistics centres, airport-oriented growth, and increasingly dense housing as well. This work suggested that such spaces are neither subordinate to nor necessarily dependent on 'the city', as 'sub-urban' suggests. Rather, contemporary post-suburban spaces are central to the growth and development of the urban region in their own right. Thus, the concept of 'post-suburbia' has gained momentum with ground breaking empirical research and critical urban theory on both sides of the Atlantic (Burdack & Hesse, 2007; Young & Keil, 2010; Phelps & Wood, 2011; Mace, 2013; Charmes & Keil, 2015). This work has illustrated that the suburban paradigm is not only out-dated, but is an al-together ill-suited metaphorical concept for urban growth. Here, the work of Phelps, Wood and Valler (2010) should be stressed as well. They are clear that 'post-suburban' is not, in itself, another essentialist category; rather it is a lens that offers new dimensions to understand and compare new urban spaces. [2]

[2] Much of preceding paragraph was published in (Carr & McDonough, 2016): Integrative Planning of Post-suburban Growth in the Glatt Valley (Switzerland), *Raumforschung und Raumordnung*.
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Given the categorical uncertainty of the urbanisation outside of the central city in Europe, this project embraces the ambiguity, and instead seeks to understand social processes which may selectively and unevenly drawn in peripheral places and/or protect them from encroachment by 'the urban', and critically analyses how, in lieu of workable definitions of 'the city, the 'the suburbs' or 'the countryside', the places which comprise the physical element of the urban-airport interface are the product of the "construction and maintenance of urban and suburban places through inclusion and exclusion" (Cidell, 2015, p. 135).

3.2 Re-imagining infrastructure

Infrastructure within urban centres is understood to contribute to a 'highly selective and marginalising' process of social polarisation in global cities (Budd, 2014, p. 9; Enright, 2013), characterised by an increasingly uneven, social and spatial pattern, or in other words, a privileged "citadel" and a "ghetto" (Friedmann & Wolff, 1982, p. 325). Graham and Marvin contend that, in practice, investment in inter-city, large-scale infrastructures such as airports can have the effect of privileging certain uses and segments of city region while 'bypassing subordinate territories', reinforcing an 'archipelago economy' and patterns of "splintering urbanism" (2001, pp. 305-306), offering a needed critical and qualitative approach to the study of urban infrastructure. Likewise, emerging perspectives on airport-oriented urbanism suggest the degree to which development that privileges competitive international airports can be seen as a factor in this uneven urban-regional growth pattern to the extent that "the economic growth which a major airport spurs within a region is more often than not occurring at some distance from the airport, meaning that negative economic and environmental consequences are going uncompensated" (Cidell, 2012). This is an important and timely subject for further urban research.

Whether located within the formal boundaries of the city, as Heathrow is, or beyond the continuous built environment, as Gatwick is (on the other side of London's Green Belt), airports are infrastructures which concentrate powerful public and private forces in our society, interests which rely on and co-constitute these places. Although urban studies acknowledges the unintended consequences of post-war modernist planning and megaprojects that emphasised circulation and flows, such as inner-city expressways (Jacobs, 1961; Hall, 1980) and more recently the global neoliberal restructuring of cities and their role in the globalisation of material and non-material flows has been understood (Friedmann,

1986; Sassen, 2012), questions remain regarding 'the limits of the urbanism of flows which are closely bound up with globalization' (Roseau, 2012, p. 33). This is certainly worthy of critical urban scholarship, given the degree and pace of changes to both the urban-regional landscape around major airports and political economy of cities in recent decades.

Airport expansion opposition movements prove to be fascinating and unpredictable developments. Quantitative research on the connections between globalisation and aeromobilities shows a historical pattern that "the most important cities harbour the most important airports" (Derudder et al., 2014, p. 78). Yet, as "both consequence and driver" of globalisation (Coventz, 2010, p. 57), the production of airport space through the interscalar processes of urban governance has resulted in a remarkable diversity of airports and their surrounding areas, showing that globalisation can be "constructed differently in each place, from an external force that has to be granted access, to a series of processes that need to be engaged with to keep growth occurring here and not somewhere else" (Cidell, 2006, p. 661).

Massey argues that in global cities such as London, "the restructuring and reterritorialisation of planetary power-geographies" often selectively re-purposes the existing built environment, using the example that in "the current form of globalisation, the Isle of Dogs is caught in a peculiarly complex and violent entanglement (Massey, 2005, p. 169). Making sense of global city-regions, or their infrastructures such as airports remains a compelling and pending socio-spatial problem with which there is very little consensus in contemporary urbanism or in urban studies literature. I share Lassen and Galland's concern for the "existing relations between social, spatial and environmental consequences related to increased flying, airport development and globalization, instead of dealing with such elements individually" (2014, p. 149). This project takes the view that intensifying or expanding flows at airports or through airspace infrastructure can thus be interpreted as a three-dimensional planning project: the project of integrating global flows and local environments. Airports in particular, however, have boundaries that extend well beyond their perimeter fence of noise contour maps. To the surrounding communities, such infrastructure needs mitigation at the very least, whether through new technology, public consultation material, integrated planning or simply by force, of the conflictual visions for the given space. As Healey explains, "planning project, infused with this understanding of socio-spatial dynamics, becomes a governance project focused on managing the dilemmas of 'co-existing in shared spaces' (Healey 1997, p. 3). Dimitriou, Ward and Wright (2013, p. 38) challenge the notion that the planning and appraisal of

infrastructure projects should be ‘tightly controlled from the outset and achieved with the greatest possible speed’. Rather, their research suggests that ‘project decision-makers to adopt more holistic, flexible, robust strategies and procedures that incorporate periods of engagement with a wide range of project stakeholders from the earliest opportunity’.

A local expert discusses the idea of ‘”fuzzy project boundaries” and the issue of and local antagonism:

> When you have projects that are managed with tight deadlines, tight budgets, a tight set of stakeholders, by their very nature they will define the boundaries of their interest, because that's what they have to do to declare how they measure success. What they tend to do is have tight boundaries, and if you have airport expansion then the economists epitomize this difference by talking about 'externalities', they imply that the airport is the airport, and anything outside of the airport is an externality, please read: 'secondary issue'. Of course, what is actually true is it's not a secondary issue, the secondary issue can overwhelm the primary issue, which is, how do you deliver an efficient airport? The next question then is 'well, if we have our boundaries tightly bound, we are better able to judge, technically-speaking, the success of these projects, finished on time, within budget, according to specifications? But if the success of the airport has broader functions, then purely what we call the iron triangle criteria of project management and delivery, then we need to look at the boundaries again and actually decide on how far are we wanting the boundary of this project to be defined, because they will define it, the stakeholders. I suspect what's happening now is, in reality, and the same with HS2, is that they try not keep the artificial boundaries so tight, and they only absorb stakeholders and issues that they can't ignore. In other words, noise, and if there's enough opposition then they will expand the boundaries. (local expert, personal communication, 27 July 2016)

From this perspective, airport campaign groups can be considered actors because they cannot be ignored, and are reluctantly drawn into the process of spatial negotiation.

There is a large body of literature highlighting the variegated processes of “spatial stretching and territorial perforation associated with globalization” (Amin, 2004, p. 33). Addie proposes that the “theoretical and empirical challenge of connectivity” and the study of relations between flows and place “within the complex, contested, and contradictory landscapes of globalizing city-regions” presents an opportunity to study and better understand the complex

geography of extended urbanisation patterns and externally-oriented transport flows (2015, p. 192; McNeill, 2010; Griggs & Howarth, 2013a), and outside of the central city, infrastructure stretching across the three-dimensional geography of urban-regional airspace. Addie writes that in order to "effectively manage globally-integrated, economically-viable and socially just air hubs, planners, policy-makers and community activists must therefore engage a complex set of economic, political and sociotechnical interests" (2014, p. 98).

Within urban areas that have multiple airports, it is the airports that are most centrally located that are the most popular with the travelling public. This essentially pulls airports and aviation flows closer to centres of population, along with their local environmental externalities, paradox has implications for the socio-environmental capacity of the city region. This can mean that the most central airports, such as London Heathrow and London City become more competitive, and likely reach full capacity sooner. This paradox has problematic implications in terms of social sustainability and the "environmental capacity" of the area (Upham et al., 2003), as well as the operation of the airport itself (Bréchet & Picard, 2010). According to Upham, Thomas, Gillingwater, and Raper (2003), the total capacity is of an airport is ultimately dependent on three essential elements: (1) "infrastructure capacity", which depends especially on runway and terminal capacity, as well ground access, (2) "airspace capacity" which relies on air traffic management and navigation systems, and finally, (3) "environmental capacity", which concerns externalities including local jet fuel emissions and decreased air quality, the airport's contribution to global climate change, local threats to biodiversity, and the subject of this paper: the governance of the relationship between the airport and the local impact and response to aircraft noise pollution.

In their study of aircraft noise conflicts around Barcelona El Prat Airport, which was recently expanded with an additional runway, Suau-Sanchez, Pallares-Barbera and Paül introduce the concept of "socio-environmental capacity", which they contend is key component of overall "environmental capacity", stressing that "environmental issues are often taken into account only because of social response and concerns" (2011, p. 278) They recommend developing new ways of including all parties in the decision-making process to achieve the balance between airport capacity and noise pollution (p. 283). Rationales which once justified the construction of 'old megaprojects', purportedly "based on politically-neutral, technocratic expertise and the ideal of democratizing society and distributing a 'fair share' of their benefits'" (Lehrer & Laidley, 2008, p. 788) has become a much less convincing logic for the

expansion of airports within dense urban regions. In that airport expansion inevitably has different negative consequences for different sectors of society, important decisions about megaprojects such as where (or if) to build a new, full-length runway in a growing urban region are inevitably political decisions with 'winners and losers' that reveal a core, unresolved tension between externally-oriented transport flows and their local setting.

Like airspace, urban verticality, too, is consciously, strategically produced. Graham includes Lefebvre's critique of rational, futuristic architecture in *Vertical* (2016), reminding the reader that the modernist designer of the utopian *Ville Contemporaine* and *Ville Radiuse* concepts "thrust built volumes into abstraction, separating them from the earth by means of piles and pillars", physically fragmenting the urban fabric and its residents "on the pretext that he was exposing them to open air and sunshine. At the same time – literally – volumes are treated as surfaces, as a heap of 'plans'" (1991, p. 337). Le Corbusier's 'machine for living in' is seen as, in fact, "a fracturing of space [and] as the appropriate habitat for a man-machine, corresponds to a disordering of elements wrenched from each other in such a way that the urban fabric itself – the street, the city – is also torn apart (1991, p. 303, cited in Pascoe, 2001, p. 125). This is the same space that is taken for granted until a new high-rise is built that may block the sunlight to your backyard, or the effect of a neighbourhood feeling empty if tall, beloved old building is demolished.

Like suburbanisation, airport and airspace expansion are other ways that the urban fabric is extended from the continuous central city into the periphery, and lends itself to Lefebvre's metaphor of the often turbulent 'explosion' of the urban realm through the "extension of the urban fabric" through the "projection of numerous, disjunct fragments (peripheries, suburbs, vacation homes, satellite towns) into space" (2003, p. 14-15). Lefebvre's metaphor is usually meant to describe the chaotic extension of the urban across the landscape, far beyond the conventional city or even urban region, while 'implosion' is used to describe high-rise towers in the central city. However, not unlike an actual explosion, aviation flows and airspace extend from a specific place, into the air, with no less than profound effects on the ground as well.

Le Corbusier envisioned the airport of the future to be removed from its urban context, "in a denuded area, consisting only of wide-open skies, a wide-open prairie, and wide-open cement runways" (Pascoe, 2001, p. 127). This form of verticality perpetuates the effect of distance

and spatial fragmentation. According to Le Corbusier, “it is question of the airplane eye, of the mind with which the Bird’s Eye View has endowed us; of that eye which now looks with alarm at the places where we live, the cities […] the airplane indicts” (1935, p. 5).

Since the advent modernism and the machine age,

> Each generation of machines evolved naturally and technologically, a process to which architecture could never measure up. Hence, ‘the beauty of an airport lies in the splendour of its space’; the fact that in its vacuous flatness it existed only in two rather than in three dimensions, laying itself down, in deference, to the inexorable, final approaches of aircraft. (Pascoe, 2001, p. 129)

Lefebvre writes that the ”urban fabric,” does not narrowly define the built world of cities but all manifestations of the dominance of the city over the country. (2003, pp. 3-4) [Meanwhile] industrialisation and urbanization was taking place, the large cities exploded, giving rise to growths of dubious value: suburbs, residential conglomerations” (2003, p. 4). Following Lefebvre, and usefully for this project, Brenner and Schmid highlight the ambiguous term “’non-urban’” to encompass “the suburban, the rural, the natural or otherwise” (2015, p. 164). Rather, “a vacation home, a highway, a supermarket in the countryside are all part of the urban fabric. The imagined urban-non-urban and London-countryside binaries can be read in the following map of London and the South East of England:

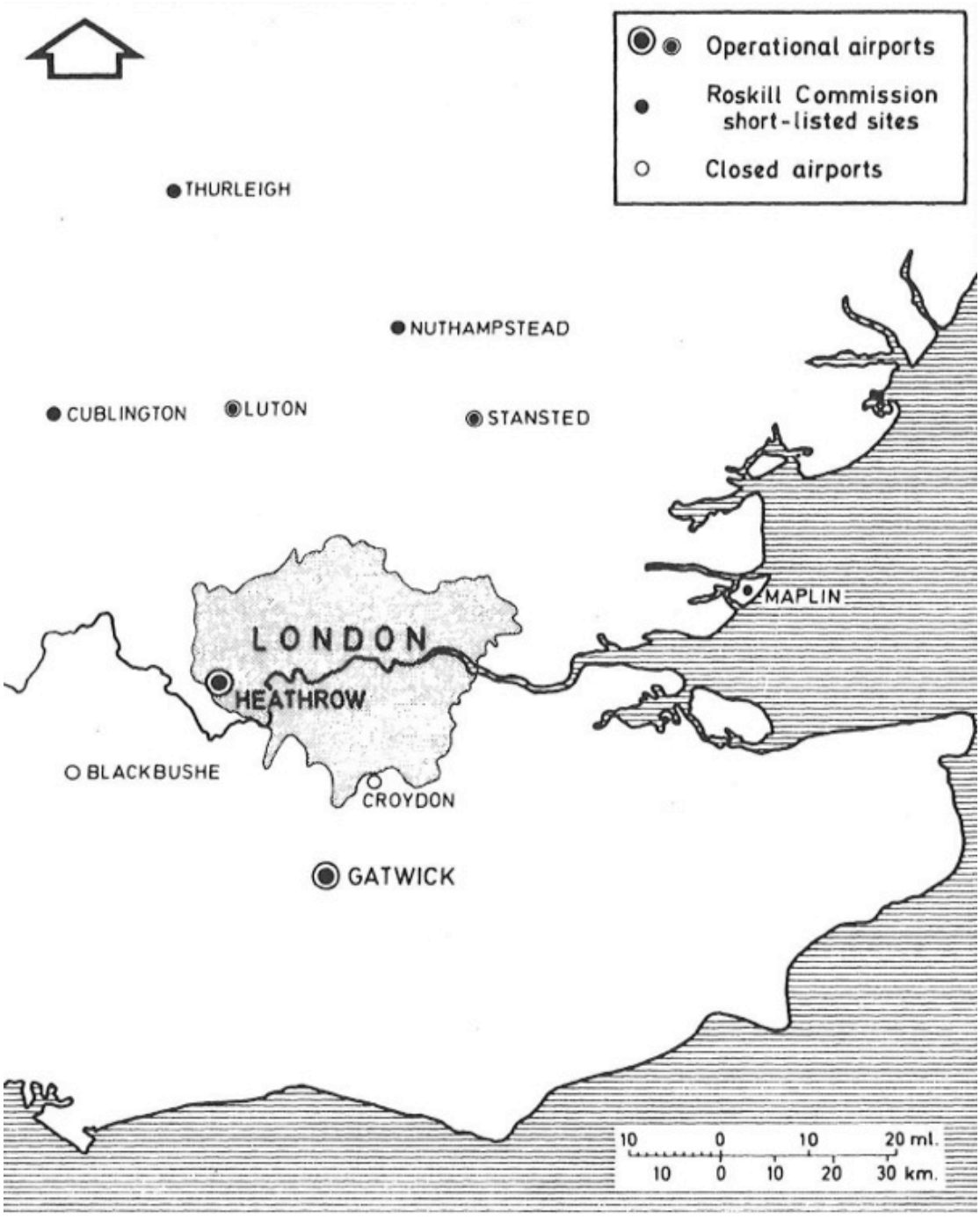


Figure 2: "London's Airports" (Hall, 1980, p. 18).

This project may be considered part of the larger project in urban studies of re-imagining the urban realm after the declining relevance of 'the city' as the analytic object for urban studies at all (Chaoy, 1994; Wachsmuth, 2014). Harvey has argued that the city is no longer "any

kind of meaningful entity in modern life. It had been superseded by a process of urbanization or, more generally, of the production of space, that was binding together the global and the local, the city and the country, the centre and the periphery, in new and quite unfamiliar ways (1991p. 431). Brenner and Katsikis study transport flows and ways that "urbanization is revealed as a relation of access to a broader terrain through networks that link cities, yet expand beyond them via long-distance transport corridors that cumulatively become important landscape attributes" (2014, p. 452). This discourse within urban geography proposes advancing our conception of cities and the urban realm by including what would otherwise be considered 'non-urban' spaces, or 'operational landscapes', which are not necessarily inhabited, but are nonetheless central to the process of urbanisation, such as intercontinental shipping lanes - and inter-continental aviation networks (Urban Theory Lab-GSD, 2014, p. 461). For this project, the term 'non-urban' will be employed to imperfectly describe the area within and beyond the Green Belt, as well as the airspace above the city and the ground level 'non-urban'. Regarding the application of this term to describe suburbs and other spatial forms, which comprise the blurry urban periphery, for this project this term will take on a practical advantage, in addition to its connection this literature on peri-urbanisation. Simply put, the South East's commuter towns, villages and new towns do not conform neatly conform to any established model of 'suburban' or 'ex-urban', but in that they are decidedly not 'cities', I will use the term 'non-urban' loosely to describe peripheral places and illustrate that they are, in fact, part of the non-contiguous urban fabric.

If the concept of the city, the suburb and the countryside are indeed out-dated, then examining how the concept is invoked discursively. Building on this theme, Storper and Scott explain that although "the identity of the city as a spatial unit is deeply compromised by the widening external relations that form its so-called 'constitutive outside'" (2016, pp. 17-18), the idea of the city as a concentrated human settlement still has some relevance to academic debates and studies of the urban:

> The city, in a nutshell, is in important ways an irreducible collectivity and, as we argued earlier, its peculiar character derives from its properties as a locus of agglomeration, gravitation and density as well as from its specific daily and weekly rhythms of life. […] Cities concern us because distance is not dead, and substantial elements of our lives are anchored in these spatially-and temporally-constrained urban systems. The day we when we can move with no cost in time or effort from one place

> to another (i.e. a world of 'magic carpets') is the day when we can say that the city is dead. (Storper & Scott, 2016, p. 17)

3.3 The urban-airport interface

> Thank God, man cannot as yet fly, and lay waste the sky as well as the earth! We are safe on that side for the present. (Henry David Thoreau, 1861)

This project owes an immense degree to influence to the "spatial turn" in geography, and qualitative human geography in particular, for advancing a discipline aimed at making sense of *what we can't see* in urban-regional environments, the forces, rationales and dynamics which shape space and our experience of the urban. "Driving the spatial turn still further", Soja suggests, "will be currently emerging ideas about the importance of urbanization, regionalism, and the interconnectivity of geographical scales from the global to the local" (Soja, 2010, p. 193). Local-transport conflicts seem to draw on dominant, yet unresolved rationales of modernity, economic growth and technology, exacerbating this "tension between the concentration and dispersal of flows and their impact on places" (Hesse, 2013, p. 33), and as well as tensions between "contradictory modernities" (Gandy, 2005, p. 31-40) perhaps inherent in contemporary globalised urbanisation. The unresolved human-technology conflicts found at airports seems to present a commonality that other - not unproblematic - form of urban verticality that other prominent and polarizing form of vertical urbanisation: the skyscraper (Graham 2015).

The contrast in scales regarding urban governance and spatial planning of airport space has not, however, resulted in a situation where local actors are simply "the helpless pawns of overwhelmingly powerful globalizing forces" (Kesselring, 2009, p. 52). Ullman's (1954) canonical research developed a way of seeing transport in its spatial context, which is "particularly helpful when interpreting the functional specialization of certain places (notably cities) in the context of transport flows and chains" (Hesse, 2010a, p. 78). Since then, research of the urban context of global freight distribution, for example, and port-city spatial dynamics suggests a useful template for understanding international airports and globalised urbanisation. This theme of research lies at the nexus of transport geography and urban geography, and provides an instructive conception of the port-city interface, investigating the integration of the port and the post-industrial city (such as providing a greater degree of

public access and local integration with remaining industrial maritime functions), and analysing the negotiation of the spaces and scales of maritime flows within local and regional governance (Hayuth, 1982; Hoyle, 1988; 2000; Daamen and Vries, 2013).

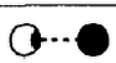
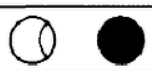
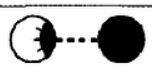
STAGE	SYMBOL ○ City ● Port	PERIOD	CHARACTERISTICS
I Primitive port/city		Ancient/medieval to 19th century	Close spatial and functional association between city and port.
II Expanding port/city		19th–early 20th century	Rapid commercial/industrial growth forces port to develop beyond city confines, with linear quays and break-bulk industries.
III Modern industrial port/city		Mid–20th century	Industrial growth (especially oil refining) and introduction of containers/ro-ro (roll-on, roll-off) require separation/space.
IV Retreat from the waterfront		1960s–1980s	Changes in maritime technology induce growth of separate maritime industrial development areas.
V Redevelopment of waterfront		1970s–1990s	Large-scale modern port consumes large areas of land/water space; urban renewal of original core.
VI Renewal of port/city links		1980s–2000+	Globalization and intermodalism transform port roles; port-city associations renewed; urban redevelopment enhances port-city integration.

Figure 3: The port-city interface developed by Hoyle (1988; 2000).

> The essence of the relational approach is that we cannot understand spatial processes without considering specific relationships that exist between places, between different actors in places and between actors and their institutional contexts. Spatial dynamics are therefore relationally constituted through interactions and place-specific traded and non-traded interdependencies among actors. (Storper, 1997, cited in Raimbault et al., 2015, p. 4)

Analysis of the port from the perspective of the port-city interface, especially of the spatial strategies emerging from this process, such as provides a greater degree of public access and urban integration with port functions (see Figure 2), offers a practical template for research of the urban-airport interface. This interface model provides an opportunity to show how various actors and scales are managed through spatial planning and political conflicts and the challenges of planning in this multi-dimensional context (Witte et al., 2014). Brian Hoyle in particular has established port-city research as an important realm of interscalar negotiation given "the sensitive and often controversial port-city interface needs careful and appropriate planning solutions" (Hoyle, 2000, p. 414). Such researchers of the port-city interface would conduct research on the perspectives of port authorities, urban planners, real estate developers, and government officials, as well as "community groups as a major components of the decision-making process in port-city change" (Hoyle, 2000, p. 407). Hoyle describes

such groups as constituting "a source of ideas; they influence the pace and pattern of change and development; they encourage, modify, restrain, and warn; they provide retrospective overviews and influence agenda for the future" (2000, p. 407). At a larger scale, port regionalisation is said to be "not a functionalist logic of the 'global' imposing development on 'local' places [but rather] the result of a delicate relational process in which interests from various scales converge in the formation of policy agendas and strategic decision-making and materialise through the process of strategic coupling" (Raimbault et al., 2015, p. 15).

As "critical transactional spaces" (Freestone & Baker, 2011), the development of major international airports and their relationship with the city region and the inter-scalar processes of urban governance – has resulted in a remarkable diversity of built environments and political landscapes. Under such complex growth pressures, land around the airport – the contested space between the city and the airport – can be understood as the physical interface between the global flows of passengers, and local milieus that co-constitute the global city region – a space that requires further research and theorisation. Whether as anchors of a new form of regional development, or more commonly as "vital growth poles for urban and regional economies and centres of a new post-industrial spatial structure" (Conventz & Thierstein, 2014, p. 90) of global city regions vying to increase their presence and connectedness on larger, global scales, the study of major airports can illuminate the complex governance and planning of global cities.

Due especially to aircraft noise, large airports remain difficult to integrate within their surroundings. Yet, as urban regions such as London and the South East grow, become denser while also spreading outwards across the urban-region and encircling their airports, the challenge of urban governance here is to somehow balance conflicts between economic imperatives and the logic of greater global connectivity, with local impacts such as aircraft noise pollution. Drawing again from literature on ports and cities, at airports we can see theorise a parallel, 'global-local mismatch' in the priorities a form of urban development focused on the economic value of global transport flows for their surrounding cities and regions, and urban governance and spatial planning that strives to balance social and environmental concerns with such economic growth (Cidell, 2014; Merk, 2013). These complex territorial configurations and priorities of the global city region can be seen to confront airport-adjacent communities where urbanisation and the needs of the aviation industry intersect. Focussing on their local contexts, where the mismatch with these

infrastructures is the most pronounced reveals that the effects of noise and other environmental issues are often concentrated in airport-adjacent areas. The externalities of connectivity have a historical precedent in cities such as London, as former centres of empire are fundamentally co-constituted by global economic external relations.

Boschken (2013, p. 1776) makes the link between today's global cities, which are also historically significant port cities, and their local environmental footprint, a "high-stakes paradox in sustainability", between global connectivity, economic development and coastal ecology. While ports connect the urban realm to the sea, and to ports around the world via an invisible, 'invisible global infrastructure network of shipping lanes' (see Peters 2010), airports connect the urban to the global scale via controlled airspace and a network of flight paths inevitably stretching over their respective cities and regions. Trajectories of intensifying global flows, and a concurrently growing city region next to and under aviation infrastructure present a paradox that has not been resolved by new aircraft technology. Whereas the negative effects of basing trans-oceanic shipping flows within cities may be limited to port-adjacent communities, or environmental degradation below the surface (another three-dimensional realm extension of the urban footprint), flight paths extend far across the urban region.

The relational approach that has been established with the port-city interface "represents not only a concrete site of encounter and overlap, but it is considered to be a strategic platform for integration and contestation between port and city, economy and territory. Thus it is viewed as an artefact that links subject matters and relates them to each other. In more geographical terms, it is seen as a connector between different spatial units and between different spatial scales" (Hesse, 2017, p. 2). Both sea ports and airports often exhibit a distinct scalar mismatch between economic benefits that are often distributed nationally, while closer to the airport the effects of noise and other environmental issues are often concentrated in these airport-adjacent areas. While the latest generation of mega-ports and mega-ships are usually outside of the city hidden from public view due to their size, major hub airports are high-profile global gateways that are made even more visible by high-profile airport expansion conflicts. These infrastructures present a paradox, between the expansion of airports and the use of airspace, while 'on the ground', urban regions become denser and extend outwards, horizontally. You can see this in the quieter suburbs and "commuter belt" towns outside of London, in the South East of England. In other words, this is a paradox of

social-spatial trajectories of suburbanization in and around London, and the adverse effects of the airport.

The main existing externalities of Heathrow and Gatwick airports include aircraft noise pollution, air pollution, and local traffic congestion. These local dis-benefits have made the airports difficult to integrate with their surroundings, and have a history of putting local and county authorities at odds with the central, UK government and the project of strategic positioning of London and the South East as a globally oriented economic engine for the United Kingdom on a regional scale (John et al., 2005).

Globalisation interpreted as a process that is materialised and internalised by local actors and urban governance through strategic planning. With airports, this may risk making local communities the "'doormat' for the global space of flows", (van Wijk et al., 2015, p. 183), or so-called 'noise ghettoes'. Likewise, Bréchet and Picard (2010) introduce the term "noise victims" to describe residents disproportionately effected by aircraft noise pollution. However, this project will demonstrate that although the power dynamics may remain uneven, "places neither dominate flows nor that flows tend to determine places, but that the two are intertwined in a complex relationship that is constantly reproduced in the context of global exchange" (Hesse, 2010a, p. 76), while, along with the "big policy players, local NGOs and neighbourhood committees can act as specific knowledge brokers and should become involved appropriately" (Hesse, 2017, p. 11).

Still, a distinct spatial mismatch inherent in airport hubs exacerbates the conflicting trajectories of residential growth in relation to airport expansion. One of the most familiar examples of the political production of scale is the so-called NIMBY (Not In My Backyard) phenomenon (2004, p. 21). On the other hand,

> The political meaning of 'local' cannot be determined outside of specific contextual reference. Local/global in itself cannot be an adequate surface along which to constitute political antagonism. […] And yet, of course, most struggles around globalisation are inevitably 'local' in some sense or other. A long tendency on the left has been either to denigrate them for being 'only local' or to romanticise them for their supposed rootedness and authenticity. There are spatial imaginaries in play here: both responses depend upon the notion of the local as effectively closed, self-constitutive. (Massey, 2005, p. 181)

Single-issue groups such as airport campaign groups discussed here have been accused NIMBYism, and essentially being 'intolerant, short-sighted, freeloading or engaged in an essentially protectionist form of participation that is selfish in ends and uncivil in spirit' (McClymont & O'Hare, 2008, p. 323). This mismatch between the benefits and costs of an airport is used in many different places to argue that anti-expansionists are only NIMBYs, which activists must then work to counter. Such an argument states that if the benefits are distributed over a large area, and the costs are geographically confined, then the greater good should win out (Cidell, 2004, p. 162).

3.4 Co-producing airspace

> The physical infrastructure of the airport […] is clearly a technological project, but its function is to perform a diverse number of tasks that include those related to the physical act of flying (e.g. the maintenance of runways, air traffic control, etc.), or the information and communications systems required for surveillance. In all cases, technological functions support some social objective, whether it be the needs of the traveller or the needs of security. (Ali & Keil, 2010, p. 101)

During the advent of the jet engine and mass aviation, which compressed distance and time in ways which were unthinkable a generation earlier (Gottdiener, 2001), Lewis Mumford wrote described aircraft noise pollution as a classic human-machine conflicts, "as befits a machine originally designed for military purposes produces the maximum amount of environmental injury and social disruption" (1974, p. 18, cited in Pascoe, 2001, p. 139). The challenge of the mitigation of this conflict remains today. The economic benefits of airports notwithstanding, airports have also described as prone to 'wreaking creative destruction' onto the landscapes that surround them (Pascoe, 2001, p. 7) due to externalities such as noise and air pollution. There is an argument to be made that more research and work is needed on local-airport conflicts, because aviation is not only here to stay, but because of the place it holds in our society, and the mental associations we make between aviation and our sense of freedom and mobility:

> It's quite clear that the jet is the defining sound of the last 40 years of the 20th century. Before the aeroplanes' invention the only things that could be heard in the sky were thunder or birdsong. Here now there was a new sound in the sky. I think as the century has progressed, the sound of the aircraft has intensified, and also has intensified our sense of what it is to be modern. (Pascoe, 2016)

From the (perhaps not very objective) perspective of the UK Noise Association, "noise remains the forgotten pollutant" (UK Noise Association, 2017, p. 2). Indeed, noise seems to have a peculiar role in our consciousness: when we are annoyed it can be difficult to think of anything else, yet when someone else is annoyed we tend to dismiss or minimise their perception of the situation. While this is an issue that is relevant in most urban environments, the specific governance framework and policies to aircraft noise make a significant difference as to whether noise is perhaps rationalised as part of a city's noise landscape, or is perceived as a menace which is likely to exacerbate antagonistic feelings by local residents.

Bröer's comparative research on aircraft noise pollution in Switzerland and the Netherlands (2006) offers a sociological perspective, emphasising the role of such policies to either push residents into an entrenched, adversarial stance, or essentially, to funnel local opposition into a technical-managerial or perhaps even post-political mechanism for addressing the issue:

> Noise is presented as a threat to everyday life yet inevitable. If people adopt both perspectives at the same time, all they can do is protect their own backyard. The protection of one's own backyard is radicalized because the distribution policy has eroded existing institutions that might channel local demands. NIMBYism is a product of Swiss noise policy, and therefore much less prominent in The Netherlands. (2016, p. 270) [where all parties accepted the acoustic definition of noise annoyance and noise contours became a fetish (p. 270) […] planning approach led by experts, ecological modernization, and eventually "a promise from policy makers to expand the airport and alleviate noise exposure at the same time. (p. 267)

National Air Traffic Services Limited (NATS) defines aircraft noise, as opposed to the sound of an aircraft, as "unwanted sound that may result in disturbance and annoyance". What we hear when we recognise the sound of an airplane is the noise from the engine especially, but also the sound of airflow around the wings and fuselage of the aircraft, which in technical terms creates different tones and frequencies depending on factors such as the speed of the aircraft (NATS Ltd., 2017a). Using the example of the contested re-routing of freight trains through a suburb of Chicago, Cidell develops the idea of uncanny infrastructure, that is, arrival transport flows that appear to be 'out of place' in the suburban realm, as opposed to in 'the city' which is imagined as a more appropriate place, because, according to the argument, "cities are where noisy, disruptive, hazardous trains have always been and should always be" (2015, p. 145). Through her analysis of the contested decisions regarding the location of these

locally unwanted material flows, Cidell highlights the role of transport infrastructure in the social production of the urban (Cidell, 2015).

3.5 Chapter summary

This section has highlighted the complex, nuanced ways in which continuous flows of transport constitute the urban fabric, and comprise yet another way that flows extend into the broader urban realm. Specifically, aircraft flows are interpreted as the extension of this realm into the 'vertical' or 'three-dimensional' space above the urban region. With this perspective on the urban realm and the role of transport flows, this Chapter introduces the analytical concept of the urban-airport interface as a discursive, power-laden, technical and managerial process of spatial negotiation.

By borrowing from the foundational transport geography interpretations of the relationship between the port and the city, and then combining concept of the interface with the additional, vertical axis of pioneered by emerging research on the three-dimensional, spatially stratified urban realm, this Chapter has conceived of the urban-airport interface as social process and the spatial negotiation between ground level and increased use of airspace above the city. The contested issue of aircraft noise pollution, then, for the rest of this text can be thought of as an effect of this very particular form of urbanisation. The following two Chapters will examine how various spaces, scales, and actors negotiate, manage and shape the spatiality of aircraft flows and their noise footprints. Ultimately, the conceptual approach of the urban-aircraft interface and lived experience of aircraft noise pollution will be envisioned as the materialization of interscalar spatial negotiation. The seemingly intractable local conflict over aircraft noise reveals social relations which are otherwise hidden behind the technocratic and managerial realms of airspace planning and management, and balancing of airspace infrastructure such as new runways across the urban-region.

Chapter 4

London and the South East of England: Portrait of an urban region

4.1 Globally-intertwined urbanisation

Globalisation and the intertwining of urban environments into networks of global flows to create identifiable 'global cities' takes place with specific and unique local histories and geographies, as Abu-Lughod demonstrates in her study of three of the United States' global cities (1999).

> Yes, we still name cities and think of them as distinctive places. A Londoner today might dispute which outer suburbs count as London, but swears that the city does not extend to adjacent urban centres such as Reading and Slough. (Amin & Thrift, 2002, p. 1)

London is an archetypal global city (Sassen, 1991) and, aside from being the capital of the UK, is perhaps more than any other feature defined by its global interconnections, and as globally intertwined as any place in the world can possibly be. As such, this is a place where the study of global-local tensions may be especially fruitful. In the words of Doreen Massey, the juxtaposition in space of such inter-scalar intentions presents "a real collision" in that "the dominance of London by global financial industries changes the character and the conditions of existence of all else. […] London is a 'successful' city. Endlessly it is so characterised. (The other regions of the country are problems, we are told, but not London and the South East.)" (2005, p. 156).

Yet, in the post-war era, as the New Towns, other existing satellite towns and the commuter transport infrastructures in the South East expanded, the population of London dropped (Street, 2014, p. 71). Meanwhile, once bustling industrial areas such as the London Docklands declined in the 1960s and 1970s, while London began to reposition itself in global financial networks. Meanwhile, Heathrow and London's other airports became increasingly intertwined in growing global air traffic flows (King, 1990). Pre-war, the population within London itself had been rapidly growing, from 7,157,729 residents in 1911 to 8,098,206 by

1931 (see Figure 9; GB Historical GIS, 2017a). However, London's population decreased consistently after the war, until it reached a low of 6,483,5431 by 1981.

This decline reversed in the early 1980s, and London's population has been steadily rising throughout the 1990s and 2000s. This population growth, densification and urban-regional population growth took place in parallel with a consistent rise in the numbers of passengers passing through London's airspace infrastructure. By 2011 Greater London's population reached a new peak of 8,173,941 (GB Historical GIS, 2017a). Meanwhile, in South East England (an official, statistical region which includes West Sussex, Surrey, Kent and other counties, south and east of London), the population increased steadily during the same time, from 3,470,715 in 1911 to 4,000,416 in 1931, continuing on to 6,881,434 by 1981 and 8,634,750 by 2011 (GB Historical GIS, 2017b).

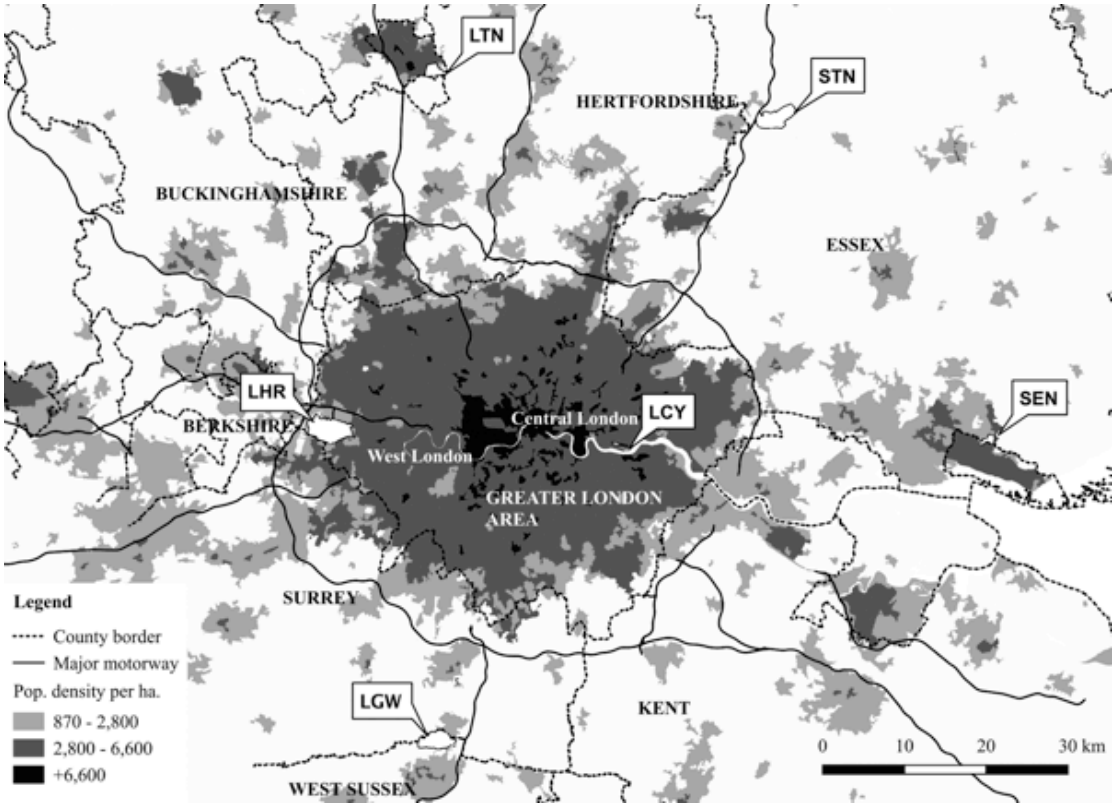


Figure 4: Current population density in London and the South East. Map by author, (OpenStreetMap (2015); ONS (2015).

Significantly, it was during the 2000s – when people were moving back to the London and the South East coincided with the sharp rise in demand for passenger flights – that local airport conflicts became such a volatile spatial planning concern (see Figures 4, 9 & 10). Such socio-spatial consequences of this paradox of airport proximity and conflicting and converging growth trajectories remain a vital issue that requires further research and theorisation.

These two conflicting trajectories became apparent after the Government's publication of the South East of England Regional Air Services Study (SERAS), which recommended expansion in the South East with runway expansion at first at Standsted Airport, and Heathrow Airport by 2030. The extended public consultation process and construction of a colossal fifth terminal at Heathrow (which opened in 2008) and the 2003 White Paper both seemed to signal that airport expansion had gained momentum in the early 2000s under the New Labour Government. On the other hand, a groundswell of opposition to large-scale expansion anywhere in the UK, for environmental, social, and political reasons was also growing, and coalitions formed that become more BANANAS (build absolutely nothing anywhere near anybody) than NIMBY (not in my backyard) in nature (Humphreys & Francis, 2002; Griggs and Howarth, 2013b). Since then especially, the growth of airport infrastructure and the growth of residential population across London and the South East have both continued despite their apparent incompatibility.

There is no level of government that corresponds in any way to London *and* the South East. Instead, urban-regional governance in the UK can be found here in the overlapping "structure, format and regulatory activities at a particular spatial scale [which] involve a range of actors of varying powers and structural dependencies" (Tewdwr-Jones, 2012, p. 156). Within the administrative boundaries of the Greater London Area are 32 boroughs as well as the City of London (which has a greater degree of independence in many respects), the Greater London Council (GLC) had been a top-tier administrative body, in some ways a city-regional government for the area within the Green Belt, and had competence of most planning and development matters until its dissolution in 1986 during the era of Thatcherism (Hall, 1963; Elinbaum & Galland, 2016).

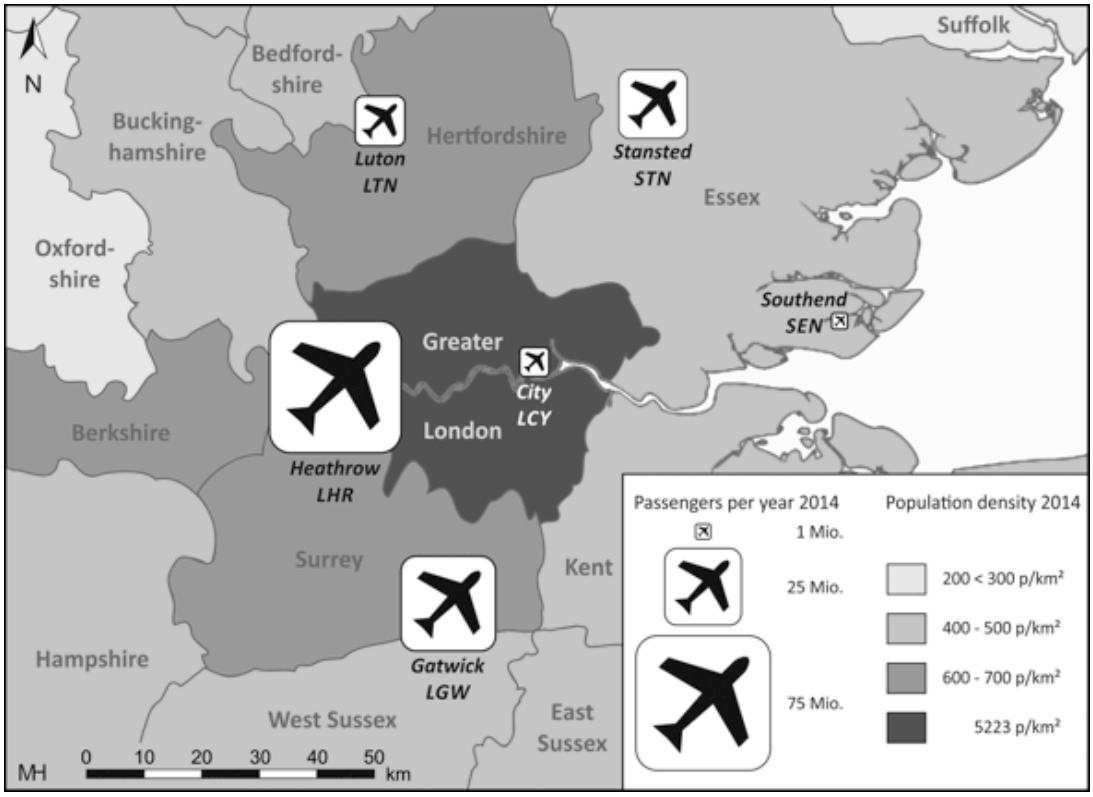


Figure 5: London, the Home Counties and commercial airports. Map by Malte Helfer, source: CAA (2015b); ONS (2015).

A governing body for the area within Greater London was reintroduced with the creation of the Greater London Authority (and the London Assembly and the office of the Mayor of London) in 2000, which creates the London Plan, the "Spatial Development Strategy of Greater London" (Greater London Authority, 2011; Elinbaum & Galland, 2016). This supra-local plan for Greater London provides county-level spatial guidance, such as promoting development and "regeneration" in post-industrial parts of London, and selective areas of intensification. Notably, the London plan prominently incorporates development on axes towards Gatwick, Stansted, and Luton (which are all located beyond boundaries of the Greater London Area) into Regional Coordination Corridors (see Figure 10), a pro-active approach to inter-jurisdictional spatial planning.

During the 2000s London has witnessed the completion of many 'major regeneration projects, Kings Cross, Wembley Stadium, the Olympics site, the Thames Gateway, Heathrow Terminal 5, in addition to new high-rise in the City and elsewhere in central London, retaining GC status', "maintain the conditions of its competitive success", for example,

“London’s role as an international transport hub is bound up with the role of its airports, but the principal of these, Heathrow, is operating significantly over its design capacity and its future expansion has been dogged by controversy and delays” (Syrett, 2006, p. 297). Meanwhile, Heathrow Airport is effectively already at full capacity already, while Gatwick is also expected to reach capacity in the near future. Heathrow is considered the UK’s ‘global gateway’, and its expansion has been read as an ‘effort to selectively open, connect, and entangle’ places into global flows through the expansion of such ‘infrastructures of empire’ (Cowen, 2017).

The London Plan now provides a high-level approach to spatially integrating London, as the Local Plans of these 33 boroughs must conform to the London Plan, which guides the Mayor of London, who has the power to override borough decisions if applications are considered a matter of ‘strategic importance’ to London (Brown, et al, 2014). The jurisdiction of the Mayor of London, of course, ends at the surrounding borders of the Home Counties, and the Plan presents a more vague strategy with regards to integration with the rest of the South East, and, towards Gatwick in the Wandle Valley, towards Stansted via the London – Stansted – Cambridge – Peterborough Corridor, and towards Luton in the London – Luton – Bedford Corridor (see Figure 12). By emphasising the potential for growth towards these three airports in the Counties of West Sussex, Essex and Bedfordshire respectively, the London Plan also tacitly directs growth away from Heathrow Airport, the expansion of which the London Assembly and all three Mayors to-date (Ken Livingstone, Boris Johnson and currently Sadiq Khan) have all been strongly opposed (incidentally, Khan opposes the expansion of Heathrow Airport, but supports building a new runway at Gatwick Airport instead).

In lieu of any integrated spatial plan for London and the South East at the urban regional level, the National level government is left to make spatial decisions for the functional metropolitan area in practice. To the extent that airport expansion is locally unwanted, the London Plan demonstrates its allegiance to London and Londoners, but viewed from the outside, past the M25, into the Green Belt, from the Home Counties, it can also be viewed as pushing airport activity and aircraft noise pollution past its jurisdictional boundaries, which may force opponents in the South East into an adversarial stance.

Yet, “metropolitan areas share underlying needs to govern themselves, which stem from the strong interdependencies and externalities generated by urbanization; but all such regions have fragmented political geographies for addressing these problems” (Storper, 2014, p. 118). The uneven presence and absence of a regulatory framework across this space structures, concentrates, disperses and resists growth, with the various forces in neo-liberal globalised capitalist urbanisation, including transport flows and the housing market are distributed by the spatial planning regime and interpreted through the prism of urban-other socio-spatial interpretations and material considerations.

4.2 The spatial planning regime and urban-rural divisions on the periphery

All forms of spatial planning in the UK, from major national decisions such as the location of airports, to borough-level applications take place within a uniquely rigid yet undeniably neo-liberal spatial-economic governance regime. This section will introduce how spatial planning embodies the tenuous, contradictory constellation of rationales that comprise governance here, a fundamentally adversarial constitution of protectionist, rigid and place-based intentions on one hand, and pro-growth, neo-liberal, externally oriented reasoning on the other. London is often celebrated as an economic success story of model of democratic accountability and high quality of life (Raco, 2014). London has also been infamously described as an “ungovernable” city (Travers, 2004), let alone a ‘governable’ urban region. Meanwhile, the formal governance of the functional urban region is unevenly divided along jurisdictional boundaries, where various pro- or anti-growth fragments of this constitution are unevenly distributed. Following Metternich’s thoughts on Italy before unification, Parker (2011, p. 84) questions whether, before the creation of the first London County Council in 1889, London could have been analysed as anything besides “a geographical expression”, as London was in many respects a collection of adjacent parish authorities and other forms of local governance at the time. I propose that London and the South East today is another ‘geographical expression’ an urban fabric that stretches far past jurisdictional boundaries and urban-rural social constructions.

Since the industrial revolution in the UK, a perception of urban-rural differences have exacerbated and polarised land-use conflicts, and it is said that ‘there remains a strong tradition of sense of connection to the rural realm and rural ways of life, which are seen as threatened by the expansion of the urban realm’ (Tewdwr-Jones, 2012, p. 3). As in many

Western cities during the 20th century, the boundary of the urban realm began to reach far into the periphery, and the edge and the countryside beyond the periphery took on new meaning. "Despite local resistance", Friedmann writes, "the urban force field of the city extends its reach ever outward into the peri-urban, particularly along major access roads. The city needs to safeguard its water supply, needs land to dump its solid wastes, needs additional land for ports, airports, and warehousing, all of which are space-intensive [while also,] urbanites dream of recreation areas in the remaining pristine hills and forests surrounding the city" (2014, p. 554). Wachsmuth suggests that it was as a reaction to industrial capitalism during beginning in the Industrial Revolution that the dichotomy of the town and country, and the very idea of the country began to speak to a deeper "society-nature opposition" in the modern Western imagination (2012, p. 508). By the 1930s Britain, and the state spatial planning regime in particular was viewed as responsible "for generating urban sprawl and for despoiling the countryside", although, as Tewdwr-Jones contends, "market and landowner opportunism" were in fact more responsible for suburban growth at the time (2012, p. 10). Nevertheless, as a reaction to this perception, and under pressure from countryside-oriented groups such as the Council for the Preservation of Rural England (later renamed the Campaign to Protect Rural England), Parliament reformed the planning profession in 1947 (Hall et al. 1973; Tewdwr-Jones, 2012). Previously, during the interwar years, the profession's purpose in the Britain had been to *manage* long-term growth, often by reducing available space through restrictive planning measures and thereby preserving "open land" despite population growth (Street, 2014). Meanwhile, personal mobility was dramatically increasing, first through the development of suburban railways connecting London with the South East, and then through the increasing population of the automobile beginning in the 1920s.

Spatial planning in the UK today is called 'town and country planning', a profession obligated to proactively direct urban growth as well as to protect of agricultural and other non-urban amenities through urban containment (Tewdwr-Jones, 2012, pp. 10-11). Cities and the countryside have since been rigidly "governed as distinct and opposed geographical spaces" (Murdoch & Lowe, 2003, p. 321), and the "planning system has on the whole guaranteed that this way of life will not be rudely distorted by alien intrusions from the town" (Hall, 1974, p. 407). The founding 1947 legislation of the new land use planning regime has "remained remarkably resilient", undergoing only incremental changes, and remains responsible for fundamentally directing what is termed 'environmental, countryside and

regeneration' spatial policy across the UK (Rydin, 2003, p. 199). Hall writes that urban conservationist and preservationist containment policies, particularly in the 1950s, represented a physical victory by the essentially rural counties over what were regarded as the expansionist designs of the major urban authorities (Hall, 1974, p. 394):

> Up to 1939, London was a fairly well-defined organic whole. The map showed a central business area; a densely built-up Victorian ring with houses of all sorts, very poor to rich; the low-density interwar suburbs, running outwards on average about fifteen miles from the centre, but extending finger-like much farther along main roads and railways. Since 1945 London has continued to grow, but not of itself; it has nurtured offspring. (Hall, 1963, p. 28)

During the same era, the green belt concept, which had been fundamental to Ebenezer Howard's utopian urban planning visions, such as Ebenezer Howard's Garden City concept, took on greater practical relevance to planners, and influenced Abercrombie's 1944 Greater London Plan (Parker 2004). Also known as the Abercrombie Plan, the latter was oriented around the idea that London was still 'the capital of the Empire and its built environment should reflect and the power of the British Empire' (Abercrombie, p. 17; Street, 2014, p. 70).

While the reputation of the planning profession had been severely damaged its perceived role in the creation of urban sprawl outside of London, the city's housing stock had been devastated by the bombing raids during the Second World War, and as a response to this planning challenge, the 1944 Greater London Plan implemented a post-war strategy to relocate Londoners to eight New Towns 20 to 35 miles around the city (established by the New Towns Act 1946) and existing centres elsewhere in the South East which are "rigidly defined and of limited size" (Hall, 1963; Street, 2014). The intention of the Abercrombie plan was to promote "the natural evolution of orderly growth", integrated through rational, urban-regional planning and "shaped into some semblance of ordered design, both for population grouping, land use, transport and public services" (Abercrombie, 1944, p. 7, cited in Street, 2014, p. 70).

Ideologically, like the association of nature and the rural realm outside the cities, the idea of a 'green belt' cordon around the city also has its roots in the reality of urban life during the industrial revolution in Britain. As a planning concept, the 'green belt' dates back to the 1943 'Plan for London' by Sir Leslie Patrick Abercrombie and J.H. Forshaw, which became a normative planning goal throughout Britain in the post-war period, "essentially tools for

resisting and diverting urban development and largely negative in nature" (Parker, 2004, p. 55; Rydin, 2003, p. 256). The physical extent of what was the London Green Belt, now known as the Metropolitan Green Belt has also continued to grow (see Figure 11), more than doubling in size by the 1990s and today stretching far past its already expanded boundary in the Abercrombie Plan (Mace et al., 2016, p. 20). However, as early as the 1960s the Green Belt was critiqued for being obsolete in the post-war era of increased mobility and population growth, the "Metropolitan Explosion", by which time Hall had warned the Green Belt had become "a pre-war conception of a city not expected to grow and therefore limiting London arbitrarily to its 1930s extent" (Hall, 1966; Taylor, 2014, pp. 218-219). There is a contention that the "success of urban containment can only partially be considered a success of the planning regime", and, rather, "the most important factor has probably been soaring land practices. […] Though containment may have given some people – particularly those who succeeded in buying their way into the new developments in the small towns and villages, and who seem from our surveys to like the idea of life in the countryside – it can hardly be regarded as an unambiguous triumph of the planning system" (Hall, 1974, p. 403).

The 1947 reforms stressed restrictive spatial planning and countryside preservation, a legacy of an era when the "pace of change — demographic-social-economic — was expected to be slow, "change was regarded as a challenge to be resisted. The basic values were those of conservation of the existing order […] a local government framework inherited from the nineteenth century" (Hall, 1974, p. 396). It has been argued that this had the effect of reinforcing socio-spatial division fragmentation between urban Britain and the Home Counties, which took on "separatist political objectives. The cities had one set of aims on behalf of their citizens, the counties a quite different set of aims on behalf of theirs; and battle was joined (Hall, 1974, p. 396). Cochrane suggests that in the affluent Home Counties these aims have maintained "a very clear anti-growth agenda, seeking to protect the green spaces, and (of course) the amenities and house prices of their residents. […] There may be a broad recognition among those living in them that the relative privilege of the older suburb, commuter towns and villages, is somehow predicated on successful economic growth, but it is equally clear that this should not interfere with the ways of life of residents" (Cochrane, 2011, p. 171). In sharp contrast to the restrictive legislation of the Town and Country Planning Act 1947, beginning in 1979 planning and policy during the era of Margaret Thatcher's Conservative Government (1979-1990) was shaped by a pro-market, neo-liberal ideology and approach to the role of the State in managing development (Street, 2014, p. 72).

This era ushered in a pro-economic growth agenda across the UK, and in London especially promoted the re-development of the capital along a specific, neoliberal global city agenda through dissolution of the left-leaning GLC in 1986 and the creation of semi-autonomous urban development corporations that could circumvent local authorities for the purpose of economic development, such as the regeneration of the London Docklands (Street, 2014, p. 72). Within this regime the built form of the countryside has thus been largely preserved, and outside of the growing cities – London especially – this has inevitably created higher demand for properties within commuting distance to the city.

At ground level, the fabric of the South East clearly extends far beyond the political borders of the Greater London Area. Gandy (2012) problematizes our conception of London's boundaries and questions 'where the city ends' with respect to peripheral 'zones of intensification' that are drawn into 'London' by the extension of its infrastructures such as the new Crossrail "behemoth" (p. 132). As John et al. contend, "the economy of London does not operation in isolation from that of the South East, nor does it simply pull in labour from a series of satellite commuter towns. Rather, London can be seen as the metropolitan core of a wider regional economy into which it is functionally but not politically embedded" (2005, p. 94). Within this context, it has been suggested that the "spirit of contemporary green belt policy is, however, in keeping with the promotion of economic restructuring within rural economies away from a dependence on high levels of agricultural production" (Rydin, 2003, p. 257), or perhaps even a planning framework complicit in "reconstituting rurality" in the British countryside (Murdoch & Marsden, 1994). For example, Hall's critique of the social effects of this spatial planning regime is based on the view that urban containment has produced an exclusive space for "rural dwellers—those who view the countryside as a way of life rather than a place of work [this group has] probably gained more and lost less than any other; and it has been quick to seize on the opportunities of increased public participation in planning. It hardly needs saying that in socio-economic terms this group is higher, and in material terms is richer, than the average" (1974, p. 406). Beyond the generally more dense suburbs in the Greater London Area that the inner boundary of the Green Belt, the post-war era saw the explosion of the urban fabric into discontinuous residential areas that had leap-frogged past the Green Belt by the 1960s and are complimented by a network of motorways and a commuter rail network (Hall, 1997; Hall 1989; Appert, 2008).

By 1960 Hall interpreted the phenomenon of pockets of growth in the "Outer Ring" as "the chronic problem of the suburbs", where "more and more long-distance commuters are having to cross a ten-mile cordon of the suburbs as well as five miles or more of the Green Belt, every morning and night, to earn their living. They have a good reason to mutter imprecations against the builders who let the suburbs sprawl" (p. 28). There is an argument that the planning regime has also led to what is thought of as "the preservationist paradox: as soon as a clear divide between the urban and the rural was defined in policy, it was transgressed in practice (Hall et al., 1973, cited in Murdoch & Lowe, 2003, p. 323). Rather than countryside preservation, the South East experienced a wave of 'counterurbanization' since "protecting rural areas, planning simply makes them more attractive to urban migrants" (Murdoch & Lowe, 2003, p. 323). Today the protection these existing towns and villages in the countryside has become an established, long-term trajectory in the South East, and decisions for nationally significant infrastructure and new towns are made at the national level:

> One of the paradoxes of the 'town and country planning system', is, well… there isn't much town or urban involved, it's been quite influenced by rural interests, and it has been quite anti-urban, and I don't think we've been doing a very good job of thinking urban, so a lot of these places have been allowed to grow rather incrementally, slowly. That's what they developed as a very reluctant compromise, but some things are national level, like Crawley, which is a new town. So you have two interesting things there: you have Gatwick, which is subject to national planning and Crawley, which is effectively outside of the local planning system. It's now built out, and it's pretty much gone to the end of its program. (local expert, personal communication, 5 October 2016)

It has been observed that historically there is a pattern of tension between different local or regional actors, and "many of the county and district councils of the South East – the Home Counties – have taken on a very clear anti-growth agenda, seeking to protect the green spaces, and (of course) the amenities and house prices of their residents" (Cochrane, 2011, p. 170-171). Murdoch and Lowe describe this as a "class-based reshaping of village populations, in a process they identify as 'reconstituting rurality' (2003), but might equally be described as making up new suburban spaces of privilege" (Cochrane, 2011, p. 171). While the Greater London Area and the surrounding Home Counties may be fragmented in significant ways, the urban region remains continually constructed through flows and practice, and, ultimately, positioned on a global stage.

Indeed, the geographical concepts of the "'large metropolis' or urban region, "refer to the territorial scale that covers the economy of the functional urban regional, generally corresponding to the built-up area of that region and its commuting zone" (Storper, 2014, p. 117). Taken as a whole, London and the South East seem to exemplify the process of "city-regionalism" that enables the "conditions necessary to attract transnational capital and boost international competitiveness" (Harrison & Hoyler, 2014, p. 2251). Cochrane suggests viewing the city and its surroundings from this perspective, "namely one that starts from the notion that it is, in some sense, a city-region – that is, London and the South East, or even the Greater South East. […] London has the strongest case of all the UK's cities to be understood as the centre of a (global) city-region, precisely because of the way in which in which sets of spatially concentrated economic activities and social networks are connected through it" (2011, p. 167). At the same time, decentralisation and the uneven extension of the urban fabric often present new challenges for traditional spatial planning and our conventional understanding of urban geography (Wachsmuth, 2014; Carr & McDonough, 2016).

There are, of course, vague boundaries and other relevant and overlapping definitions of the urban region, including the 'polycentric metropolis' or the 'polycentric mega-region' of London and the Greater South East, and the Wider South East, which at times includes Dorset, Northamptonshire and Wiltshire (Hall, 2006; Allen & Cochrane, 2007). The Greater South East, for example, includes London, the South East, East of England, East Midlands and South West, where large-scale projects straddle jurisdictional boundaries. Examples of these are the Thames Gateway redevelopment area in London, Kent in the South East and Essex in East of England, or the Milton Keynes-South Midlands corridor, which stretches from the South East, East of England to East Midlands (Pain et al., 2012). This project ultimately settled on case studies of noise pollution in London, with respect to Heathrow Airport, and West Sussex, East Sussex, Kent, and Surrey concerning Gatwick Airport, although the imperfect manner in which these boundaries relate to these infrastructures reflects the arbitrary character of historically based jurisdictional boundaries in relation to current socio-environmental concerns.

In this context, the notion that London, or 'the city' ends at the political boundaries of the Greater London Area (the 'city limits'), the peripheral M25 motorway, or even the Green Belt seems to be increasingly arbitrary (Brenner, 2014; Keil, 2017). I suggest that transport flows, such as suburban and ex-urban commuter flows and flight paths, represent yet another

form of urbanisation that has ‘exploded’ from its original form. Moving outside of London, there is a reluctance to describe the South East as suburban or post-suburban as these pockets of growth in the commuter belt are less contiguous than the North American archetype of suburbia. This has produced a clear dichotomy of the built environment that essentially consists of London proper, and beyond its borders, or perhaps the M25 orbital motorway, the apparent “natural landscape of the countryside”. In Home Counties such as Surrey, Kent, and West Sussex we find an often rural-looking landscape and discontinuous commuter towns, ex-urbs and New Towns scattered within and leap-frogging beyond the Green Belt.

A local expert likens this form of urbanisation to Sieverts’ ‘*Zwischenstadt*: in-between cities’, “essentially overgrown market towns”, strewn across the South East by the restrictions of the Green Belt:

> There's a huge, huge tradition in the South East of England of not planning positively for growth. That's the worst of all possible worlds, you get this scattering of small bits of housing but you don't get the infrastructure with it. I think this applies on a bigger scale around things like airports, and mitigation measures and effects, so instead of being very reluctant about all this and planning reluctantly for it, maybe the idea should be to say, 'well, looking around, if we're serious about these statutory designations, this is the implication of it and we need to do something positive for what will effectively be urban communities, we need to embrace that this will be their future and they will be effectively urban communities. Whether politicians are mature enough to do that, and planners are at their beck and call, whether they're able to create that agenda and openly discuss it, and discuss it in sensible terms is another question. The whole tradition in the South East is essentially not wanting to address the issues, being as reluctant as possible to accommodate growth and doing it in a very non-positive way, in a very fragmented, disjointed way, which has implications further down the line, in terms of infrastructure and alike. I mean, the scattering of population growth has been a direct product as well of the Green Belt because the Green Belt has had this paradoxical, perverse effect, if you like, of a lot of leap-frog development, albeit on a much smaller scale than in the US, leap-frogging in the form of these extensions to small towns which are beyond the Green Belt, when London was losing population. (local expert, personal communication, 5 October 2016)

For example, rejecting these "inside-outside" city-nature divisions (Heynen et al., 2006) in their study of the 'green belt' outside of Toronto, Canada, Keil and Macdonald contend that it is not 'separate' from the city, and in practice "provides the terrain for a postsuburban relationality" (2016, p. 14). Meanwhile, in London and the South East;

> a rather small proportion of the people who live in this region actually identify with it and think of it as a coherent whole, and certainly they've been encouraged to think of it by the previous regional structures that it's London versus the areas out it, so there was not having any solidarity with London at all. (local expert, personal communication, 9 November 2016)

In parallel to the adversarial competition between Heathrow and Gatwick airports and their respective surrounding communities, there has often been a similarly antagonistic relationship between communities territorially outside of the Greater London Area – within and beyond the M25 and the Green Belt, in the "Home Counties" of the South East such as Surrey, East Sussex, West Sussex and Kent (see Figure 5). Whereas the basic annoyance and health effects of air craft noise pollution may represent a machine-human conflict, outside of London aircraft noise takes an additional meaning in that it is often thought of part of the urban-machine, or in other words, a tentacle, or footprint of the urban realm spilling out, into inappropriate, 'rural' places in the 'countryside'.

Urban-rural division in UK in "its modern form can be traced back to the fast pace of change and the turbulent experience of urbanisation during the Industrial Revolution", in that urban dwellers developed a "new longing for the countryside", while during this time "wild nature took on a rural identity" (Murdoch & Lowe, 2003, pp. 320-321). With these kinds of urban-rural imaginaries, it becomes increasingly apparent how airports expansion into and over the Green Belt and countryside:

> You can probably make a good case that in functional, regional economic terms they're part of the London economy. I'm quite sure that residents would not see themselves as a suburban of London. Even within London, if you go the some of the suburbs in say, Bromley, people will still refer to themselves as being from Kent, and there's a kind of weird, historic thing that they still a postcode from Kent, even though they live in London. It's the same thing in Essex, in East London, Harrow, and people still think of themselves as from these counties, although since the 1960s they've been in London. So in terms of identification there's a lot of Outer London which still sees itself as being not in London as well… It is a very powerful story in the UK, this kind

> of psychological, cultural attachment to the countryside, means that [opponents to the expansion of Gatwick can claim] 'we are quiet, we are rural and we should be left along to be this way, and Heathrow's already noisy', that resonates with this longer cultural argument about the English countryside and it's cultural ramifications. (local expert, personal communication, 11 October 2016)

While making sense of the nuances of the psychological and cultural attachment to the countryside in the UK may be beyond the scope of this project, it is clear why aircraft noise pollution would be perceived as a threat to this nostalgic imaginary of space beyond London in particular.

4.3 Chapter summary

This passage has introduced a spatial management regime, which profoundly shapes the lived experience of residents in London and the South East of England today. At 'ground level', there is a very clear, and rather rigid demarcation of 'town', which roughly corresponds to distinctly central, urban areas where noise may be more tolerable to some, if not an appropriate place for uses of space that have heavy noise footprints. London's 'suburbs', the less dense areas in the Outer London Areas and the discontinuous ring of ex-urbs, 'commuter towns', New Towns and other forms of non-city urbanisation could all be considered, for campaigning purposes, relatively quiet areas of the urban regions that have been protected – especially with regards to the Green Belt. On the other hand, development within central London has been fuelled by a very growth-oriented, globally and economically competitive imperative. Likewise, urban-countryside divisions are reinforced by assumptions about the Green Belt, proximity to 'nature', and the preservation of the existing landscape and the protection of the 'countryside' from the encroachment of 'London'.

Chapter 5

Airport expansion in London and the South East

5.1 Planning for expansion

Before analysis of the Airports Commission's (perhaps unsurprising) recommendation for expansion of Heathrow Airport, it is worth exploring the long-term planning dilemma, which preceded the Commission, as summarized in its Final Report:

> The London airport capacity problem has perplexed governments for over fifty years, for reasons that are not hard to find. The considerable benefits of aviation accrue to the many, while the environmental costs are borne by the (relatively) few. For those who live near them, airports are noisy neighbours and are greedy for space. In a congested corner of a crowded island it is not easy to find a good home for them. No new full-length runway has been laid down in the South East of England since the 1940s. (2015, p. 3)

Indeed, it has been said that with regards to airports and urbanisation patterns, the "spatial geography of the UK also causes its own problems. As towns and cities have grown and airports developed, it has become apparent that many of them are in the 'wrong' place" (Budd, 2007, p. 9). It is quite likely that the apparent lack of space caused by the UK's island geography has influenced this conflict to a certain degree, although I will argue later that it is the fundamental, constitutive tensions inherent in London and the South East and its function as a global city-region, which are the dominant exacerbating factors.

Nevertheless, this "50-year saga of indecision" and incremental approach to expansion has clearly been overtaken by the increase in demand for the airports serving London and the South East (Gordon, 2016, p. 46). In parallel to the increase on car ownership and the expansion of the motorway network in the UK in the post-war period, the 1970s witnessed the advent of the jet age and, soon after, the popular European package holiday package led to airport expansion, as well as "major patterns of new growth on the edge of towns and cities, not just for land for runways and terminal buildings, but also for airport services and logistics" (Tewdwr-Jones, 2012, p. 15). Conflict over repetitive aircraft noise pollution even predates the jet engine. In 1958, MP Richard Harris MP, claiming that aircraft noise was

"now becoming intolerable for about a million people in South-West Middlesex" asked the Ministry of Transport and Civil Aviation to consider moving what was then called London Airport to "a coastal area which is much better fitted to take some of these new, screaming monsters which frighten the life out of our constituents" (House of Commons, 2012, p. 3). Heathrow Airport and its location in West London has remained a source of consultation, controversy, study and political debate since this era.

In 1980 Peter Hall predicted that "short-term incrementalism could eventually produce a massively sub-optimal solution" (p. 55), in a piece dedicated to airport expansion in London and the South East, London's third airport in *Great Planning Disasters*. Previously, the Roskill Commission into airport expansion had been infamously critiqued in Peter Self's article, ""Nonsense on Stilts": Cost-Benefit Analysis and the Roskill Commission" (also see Cashinella and Thompson's 1971 book, *Permission to land: the battle for London's third airport and how the Whitehall planners were beaten to their stripe-trousered knees*). A predecessor, of sorts, to the Airports Commission, the Roskill Commission Inquiry was instigated by the Government in 1968 to find an alterative third airport, rather than Stansted. This provision anticipated the time when Heathrow and Gatwick airports reached full capacity, which at the time (before the introduction of large, wide-body jets such as the Boeing 747) was predicted to occur in 1970 and 1980 respectively (Hall, 1980). This earlier commission short-listed six potential sites outside of London; Cublington, Luton, Thurleigh, Nuthampstead, Foulness in addition to Stansted, before finally recommending Cublington, in rural Buckinghamshire (Hall, 1980). However, in response to fierce local opposition and protest, the Government decided in 1973 not to proceed with the Commission's recommendation, instead deciding to construct a new airport at Foulness on the Thames Estuary, renamed Maplin Sand (see Figure 2).

A lone dissenting commission member, London School of Economics Professor Colin Buchanan disputed the cost-benefit-analysis-based conclusion, instead invoking what he considered to be a central planning principle, "the preservation of open rural background around London", claiming that the "new airport in that area would involve enormous destruction of its character and threaten the whole principle (Hall, 1980, p. 36). In the end, the "forces of economic reason may have declared for Cublington", Hall writes, "but the forces of environmental emotion were in favour only of Foulness, and they proved far stronger in but number and intensity" (Hall, 1980, p. 37). Although it would be a bold

departure from the decades-long saga of incremental planning with regards to airport expansion in London and the South East, one of the most glaring missing-in-action spatial integration strategies is a coordinated regional planning vision. Still, there is a risk that mega-project planning and its associated externalities and 'project boundaries' can be "fuzzy because there's no end, and they just respond to pressure, whereas if you had a regional plan, or if you a regional strategy, you can quite legitimately say 'this is an airport that has national, regional, local implications'. You can tie it into national-regional policy and governance" (local expert, personal communication, 26 July 2016). If greater coordination existed between restrictive spatial planning (such as the Green Belt) and areas where growth can be anticipated over the long term, airport expansion might be less of a 'toxic' issue if it could be legitimated, as the previous quote suggested, by integrated regional spatial planning. This is part of the reason the airport capacity question has remained has been a current policy quandary since the 1970s.

In 2003 a Department for Transport Air Transport White Paper outlined a strategy for the then Labour Government to increase airport capacity in London and the South East with an additional, second runway at Stansted, and afterwards, a third runway at Heathrow Airport (Transport Committee, 2016). However, BAA, owner of both Heathrow and Stansted airports at the time, withdrew its planning application for Stansted ahead of the 2010 general election, leaving only plans for the Heathrow Airport's third runway expansion plan moving forward.

During the 2008 General Election campaign, the Conservatives and their new leader David Cameron opposed the third runway at Heathrow, purportedly for the runway's implications with regards to carbon emissions and climate change. In 2010 the incoming Conservative-Liberal Democrat Coalition and then Prime Minister Cameron pledged to become "the greenest government ever", and formally cancelled support for expansion at either Heathrow or Stansted (Griggs & Howarth, 2013b, p. 276). Instead, it is often argued that in 2012 Prime Minister Cameron simply "kicked the can further down the road" (Shaw and Docherty, 2014, p. 140) by creating the Airports Commission, whose aim was to study the issue and "balance local considerations with national interest" (Airports Commission, 2013, p. 8) and also deliver its recommendation after the 2015 General Election. After 'sidestepping the issue' of airport expansion in their election manifesto (Hayden, 2014 p. 551), the Conservatives won a full majority in early 2015, and if Cameron had not promised to hold a 2016 referendum on

Brexit during that election campaign, it is tempting to speculate that his Government *would have* endorsed the July 2015 recommendation of the Airports Commission in 2016.

The Airports Commission's direction from the 2010-2015 Coalition Government had been "to find an effective and deliverable solution, and to make recommendations which will allow the UK to maintain its position as Europe's most important aviation hub", and the Commission quickly claimed that at least one new runway is needed in London and the South East by 2030, anticipating that "demand will significantly exceed total available capacity by 2050" (2015, p. 34). Although the Heathrow-versus-Gatwick choice has become the focus of the larger airport capacity quandary, as well as the Commission's recommendation, Davies also suggested in addition to that runway, another runway will also be needed by 2050. In the meantime, London's other four commercial airports (Stansted, Luton, London City and Southend) are gradually improving their terminal or land-side infrastructure, and obviously keen to offer their space capacity to the airport system serving London and the South East. As the owners of Southend Airport states, "the good news is that there is lots of spare capacity in smaller airports up and down the country, that with a bit of support [lower taxes] could be freed up to help" (Calder, 2017).

The Airports Commission's Final Report was delivered in July 2015, and then Secretary of State for Transport Patrick McLoughlin claimed at the time that a decision would be made by December 2015 (Transport Committee, 2016). Instead, the Secretary announced that while a decision would be made by summer 2016, further research needed to be conducted on environmental impacts and mitigation measures, denying that this delay was related to the May 2016 London mayoral election (in which the Conservative candidate Zac Goldsmith lost to Labour's Sadiq Khan), although McLoughlin did concede that the Volkswagen emissions scandal and upcoming Brexit referendum in June 2016 may delay the announcement further (Transport Committee, 2016, p. 9). Indeed, in October 2016, the UK Department for Transport finally announced that it had made a decision on its preferred location choice, accepting the recommendation of the Airports Commission to build a third runway at Heathrow Airport. The announcement, conclusively titled "Government decides on new runway at Heathrow", reiterated much of the ambitious claims made in Davies' Final Report, that – without worsening local aircraft pollution or carbon emissions – a three-runway Heathrow "will better connect the UK to long haul destinations in growing world markets, boosting trade and creating jobs passengers will benefit from more choice of airlines,

destinations and flights expansion at Heathrow will be subject to a world class package of compensation and mitigation measures for local communities" (2015, p. 34).

More recently, Secretary of State for Transport Chris Grayling suggests that the advent of Brexit means that connectivity through aircraft flows are more important now than ever:

> Now, as we leave the European Union, it is more important than ever that we build on this success to embrace the world and create an outward-looking Britain that has the confidence to own its place on the global stage. This is at the core of our Industrial Strategy, which is a plan for a nation that stands tall in the world and is set up to succeed in the long term. [...] We need to grow our domestic and international activity. (DfT, 2017a, p. 4)

After comparing Heathrow Airport to Amsterdam's Schiphol, Paris' Charles de Gaulle and Frankfurt Airport in terms of the number of runways at each respective airport, Lord Adonis likely invokes connectivity and Brexit as reasons to expand Heathrow:

> We have got to get real as a country, particularly, if we're going to be going down the Brexit route. You cannot trade with the wider world if you can't get to it […] We now need to take the decision, which is basically just log-jammed in Parliament at the moment. Parliament needs to decide to decide to do this third runway, and then we need to build it." (Adonis, 2017)

Not surprisingly, critics of the then-majority Conservative Government, and both opponents *and* proponents of the third runway proposal decried the delays and otherwise long, drawn out decision-making process on airport expansion, calling on the Government to be more "transparent" with the reason for these delays, as well as appearing to "kick the can down the down" even further, according to the cross-party House of Commons Transport Committee (2016, p. 14).

Although aircraft noise remains a contentious environmental effect of London's inter-city connectivity, there is currently no proposal to close down any of the six airports that currently serve the London market. Furthermore, as a multi-airport region without a focused 'airport city' (Güller and Güller, 2003) or 'aerotropolis' (Kasarda & Lindsey, 2011), research at the urban-airport nexus in London may draw parallels with recent research polycentric regions and spatial planning ideals in terms of sustainability (Burger et al., 2014; Cirilli and Veneri, 2014). The policies to manage noise to these existing airports, therefore, are at the forefront of the relationship between these existing airports and their surrounding local communities.

Perhaps in order to manage this 'necessary evil', Heathrow, Gatwick and Stansted airports have been specifically designated "for noise management purposes" under the Civil Aviation Act 1982 because of their strategic importance to the UK economy, and are subject to unique noise control measures compared to other UK airport, in addition to following the national noise policy framework. The Government's long-standing view is that these three airports "remain strategically important to the UK economy and we therefore consider that it is appropriate for the Government to take decisions on the right balance between noise controls and economic benefits, reconciling the local and national strategic interests" (2013, pp. 56-57). Although the days of state-owned airports and "state-owned flag carriers flying with little competition along regulated routes at tightly regulates fares" are long gone, "Government does affect the geography of industry" through its central role in the siting of additional airport and airspace infrastructure (Alberts et al., 2009, p. 749).

Both Heathrow and Gatwick have been privatised, and given that would both clearly benefit financially from expansion, their rationale for expansion is transparent to a certain degree. However, to understand urban governance, the management of flows and the extension of the urban fabric, there is much to learn from the ways that the industry frames and legitimises its plans to the public, directly and indirectly collaborates with public institutions, and influences the public consultation process and dissemination of its views through PR.

5.2 Timeline of expansion decisions and studies

Post-war	London (Heathrow) Airport, Gatwick, Southend and Luton resume commercial operations
1954	Government designates Gatwick London's second airport (after Heathrow)
1955-1986	London Airport expands to four terminals
1950s	Gatwick established as London's second commercial airport, Southend third (by passenger numbers)
1963	Government recommends Stansted to be London's third airport
1965	British Airports Authority (BAA) created by the Government to operate Heathrow, Gatwick and Stansted (each previously publicly owned)
1966	Stansted begins commercial operations

1967	Parliament decides against officially designating Stansted London's third airport
1968	Heathrow expected to reach capacity by 1970, launch of Commission on the Third London Airport (Roskill Commission), short-lists four alternatives to Stansted; Cublington, Northampstead, Thurleigh, and Foulness
1971	Roskill Commission recommends Cublington, single dissenting opinion recommends Foulness
1973	Government rejects Cublington recommendation, decides in favour of expansion at Foulness (re-named Maplin Sands) instead
1974	Government rejects Maplin Sands proposal
1978	Government decides against expansion at Heathrow; Government acknowledges Heathrow's approaching capacity constraints
1979	Government designates Stansted to be London's third airport pending public consultation; BAA enters a planning agreement with West Sussex County Council preventing a second runway until at least 2019
1982-1983	Government conducts Inquiries into expansion at Stansted, a fifth terminal at Heathrow, and airports at Maplin Sands and elsewhere in the UK
1985	Government White Paper promotes making better use of existing runway infrastructure
1986	BAA and its seven airports privatized during the Thatcher era under the Airports Act 1986, becomes BAA plc.
1987	London City Airport opens
1990	CAA (Civil Aviation Authority) suggest one new runway will be needed by 2005, DfT launch Runway Capacity to Serve the South East (RUCATSE) study into runway capacity
1991	New terminal inaugurated at Stansted, becomes London's third airport (by passenger numbers)
1993	RUCATSE study recommends new runways at both Heathrow and Gatwick
1995	Government decides against new runways at either Heathrow or Gatwick
1995-1999	Government conducts public inquiry into proposed Heathrow fifth terminal
1997	Deregulation in the European aviation market, growth of low-cost airlines

1999	Launch of South East and East of England Regional Air Services capacity study; BAA claims it will not propose a third runway at Heathrow
2000-2002	Government conducts public consultation on airport capacity
2001	Government approves construction of a fifth terminal at Heathrow; second runway at Manchester Airport inaugurated
2002	Government publishes results of South East of England Regional Air Services Study, which recommends expansion in the South East
2003	Government White Paper recommends building a third runway Heathrow by 2015, and additional runways at Stansted by 2030, as well as new runways at Edinburgh and Birmingham
2007	Government begins consultation for a third runway at Heathrow
2008	Heathrow Terminal 5 inaugurated
2009	BAA dissolved by UK Competition Commission, Heathrow (owned by Heathrow Airport Holdings), Gatwick (Global Infrastructure Partners) and Stansted (Manchester Airports Group) become private competitors within the London airport system
2010	Government rejects all plans for new runways at Heathrow, Stansted or Gatwick
2011	Government publishes "Sustainable framework for UK aviation consultation" (consultation document)
2012	Airports Commission founded
2013	Airports Commission recommends airport expansion in London and the South East, shortlists two potential options for expansion at Heathrow, as well as one at Gatwick; concludes that one new runway is needed in the South East by 2030, and another by 2050
2015	Airports Commission recommends building the proposed runway at Heathrow, rules out fourth runway
2016	Department for Transport announces preference for Heathrow, pending vote by House of Commons
2017	Reforms to airspace modernisation announced; vote on runway expansion through revised Airports National Policy Statement delayed until at least 2018

Adapted from Airports Commission (2013); Hall (1980); Griggs and Howarth (2013b); House of Commons Transport Committee (2016); author's research

5.3 Planning airspace and regulating repetitive aircraft noise pollution

In an interview that took place in May 2017, campaign representative shared concerns over the lack of an integrated approach to land use and airspace planning:

> There are many problems with the planning system undoubtedly […] the fact that as soon as the noise is off the ground it absolves local planners from any kind of responsibility or even from having any kind of powers over this still feels like a weird anomaly, and it's interesting that some of the changes that the CAA is trying to make to the airspace change process are, a little bit, trying to mimic other aspects of the planning process. For example, the fact that there's a proposal from the Government, rather than the CAA, for a call-in function, that the Secretary of State will have the power to call-in an application that the Government feels is of national significance, where they want to rule, rather than have this decided by the CAA. (Personal communication, 4 May 2017.

Adding this call-in role to the Secretary of State for Transport, which since 2016 has been Chris Grayling, MP for Epsom and Ewell (which borders Gatwick Airport) in Surrey, would move significant airspace changes further into the realm of democracy and politics, and further from a regulatory function. The Government announced that with the call-in feature, it expects this new mechanism to provide "high level direction and a democratic back-stop on the most significant airspace change decisions, something much called for by communities" (DfT, 2017, p. 6). Town and country planning would essentially play passive role in the process of airspace design, albeit with a greater degree of communication, as an interview subject for this project explained:

> There's talk about an increased role for local planning authorities in the context of airspace change, but a limited one, that requires them to exercise judgments, potentially, on airspace change applications, but which doesn't give them any new powers to make any kind of interventions to manage noise down the line, so that an airspace change might be approved on the basis of a view that the noise impact will be tolerable, or maybe that the noise impact will be less than it is at present. And, if a few years down the line it turns out that – because of commercial decisions – that this flight path is used by much bigger, noisier aircraft, and a lot more of them than anyone expected, because loads of people want to fly, for example, to the Caribbean rather than somewhere else, there is no opportunity for any authority at that point to intervene at that point and say, 'no, we're going to stop this happening because the

> noise impact is unacceptable'. People would expect there to be planning controls on aviation noise that just don't exist and it still feels like a bit of an anomaly that they don't. And, aviation has this unusual legal protection against noise nuisance claims that also feels unjust, you can see why that was introduced, particularly in the context of protecting what was a fledgling industry after the War, we had all these military bases, and it looked like growing civil aviation was going to be a good thing for the UK economy, and therefore to allow this to happen we couldn't have local people stopping growth in aviation because it was noisy. But it means that people have no recourse to the law over these issues, and so they look to policy-makers and representatives, with this confusing array of NATS and the CAA, and the DfT, none of whom overall, are instituting a limit-based noise reduction strategy. (campaign group representative, personal communication, 10 May 2017)

The protected legal position of aircraft noise remains part of the complex puzzle of its spatial negotiation.

In lieu of an integrated land use and airspace system or qualitative, place-specific limits to aircraft noise pollution, the key policy concerning of this externality of aviation, from the government's perspective is frequently-invoked, but vaguely defined goal "to limit and, where possible reduce the number of people in the UK significantly affected by aircraft noise" (DfT, 2013b). The intensification and concentration of aviation within urban environments can have significant impacts on human health. This is accepted as a component of the Government's broader Noise Policy Statement for England (2010), which, likewise, "aims to avoid significant adverse impacts on health and the quality of life". The key problem with this space-blind policy goal may be the lack of a clear definition of how to measure, quantify or judge who is 'significantly affected'. This ambiguity creates a policy gap that is a both a key area of contention of the urban-airport interface, and also allows for a degree of negotiation.

The UK currently uses a noise metric of 57 decibels imposed on a two-dimensional contour map to measure the degree of aircraft noise in terms of "decibels averaged over a 16-hour day of operations between 7:00 and 23:00" (Redeborne & Lake, 2016). In response to my question about how the CAA interprets 'significant' in practice, the CAA has explained that it has "had to define what significant means, because the government don't, and we've defined it based on an American model, […] 57 decibels averaged over sixteen hours is the

average noise rate that highly annoys people (CAA representative, personal communication, 4 May 2016). The intensification and concentration of aviation within urban environments has significant impacts on human health. Exposure to repetitive and consistent aircraft noise has been proven to effect people through detection and distraction, speech interference, disruption of work, activity, sleep disturbance, hearing loss, stress, and other related risks according to the World Health Organization (1999, cited in CAA, 2015a, p. 15). The following quote from a 2013 meeting of the Greater London Assembly Public Health and Environment meeting on night flights illustrates the lived experience within Heathrow Airport's the 57-decibel contour (for a two-dimensional representation, see Figure 14):

> If we all sat here in this room in silence for 24 hours, and once, at random, I got up and fired a shotgun over your heads, we would qualify, right? We would come in under the average WHO, a split second of very high noise and then 24 hours of nothing. It kind of ignores the nature of the noise and so you would all be pretty tense if you knew that, at some point in 24 hours, I was going to fire a shotgun over your heads at random. [Existing regulation] ignores the nature of the noise as much as the volume, the average volume. (Health and Environment Committee, 2013, p. 36)

Critics of this policy status quo contend that this "objective to 'limit and where possible reduce' aviation noise is effectively meaningless as it lacks either quantitative targets or baseline reference points to protect health, prevent annoyance, or tackle existing noise problems, and does not prevent an increase in noise" (2013a, p. 2). Likewise, in a 2016 Parliamentary debate on aircraft noise, Kent MP Tom Tugendhat, representing expressed a similar sentiment in reference to Gatwick's flight paths:

> When a road is planned or a railway is considered, all those affected have a voice. It seems that communities are only ignored when it comes to overhead infrastructure. […] This is an area where we could and indeed should change things. That is why I ask for clarity from the Government on what reducing the numbers who are "significantly affected" means. Does it mean sharing the burden so that many are affected but not significantly, or does it mean placing the burden on the narrowest shoulders so that the fewest people are affected, but those who are affected will be severely impacted and their lives transformed? That guidance should be given to our planners. It would be given if they were planners on the ground, and it should be given to planners in the air. (UK Westminster Hall, 2016, p. 2)

Inevitably, the possibility of proposed airport expansion at Heathrow and Gatwick since the Airports Commission was created in 2012 has been a significant complicating factor, conflating the local reception existing aircraft noise pollution in London and the South East with the threat of a new runway and its implications.

During this debate the Minister of State for the Department for Transport at the time, MP Robert Goodwill elaborated on the Government's position:

> In accordance with the aviation policy framework, we will continue to treat 57 decibels as the average level of daytime aircraft noise that marks the approximate onset of significant community annoyance. That does not, however, mean that all people within that contour will experience significant adverse affects. Nor does it mean that no one outside the contour will consider themselves annoyed by aircraft noise. (Westminster Hall, 2016, p. 12)
>
> […]
>
> Richard Burden: Addressing the question of noise is part of a much wider aviation puzzle, the pieces of which we need to join together. Challenges are coming to a head: noise challenges; modernising out-dated airspace regulation; improving service access; promoting cleaner and greener aviation; and meeting various environmental challenges. The elephant in the room, relevant to all those things, is the question of airport capacity. (Westminster Hall, 2016, p. 10)

By the end of the debate, Tugendhat shared his concern over the prevailing ambiguity of the dominated policy:

> If I am honest, I am little disappointed that we have not yet had a better answer on what the words "significantly affected" mean, and that we have not had what I hoped we would have—a promise that the Civil Aviation Authority and NATS will take into account the communities on the ground when they are looking at the future airspace strategy. I think that is absolutely essential for all communities across our country. (Westminster Hall, 2016, p. 13)

The following statement illustrates the 'policy hole' that arises from measuring contours on a two-dimensional map based on averages of individual noise events, the spatiality of which can vary depending on the direction of the wind. As stated in Westminster Hall,

> A Teddington resident [in West London] noted that average noise contours were not designed to measure "the very thing that disturbs people, which is peak noise […]

> People living close to Heathrow do not experience noise from flights into and out of the airport as a constant decibel level throughout the day or night. So, although the measurement of average noise experienced provides a helpful snapshot of noise over a short period, and a useful historical comparison, it does not reflect a range of variables such as the type, height or engine power of an aircraft. Nor does it account for peak noise events. And, if it lacks detail, it may also ignore a swathe of people who are overflown infrequently but loudly. (House of Commons, 2015, pp. 19-20)

Perhaps in response to this feeling, in 2017 the Department for Transport elaborated on the purpose of this key policy goal in a consultation document on it's Future Airspace Strategy, pledging "to limit and, where possible, reduce the number of people in the UK significantly affected by aircraft noise, as part of a policy of sharing benefits of noise reduction between industry and communities in support of sustainable development" (DfT, 2017a, p. 5).

5.4 Flight paths as urban infrastructure: concentration and extension

While flight paths and aircraft noise possess no concrete, static physical form, I propose this infrastructure stretches from the end of an airport's runway deep into the sky are some of the most closely monitored and planned places within London and the South East. Despite its significant growth in passenger numbers, until the recent implementation of satellite-enabled navigation, the UK's airspace infrastructure could be described as having to "accommodate 21st century volumes of air traffic in an airspace system designed for the previous century" (Budd, 2007, p. 11). While the basic spatial structure may not have significantly changed, the navigation technology of new aircraft has changed significantly here since the early 2010s. The combination of the introduction of forms of performance-based navigation, coinciding with the gradual upgrading of aircraft without a major change to the UK's airspace layout has created a peculiar situation: aircraft can now fly through existing, 'legacy' flight paths but much more precisely.

The Government, acting through the Department for Transport and the Secretary of State for Transport, has established a rigid plan three kilometre-wide, three-dimensional take-off routes which aircraft must follow as they depart from Heathrow, Gatwick and Stansted airports. Aircraft climb through these wide swathes of airspace, until they reach "NPR release altitude", and may only then change their route towards their final destination airport, which is known as 'vectoring' (CAA, 2015a). As summarised by the Civil Aviation Authority;

> Near to airports [flight paths] are called Standard Instrument Departure Routes or SIDs and Standard Arrival Routes or STARs. Although aircraft plan to follow these routes they are not motorways in the sky which aircraft precisely follow but a framework. Aircraft taking off from some airports are also required to follow specific flight paths called Noise Preferential Routes (NPR) designed to avoid the overflight of built-up areas where possible. Once an aircraft reaches the end of the NPR, normally around 4,000 feet, the air traffic controller determines the path that is flown by an aircraft through the airspace structure. (CAA, 2015a)

The Department for Transport's NPRs provide a spatial framework for departing aircraft from Heathrow and Gatwick airports provides a three-dimensional area of airspace infrastructure to both the airports, and a degree of structure to local planners and residents. However, within these three kilometre wide swathes, NPRs there is a still a considerable amount of leeway in terms of the number, size and noise footprint of aircraft travelling through these corridors. Heathrow and Gatwick airports also have the freedom to concentrate aircraft within these NPRs, align aircraft to one edge or the other to improve or trial manoeuvres in the aim of operational efficiency or respite from aircraft noise pollution.

NATS has developed a metric to evaluate the overall "environmental efficiency" of airspace in the UK, called "3Di", a "three dimensional inefficiency, score (2017b), which is used to measure jet fuel consumption and incentivise financial efficiency. In line with NATS' dominant priority, "to ensure the safe and expeditious flow of air traffic under our control" (in terms of an optimal, cost-efficient flight profile), 3Di is expected to promote objectives including the ideal, continuous climb and descent, and as direct as possible routes between origin and destination runway, in order to achieve reductions in jet fuel emissions, rather than noise necessarily (NATS Ltd., 2017b).

The reforms to the aviation of regulation announced by the Department for Transportation directly address many of the key issues explored in this dissertation, which was followed by a two-month re-consultation period on its Airports National Policy Statement (NPS) from beginning in October 2017. The DfT acknowledge that "sensitivity to aircraft noise has increased, with the same percentage of people reporting to be highly annoyed at a level of 54 dB LAeq 16hr as occurred at 57 dB LAeq 16hr in the past. The research also showed that some adverse effects of annoyance can be seen to occur down to 51dB LAeq" (p. 18). It was decided that, taking into account "evidence on the link between exposure to noise from all

sources and chronic health outcomes, we will adopt the risk based approach proposed in our consultation so that airspace decisions are made in line with the latest evidence and consistent with current guidance from the World Health Organisation" (p. 18). With this in mind, the reforms stated that in order to assess proposed airspace changes, and,

> For the purpose of informing decisions on airspace design and use, we will set a LOAEL at 51 dB LAeq 16 hr for daytime, and based on feedback and further discussion with CAA we are making one minor change to the LOAEL night metric to be 45dB LAeq 8hr rather than Lnight to be consistent with the daytime metric. These metrics will ensure that the total adverse effects on people can be assessed and airspace options compared. (DfT, 2017a, p. 18)

The CAA follows the Government's Transport Act 2000, and safety is the main stated priority. However, formal airspace changes, that is, changes to local fight paths, which require approval at the National level, remain a significant source of controversy in London and the South East in recent years especially.

To their credit, in 2017 the Department for Transport publicly recognised that "opposition to airport expansion and airspace changes is driven primarily by local concerns about noise and that continuing growth in air traffic will make this more challenging" (2017, p. 59). Formal airspace changes are usually proposed by the airport, and subject to the approval of the CAA. At the heart of these issues are a stratified layers of altitude based priorities, which become a dominate rationale when the Civil Aviation Authority considers these official airspace changes, and the spatiality of the tension between reductions in aircraft noise and achieving a greater degree of fuel efficiency needs to be managed:

> *Words like, 'balance' are frequently used. Balancing for example, fuel efficiency and jet fuel emissions versus local noise pollution. How do you negotiate these priorities?*
>
> We do have guidance from the Government. What we have is Air Navigation Guidance, which is a document, which is given to us by the Secretary of State for Transport, which says, 'these are the environmental factors you take into account'. That was originally crafted in 2002-03 [and] re-drawn in January, 2014. […] What they said was, 'naught to 4,000 feet above sea level, noise is the priority, 7,000 feet and above, emissions is the priority, in brackets, noise is not considered significant above 7,000 feet, between four and 7,000 feet. There's a balance'. If you're an airport and you want to change the airspace, we'll say, 'look, up to 4,000 feet noise is your priority. Four to seven: balancing act. Above seven: emissions'.

Having direct as possible flight paths between two airports reduces emissions—

It does, but if that tramples at lower level, [and below there are] several communities where you can go around [resulting in] slightly higher emissions, but you've got significant environmental benefits in terms of noise for people on the ground, then that's what you should do. […] If there's a significant environmental impact to do with the decision, [the CAA will] refer his decision to the Secretary for Transport for endorsement. Some would say, 'well then you've given the Secretary of State the decision to make, but it's a case of 'we've made this decision, Secretary of State, this is our rationale for the decision, what do you think?' He may say, 'well I don't agree with it', you say 'okay well, we have to go back and start again and rework it and look at other options', but in most cases I suspect the Secretary of State would say 'yeah, the process is being followed, the CAA has come to its decision based on its expertise, therefore I endorse that decision'. There will be' losers' in any decision we make at which point the 'losers' say 'well, you're not independent'. Actually, we just happen to take a much bigger picture into account than simply flying over your house or confining your particular airspace activity, and that's the problem. One of our old bosses, his view was, 'if we're pissing people off uniformly, we're probably doing alright'. If there's one group that's really chuffed, really happy, we might have made a mistake'. (CAA representative, personal communication, 4 May 2016)

The tension between concentration, dispersion and respite remains an important unresolved issue with respect to aviation infrastructure.

In this way, that rationale for the design of NPRs and release points of aircraft is a key component of local airspace design, and conform to the Department for Transport's Guidance to the Civil Aviation Authority on Environmental Objectives Relating to the Exercise of its Air Navigation Functions, January 2014, which outlines altitude based priorities. Irrespective of the level of noise generating by each aircraft, the Government determines that between sea level and 4,000 feet, "environmental priority is to minimise the noise impact of aircraft and the number of people on the ground significantly affected by it", whereas between 4,000 feet and 7,000 feet, "focus should continue to be minimising the impact of aviation noise on densely populated areas", but minimising noise may be balanced with "the need for an efficient and expeditious flow of traffic that minimises emissions" (CAA, 2016, p. 15). Thus, the layer of three-dimensional airspace between 4,000 and 7,000 feet above sea level has become an often contested space of negotiation between local concerns and the rationales

behind the production of flows, and a contested realm of spatial planning in the most literal sense, although it is not recognised as such, because, as I argue, it is hidden within the aforementioned 'vertical blindspot'.

Not unlike the space of negotiation between 4,000 and 7,000 feet above sea level, another critical space of negotiation related to NPRs where aircraft flows pass through these three kilometre-wide spaces. Although one might assume that the general intention of the NPRs would appear to be that the aircraft would fly as close to the centre line as possible, in practice planes passing anywhere within this swathe are still "considered to be flying on-track" without a significant change in the lived experience to the residents on the ground being considered officially an "airspace change" (CAA, 2015a). Changes to aircraft flight paths within the NPRs, and between four and 7,000 feet often become focal points for aircraft noise conflicts because this form of noise pollution is essentially exempt from any local or national regulation. According to the CAA, "the local authority can tell an ice cream truck to shut up because it's making too much noise, the Environmental Protection Act and the Neighbourhood Noise Act don't include aircraft noise, the Environmental Protection Act specifically says noise in the air is except, so there is no legal power to restrict aviation activity down to noise alone. This was brought in by Winston Churchill [then Secretary of State for Air, before the invention of the jet engine]. The only time we take environmental impact into account is when we do an airspace change" (personal communication, 4 May 2016). The same Green Belt which surrounds and contains the continuous built environmental of Greater London (including Heathrow Airport) also restricts growth between London and Gatwick Airport, which is essentially nestled within a complex land use restrictions, including the Green Belt and Areas of Outstanding Natural Beauty such as the Kent Downs and Surrey Hills (see Figure 11).

The issue of how to manage airspace above National Parks and Areas of Outstanding Natural Beauty (AONBs) such as Surrey Hills and other AONBs and the Metropolitan Green Belt presents a further complicating factor to this rubric of altitude based priorities. The CAA states that flight paths should avoid being created over these areas, "where practicable, and without a significant detrimental impact on efficient aircraft operations or noise impact on populated areas" (DfT, 2014, p. 13). In lieu of integrated systems of airspace design and spatial planning, air space design is based on general principles of avoiding 'where practicable' both concentrated population centres and specifically designated natural areas,

with, perhaps, understandably, mixed results, as the subsequent chapters of this dissertation will prove. Thus, although the Government recognise that Heathrow, Gatwick and Stansted airports have noise effects which require specific, customised regulation, patterns of aircraft vectoring, the location of aircraft within an NPR, as well as airspace trials are all aspects of the production of airspace that remain contested. As such, and uniquely in the UK, the "ownership and enforcement" of the NPRs for these three airports is "controlled by the DfT, rather than the CAA" (DfT, 2017, p. 31).

In 2017 the DfT announced major reforms to these Altitude Based Priorities (ABPs):

> We have noted the numerous responses raising concerns with the ABPs, particularly on the priority between 4,000ft and 7,000ft. We have therefore updated the guidance to make it clearer that, in this volume of airspace, noise is the environmental priority, although the CAA takes into account CO2 emissions if it considers that these would be disproportionally increased. The potential impacts of these changes have been assessed through a full Regulatory Impact Assessment, published alongside this document. (2017a, p. 28)

The clarification of this reform in the report *Air Navigation Guidance 2017: Guidance to the CAA on its environmental objectives when carrying out its air navigation functions, and to the CAA and wider industry on airspace and noise management* are set to come into force as of 1 January 2018 and will have significant consequences for the spatial negotiation of flight paths and the footprint of aircraft noise pollution, and deserves to be quoted in full:

> a. in the airspace from the ground to below 4,000 feet the government's environmental priority is to limit and, where possible, reduce the total adverse effects on people;
>
> b. where options for route design from the ground to below 4,000 feet are similar in terms of the number of people affected by total adverse noise effects, preference should be given to that option which is most consistent with existing published airspace arrangements;
>
> c. in the airspace at or above 4,000 feet to below 7,000 feet, the environmental priority should continue to be minimising the impact of aviation noise in a manner consistent with the government's overall policy on aviation noise [emphasis added], unless the CAA is satisfied that the evidence presented by the sponsor demonstrates this would disproportionately increase CO2 emissions;

> d. in the airspace at or above 7,000 feet, the CAA should prioritise the reduction of aircraft CO2 emissions and the minimising of noise is no longer the priority;
> e. where practicable, it is desirable that airspace routes below 7,000 feet should seek to avoid flying over Areas of Outstanding Natural Beauty (AONB) and National Parks; and
> f. all changes below 7,000 feet should take into account local circumstances in the development of the airspace design, including the actual height of the ground level being overflown, and should not be agreed to by the CAA before appropriate community engagement has been conducted by the sponsor. (DfT, 2017b, pp. 17-18)

A central concern of runway expansion has been the large number of residents who would be *newly affected* by the aircraft noise pollution from new flight paths to a new, third runway in Heathrow, compared to building a second runway at Gatwick (Airports Commission, 2014a, p. 28). On the other hand, there is a view that increasing capacity may reduce noise generated by aircraft circling in holding stacks due to congestion, as expressed by the CAA "Noise reductions from less aircraft holding at low levels are expected to generate societal benefits" and that for passengers, "time savings from more direct routeing and the provision of additional capacity when and where required are expected to generated societal benefits" (CAA, 2015c).

CAA Chief Executive Andrew Haines compares runway expansion without airspace modernisation to "building a brand new car park and forgetting to build the access road to it […] Effectively the airspace structures have not been redesigned since the 1960s and 1970s. We're not using modern technology, we're using an incremental approach to flight paths which means it's not the most efficient". Haines elaborates, "how you configure the airspace probably has more noise impact on the local community than anything else. […] It's not an issue that has got anything like the same level of political or media attention as runways" (Pultarova, 2016). According to Martin Rolfe, the Chief Executive of NATS, the current organisation of the UK's airspace before modernisation is complete can be considered "a network of B roads", which, in addition to constrained airport infrastructure, reduces the efficiency of modern airspace management, and is overdue for a significant redesign, particularly once a new runway has been inaugurated somewhere in the South East (BBC, 2016).

Airspace modernisation is a far-reaching project intended to connect the local airspace of the UK's airports to the continental network far above 7,000 feet. The UK has committed to being part of the "Single European Sky project pan-European initiative" by implementing its Future Airspace Strategy modernisation programme (CAA, 2017a). Eurocontrol's stated priorities of the 'Single European Sky' are "air transport safety, capacity and efficiency needs at European rather than at a national level". Eurocontrol also adds the dimension of time to the otherwise three-dimensional spatial form of flight paths, which it calls its "four-dimensional trajectory management (i4D)", aiming to increase efficiency by integrating national and European territories of airspace:

> The sharing of trajectory information between the air and ground can enable a safer and more efficient handling and certainty of flights. Controllers can clearly see on their screens the actual ground and airborne trajectories, which allows them to resolve any discrepancies and anticipate flight paths with greater precision. On the airborne side, the aircraft can better manage their speed profile, which leads to fuel savings and fewer emissions. The sharing of trajectory also means that aircraft sequences can be managed with greater efficiency in the approach and landing phase, reducing congestion at busy airports. (Eurocontrol, 2014, p. 2)

The incremental redesign of airspace above England, a project known as the CAA's London Airspace Management Programme (airspace over Britain is divided between "London" and "Scotland" components, see Figure 13) and the broader Future Airspace Strategy will, at some point, need provide answers to the questions raised regarding concentration versus dispersal, and expansion versus communities being newly effected. As summarised by a Gatwick action group member:

> It's certainly going to be very difficult to completely redesign London airspace as they want to do with LAMP, without newly effecting some people to some extend, although that's our objective, to say that nobody should be newly effected, and nobody should be effected more than they are now, so the idea being that you can make changes but those changes have to be on a downward path, so you might give all the benefit to people over here and none to people over here, but you don't increase the pain here. (Personal communication, 4 April 2016)

In the UK airports and their air traffic control organisations are encouraged by the regulatory regime to carry out temporary airspace changes, in order to promote innovation and collect information. The CAA values these trials for their potential to "gather data and validate possible proposals for future requests for changes to the UK airspace structure" (CAA, 2015).

What this means is that "that for a short period aircraft may be flying different routes to the published structure. Government policy states that as these trials provide a valuable contribution to the efficient use of UK airspace we should encourage their use" (CAA, 2015). It is because Heathrow and Gatwick are both specially-designated airports by the Department for Transport and their noise footprints are subject to an additional level of regulation and approval by the Department for Transport, "if a trial is now proposed in the vicinity of these airports the organisation proposing the trial will also discuss the issue of consultation with the Secretary of State for Transport's office" (CAA, 205). This also requires the airport to make public specific start and end dates of the trial, although public consultation is only required if the airport chooses to make the new airspace change permanent through the full airspace change process (CAA, 2015).

The introduction of performance-based navigation (PBN) is one of the most significant developments in the relatively short history of commercial aviation. This technology, and specifically decisions regarding how it is used have far-reaching implications in terms aircraft noise pollution. This technology essentially removes a degree of control from the pilot, and also minimizes the degree of randomness inherent in different types of aircraft flying imperfectly through relatively wide NPRs. Due to these spatial implications this technology in particular is worthy of critical scrutiny. However, until very recently the implementation of satellite-enabled navigation seemed to leave very little room for public consultation or negotiation.

According to the Department for Transport, PBN's main benefit is that "the overall level of aircraft track-keeping is greatly improved for both approach and departure tracks, meaning aircraft will be more concentrated around the published route", and noise impacts will be much more concentrated, "thereby exposing fewer people to noise than occurs with equivalent conventional procedures" (2014, p. 16). With this clear endorsement from Government, PBN and with it the idea of concentration has become a central component of the CAA's Future Airspace Strategy (2017a). Meanwhile, the Department for Transport maintains,

> The balance of social and environmental advantage lies in concentrating aircraft taking off from airports along the fewest possible number of specified routes and that these routes should avoid densely populated areas as far as possible. The framework

> also stresses that any changes to departure routes should avoid significantly increasing the number of people affected by aircraft noise. (DfT, 2014, p. 27)

Consistent with this view, the CAA promotes this technology's potential to reduce the local impact of aircraft noise pollution:

> Increased Concentration through the use of PBN is the consequence of the accuracy and predictability of PBN design criteria. This accuracy and predictability means it is possible to make a more efficient use of airspace by allowing more aircraft through a similar volume by positioning adjacent routes closer to each other, reducing ATC intervention and the numbers of people affected by aircraft noise. Increased concentration through the use of PBN can deliver great benefit to local communities owing to the reduction in numbers of people affected by aircraft noise. However, the increased concentration of aircraft concentrates the aircraft noise over a smaller area which can negatively affect those communities in the close vicinity of the PBN flight path. (2016, p. 13)

The Department for Transport takes a consistent position on the introduction of this new technology:

> PBN will mean that aircraft following a particular route will adhere to that route more consistently than they do the historic conventional routes. This will increase the concentration of traffic and impact over the areas directly beneath the published NPR, but will reduce the overall extent of the areas overflown, thereby offering the potential to reduce the number of people exposed to noise from aircraft flying below 7,000ft (DfT, 2015, p. 17).

However, Department for Transport has also reconfirmed its support of the principle of respite through new technologies, stating in 2017 that it "expects the CAA to encourage the use of new and innovative approaches to managing aviation noise through airspace design such as the provision of respite for communities already significantly affected by aircraft noise where possible" (DfT, 2017, p. 21). As interpreted in practice by the CAA;

> The government guidance at the moment is: you should concentrate on the minimal number of routes, and avoid the maximum number of people, so its concentration. So you concentrate away from towns, however there's a groundswell saying 'well actually we don't want that'. The people in the countryside say well it's noisy in the towns so put the aircraft over the towns cause they won't hear it as much as well do in nice quiet countryside. Which goes against government policy, which is, actually, *you*

> *sacrifice the good of the few for the good of the many* [emphasis added]. (CAA representative, personal communication, 4 May 2016)

This view is also advocated by NATS, as summarised by Ian Jopson:

> The advantage over conventional procedures is that routes can be designed to optimise trajectory for fuel burn, noise, air traffic control capacity and safety without being constrained by the position of traditional ground based navigation aids. With aircraft being able to follow a defined route much more accurately, it is possible to concentrate them over a smaller area, radically reducing the number of people exposed to aircraft noise. The problem of course is that those under the new departure route could potentially experience more noise. […] The best solution is obviously to create routes that carefully avoid populated areas, but when that's impossible we can look to create multiple routes that can be used alternately in order to provide assured and predictable respite. (NATS Ltd., 2014)

If PBN is said to be solution to the problem of aircraft noise pollution, the concept of respite appears to be the solution to the problem of PBN:

> While I absolutely appreciate this means a greater concentration of aircraft, there will be many people who would previously have been overflown who will now be free of noise almost entirely. For those that do live under the flight path, PBN gives us the opportunity to introduce meaningful and predictable respite routes, something that would have been impossible in the past using traditional technology. (Jopson, 2014)

The industry group Sustainable Aviation has put the issue more bluntly, recommending that the "Government must recognise that increased concentration around NPR centrelines is an inevitable consequence of performance based navigation (PBN) and is the key to the safety and capacity benefits that a PBN network can bring" (2015, p. 59). This is a revealing passage because elsewhere proponents of satellite-enabled navigation have been reluctant to directly link this new technology with an increase in capacity.

This issue came to ahead when it was discussed in a Parliamentary debate on aircraft noise in 2016. Robert Goodwill, Parliamentary Under-Secretary with the Department for Transport argued provided a more measured interpretation of the benefits of PBN:

> Performance-based navigation can vastly improve the accuracy with which aircraft can fly a designated route, and airspace systemisation will mean that they follow a more predictable route, reducing the need for interference from air traffic controllers.

> That will not only make air travel safer but reduce emissions and journey times. It will also offer the chance to reduce noise for communities around airports by allowing routes that can accurately avoid built-up areas and maximising the rate at which aircraft can climb or descend. For those benefits to be realised, however, we need to ensure that when those essential changes take place, they work for communities as much as possible. (p. 13)

The implementation of new navigation technology is also hindered by the presence of older aircraft, are seen as "the lowest common denominator… the procedure has to be designed on the worst performing aircraft that's going to use it" (CAA representative, personal communication, 4 May 2016). The CAA seeks to balance such concerns:

> We want to strike a fair balance between the negative impacts of noise (on health, amenity (quality of life) and productivity) and the positive economic impacts of flights. As a general principle, the Government therefore expects that future growth in aviation should ensure that benefits are shared between the aviation industry and local communities. This means that the industry must continue to reduce and mitigate noise as airport capacity grows. As noise levels fall with technology improvements the aviation industry should be expected to share the benefits from these improvements. (UK Aviation Policy Framework, 2013, p. 55)

NATS also acknowledges the problem of attaining a balance between environmental capacity and commercial imperatives:

> Aircraft are individually less noisy than in previous generations with a reduction of noise by more than 90% since jet aircraft entered service in the 1960s. However as traffic continues to grow as demand for air travel increases, this improvement is often counteracted by the number of aircraft overflying an area. (NATS Ltd., 2017a)

The precise nature of this new technology raises questions between balance, dispersal and concentration. To the industry, 'greater fuel efficiency' obviously results in economic benefits, but how and where should the disbenefits be either distributed? This question of spatial distribution has become a major quandary, one that the DfT, the CAA and NATS – rather than politicians – each have respective roles in negotiating, distributing and managing.

> *New technology seems to have the potential for environmental benefits, but if the increase in sheer volume of aircraft is being intensified at the same time, what a lot people don't want is we don't want to see the increase in volume cancel out these benefits?*

> Yeah, effectively using the new technology to increase capacity, rather than to give benefit to others. So you can either keep the capacity the same but benefit everybody in an environmental way, or you can not benefit anybody but increase the capacity, or you look at can you balance it so you get a reasonable increase in capacity, you know, the Government wants growth, there's growth, that's good for the economy, but on the other hand, you've got an environmental benefit because as well because less fuel burn, cleaner routes, getting aircraft to altitude, quicker, cause the quicker they get the smaller the noise footprint gets, yes there are arguments about to go quicker you might use more power so there's noisier next to the airport, so there is a balancing act there. (CAA representative, personal communication, 4 May 2016)

NATS representative Jopson explains that, "aviation is a big global industry and it delivers big social and economic benefits to the UK and globally", in a sponsored (paid) article for Heathrow published in *The Guardian*, "but it has its negatives – we make noise, we burn fuel, release climate change gasses. We want to keep enjoying the benefits of aviation, working to minimise our impacts" (Hamburgh, 2017). Conversely, opponents question the basic motivation for airspace redesign, arguing that "making the route more direct is irrelevant if you're going to have more and more of those flights" (2016). From the NGO's perspective, "What we've seen from some of the airspace changes and airspace change trials of recent years is that people react very strongly to changes in noise impacts. So you can't assume that an airspace change will be good for local people based simply on the total number of people affected at a given noise threshold" (AEF, 2016).

Similarly, at the local level in London development in quieter aircraft technology and simultaneous changes in navigation procedures have not ameliorated the intensity of Heathrow's noise footprint:

> Over some period of time, aircraft noise has been reduced massively. As I understand it, there's an academic debate as to the rate which that might be able to be continued, so some of the assumptions that are used in modelling to predict future noise. […] It is true that modern aircraft are quieter than older aircraft, as the new aircraft are designed to be less noisy, but by concentrating on those narrower routes, you actually increase the noise within those routes. Also, if you fly more aircraft then you create more noise. So, it's just a simple equation. […] London City airport for example, acknowledge that if they get their planning permission there will be more airplanes.

> Their argument is that they will use quieter aircraft. That's fine. We said, 'as they introduce those quieter aircraft, there should be a reduction in the overall noise envelope'. They resisted that, they said 'no, we will maintain the existing level of noise and make sure it's not got worse'. Our line is, there's a phrase in one of the British regulations that says that the benefits of quieter aircraft should be shared by the communities and the airports, so the airport reject that, they say 'no, we will keep the existing level of noise, so we will grab all of that benefit from those quieter aircraft'. We wanted to get them to agree to a sharing of that noise reduction, but they wouldn't. […] Heathrow claim that if they can have a third runway they will produce less noise. […] I've learned a bit over the years and spoken to a lot of people, and everyone I've spoken to say that is fantasy. Well, it's fantasy in one sense, but it depends how you measure it. Noise people can argue about noise for years on end and, the way I understand it, if you put in a certain set of assumptions, you run a model in certain way, and you selectively choose your output, you may be able to show using that particular process that there's less noise, but from my common sense perspective I just don't see how flying a third more planes can lead to less noise. (Greater London Authority, personal communication, 8 July 2016)

Whereas the industry-oriented lobby group highlight population encroachment as the problem civil society groups organising against airport expansion shared critical views of both the Government's metrics for measuring noise, and the airlines and the way the technological benefits of their new aircraft are presented to the public:

> It's set up against the residents, and the local people, they're told this aircraft is quieter without proof. It's just PR, PR, PR. We had this with Heathrow and British airways at the last third runway application, where British Airways and Heathrow said, 'we've got this new jet, it will be quieter, it will be less environmentally-impactful', lots and lots of information, 'we promise it will be quieter, blah, blah, blah...' (Heathrow campaign group representative, personal communication, 25 July 2016)

To many residents below busy commercial airspace, this concentrated infrastructure and their three-dimensional noise shadows, this creates a vertically arranged network "noise sewers" or "noise ghettoes" above the urban region. A Gatwick campaign group representative shares the concern that the benefits of quieter aircraft are over-stated:

> *What do you think of the industry PR about innovative technology, such as the Airbus A380s, which are said to be quieter than the 747s they're replacing, or the reduction of the noise from the drag on the Airbus a320s when they're landing?*

> They are getting much more quiet. Did you ever see Concorde? My god, I used to live in London, it would come over, it was fantastic noise, it was so loud, but if you lived nearby it would've been a nightmare. It was a beautiful plane to watch… It's so low on the agenda, Evan, noise, that's the problem, and as I say we're trying to get it up on the agenda. Yes, they're quieter, but it's also how they measure them. There's this thing called 57 Leq, where they measure, there's the airport, and they take an average noise. It's nonsense. It was done in the 1960s from sealed rooms. It's just nonsense, everyone knows it. They know it's nonsense, but it suits their purpose. So to answer you, they want the cheapest engines they can get, fuel-wise, and they don't really care about noise. (Gatwick campaign group representative, personal communication, 5 July 2016)

According to the Department for Transport, there is not any, single "threshold at which all individuals are considered to be adversely affected by noise but it is possible to set a Lowest Observed Adverse Effect Level (LOAEL) that is regarded as the point at which adverse effects begin to be seen on a community basis" (2017, p. 21). Instead,

> as noise exposure increases above this level, so will the likelihood of experiencing an adverse effect. For the purposes of assessing and comparing the noise impacts of airspace changes, the Government has set a LOAEL of 51dB LAeq for daytime noise and 45dB Lnight for nighttime noise. [This concerns the] impacts of noise, including specifically from airspace changes, on health and quality of life and gives a monetised value for change in sleep disturbance, amenity (annoyance), acute myocardial infarction (heart attack, and stroke and dementia. […] Up to 4,000 feet, there is a strong likelihood that aircraft could create levels of noise exposure above the LOAELs identified above. (2017a, p. 21)

Instead, the DfT concede that as of 2018,

> Decisions on how aircraft noise is best distributed should be informed by local circumstances and consideration of different options. Consideration should include the pros and cons of concentrating traffic on single routes, which normally reduce the number of people overflown, versus the use of multiple routes which can provide greater relief or respite from noise. (DfT, 2017a, p. 5)

In July 2017 the Department for Transport acknowledged that, indeed, there have been flaws with the existing procedures of managing airspace and aircraft noise pollution:

> The government's recent consultation on airspace policy proposed changes in how noise should be assessed in the airspace change process, to take account of this evidence. However, there remains a challenge when technological improvements in noise reduction do not appear to be sufficient to deal with the negative impacts on some communities' quality of life. […] Given that conventional ways of mitigating noise have arguably failed to reduce public annoyance, particularly where there has been a noticeable increase in the number of flights, the government will explore whether a new approach to reducing noise annoyance is needed. This could include better information and engagement or creating a greater sense of 'fairness' and sharing of the benefits of aviation growth, including new forms of compensation and community investment. The strategy will also explore how sustainable growth should be defined in terms of noise. For example, whether it is possible to design targets for noise reduction and how best to monitor and report aviation noise at a national level. (2017a, p. 60)

The extended purview suggested by these reforms was welcomed by campaign groups such as HACAN, who stated that,

> in geographical terms around Heathrow 57 didn't even include Fulham and Putney; 54 goes as far as Clapham and Vauxhall; 51 takes us to around Peckham. It still doesn't capture everybody annoyed by the planes and, in particular – because it is an annual average - it doesn't cover places like Ealing or Teddington that only get planes for about 30% of the year but when they do get them they are very annoying! But this is an historic change – HACAN has been campaigning for the end of the 57 contour since the Terminal 5 Inquiry, over 20 years ago! (2017)

The reforms also highlight frequency, rather than only averages, as an element of annoyance:

> Frequency of noise is important and supplementing this risk-based approach with the frequency-based noise metrics will ensure that aircraft noise and its impacts can be accurately factored into decisions. It will also ensure communities understand how they will be affected by any changes and will enable interested parties to engage in an informed manner. (DfT, 2017, p. 28)

The AEF had previously made this argument, maintaining that "annoyance and health impacts are influenced by the number of flights overhead, as well as their relative loudness, and air traffic levels have been increasing" (2017, p. 1).

Inexplicably, Gatwick introduced this technology while it was also campaigning for a second runway through its "Gatwick Obviously" PR campaign, which arguably back-fired with the ensuing local outrage and the creation of new campaign groups. They generally advocate for either the return to conventional, 'legacy' flight paths, or the equitable dispersal of flight paths as alternatives to concentration. Paradoxically, this could also be used as a form of infrastructure expansion above new areas. One of the most effective of the local campaign groups around Gatwick has been Gatwick Obviously Not, which was founded in 2013 after Gatwick Airport launched its "Gatwick Obviously" campaign for a second runway, which was also the year that many of these airspace redesign issues began to be trialled and discussed, including the early stages of the UK's Future Airspace Strategy, known as LAMP (London Airspace Modernisation Programme).

Critics of airspace modernisation cannot fully regulated without limit-based noise policies:

> Both the CAA and the Government recognised they needed to do something about this. So on those issues there has been progress in terms of taking seriously the fact that these changes can't just happen without at least a process for engagement and without at least a much more evidence-based approach than has been the case in the past, to consider 'what's the least bad option for those on the ground'? The sticking point of course is that what many people want is a reduction in noise, and there is still no Government strategy or commitment to reduce aviation noise, there are no noise limits, the Government is unwilling to set out any threshold. In terms of the Government's thinking, that the proposals that they've put out recently in terms of the principles of airport change, give the issue a degree of attention that it hasn't had for very long time in terms of government policy-making. They've developed quite a nuanced approach to trying to capture the different health-based impacts of particular airspace changes, in particular, looking at different options and trying to get a really sound evidence base for what is the best solution for what is the best solution for the local community. They've tried quite hard to think about 'how do we deal with the fact that in some cases the best solution on average will be to have a very concentrated route, what can we then do? We should be encouraging, requiring airspace change sponsors [the airports] to look actively at whether they can provide respite, to look actively about whether they should be providing compensation to people who eventually end up under that flight path'. So I think they've taken the issue seriously

> in a way that they haven't done for a very long time, and I think that has been in large part down to the fact that you've had these very, very vocal community groups forming who were suddenly impacted by noise either for the first time or in a very new way than they had been before, and who are kind of up in arms about this issue. And in some ways it doesn't help the debate that those people tend to be well-educated people in big houses who don't want the value of their property to be compromised, but equally are the people who don't just accept this as something that they have to suffer, people who feel, 'but this is just an outrage, and I just need to have a proper gentlemanly conversation with the Minister to tell him what's going on and he needs to fix this!". And this kind of [reaction], 'they can't just do this, who's just done this? How can this happen to me?' There's still this feeling of outrage among many of those different community groups in the South East. (campaign group representative, personal communication, 4 May 2017)

From the perspective of a campaign group representative with an interest in the Programme;

> If you gave me a blank sheet of paper I could redesign LAMP, make it work more efficiently, but if I've still got the same amount of planes there's still going to be the same amount of noise. It's just going to be redistributing the noise. We have to look at why we have so many transit flights coming in, and if it makes sense. It makes sense for the businesses, they make a fortune every time a plane lands, but it doesn't make sense for the nation. Trying to get that argument through is a very hard one: Heathrow fly over Gatwick's airspace, so Gatwick can't go up too much, with Heathrow coming in. They need to think about that, take Heathrow up a little bit, Gatwick up, or move Heathrow a little bit, and move Gatwick, just a little bit of thought, that's all they need, but they have complete freedom of the skies, they do what they like. So, to answer you, dispersal, smooth approach, higher approach, and that's what we're driving at all the time, but I look at these people, when I'm around the table with NATS or the CAA, they still don't get it, they still want us to go away, they're still hoping that our energy will dissipate, and that we won't follow through, but it's getting worse for them now, the amount of people engaged is growing, not shrinking, and it is a real issue. (Gatwick campaign group representative, personal communication, 5 July 2016)

Responding to the question of if the Government is receptive to rethinking its policies regarding aircraft noise pollution, and if there are any issues on which campaign groups

and/or environmental NGOs have been able to get achieve traction with, a campaign group has observed:

> I think that there was recognition that we can't just let this go because this whole program of modernisation of airspace that is supposed to be underway, and to which the UK Government has committed by international treaty, was actually getting seriously held back by the fact that there were all these local communities up in arms, and MPs saying 'what's going on? We can't have this'. So it became a real issue for the CAA, and for airports themselves, who were starting to fall behind on the timetable of airspace change that they were supposed to be making. They can do the upper airspace stuff, that's all on track, but as soon as it hits lower airspace, the response from local communities was far stronger and more vocal than the regulators had expected – changes that looked small on the map were causing a level of uproar on the ground that they just hadn't seen coming. (campaign group representative, personal communication, 4 May 2017)

In the meantime, only Section 1a, the first elements of the London Airspace Management Programme have been implemented. It would seem that the Government has realised that there has been greater opposition to the first parts of this process (which mostly concern the introduction of PBN at London City Airport). The rollout of the rest of the Programme is on hold pending re-assessment by the Government regarding its approach to changes within airspace.

From the perspective of these active residents in the South East, airspace trials and changes raise questions about the existing regulatory regime and framework, and accountability between the various institutional actors who together regulate the now privatised industry:

> It's chaos, when all this blew up, there were thousand of angry people and we're getting a lot of press, they all said ‘it's him'. You've got Gatwick, CAA, NATS, and DfT, and the blame went round and round and never stopped, and still to this day, the CAA say they only regulate, they only do what the Government tell them, NATS say they only manage the airspace, they only do what Gatwick tell them, Gatwick say they only do what the CAA will let them, and so it goes on and on and on, and no one says 'sorry, my fault'. So, it's a bit like London versus New York, London has evolved for thousands of years, and is a complete mess of streets, whereas New York is a nice neat grid. It's the same with our airspace, it started from nowhere, a hundred and 20 years ago, and ever since day one they've had complete control, the Government or

> the airspace people. Never have they asked the people on the ground, ever, 'what would you like?', so they've had complete freedom, and they've built up these [divisions of labour]. So it's basically NATS, CAA and DfT, and there could be Gatwick, Heathrow whatever, they've built up these [jurisdictions of] total control, and they never have anybody say 'stop, have you thought about this?', 'Hmm, no'. So, it's just evolved a bit like our streets, if you were starting again tomorrow you wouldn't do it like this. You just wouldn't. (Gatwick campaign group representative, personal communication, 5 July 2016)

A member of another Gatwick campaign groups explains that by organising beyond the very local community level, and creating geographically broader coalitions, they have been able to bring attention and political pressure to the issue of aircraft noise pollution:

> "The CAA will say, 'Department for Transport is responsible for policy', and they will interpret that quite tightly so that even if there is wiggle room in the policy they won't use it, cause they'll say 'no, it's not for us to make policy, we're just the regulator', whereas the Department for Transport will say, 'okay, but there's room in the policy for you to do something different'. The change that's, perhaps, happened is, by coming together, we've been able to get through to politicians and to the senior people in CAA and DfT, that we represent quite a substantial number of people and the things they're going to want to do with regard to airports are going to be extremely difficult if they don't find solutions to these problems. I think that's a change that's happened over the last couple of years. Now, whether they are in practice going to be able to find solutions to these very difficult problems that will gain some measure of acceptance, we wait and see. They could, for example, start to produce noise measures that would make some sensible measurement of what the noise is like if you're right underneath this [flight path centre line], and how far out the shadow extends, and where it is, who can be said to be effected by a concentrated route. Of course, there will be some people who are out a long way away who will say they're effected because they're very sensitive to it and there will be people right underneath it who will say they don't care, but you might be able to get some kind of compromise which suits most people in terms of a definition. So there's stuff like that we can work on. (campaign group representative, personal communication, 4 April 2016)

MP Richard Burden developed this idea during a Parliamentary debate on aircraft noise pollution:

> The question is, how we are to find a balance between dispersing routes between a number of corridors or concentrating on a number of routes. Either option has pros and cons for communities, and those that are negatively affected must be fairly compensated. However, whatever is done, a decision must be made. We have seen that trust can drain away when trials come out and people do not know what is going on. NATS, the Civil Aviation Authority, airports and communities need clear signals as to what will happen about airspace operations. (Westminster Hall, 2016, p. 11)

To those overflown, the increase in noise, lack of certainty, complex governance structure and perceived lack of an accountability mechanism not surprisingly leads to suspicion and distrust. In the words of one Gatwick campaign group member, "it's a bit of a free-for-all up there". (Personal communication, 5 August 2016)

> We also propose to allow the designated airports; Heathrow, Gatwick and Stansted, to manage noise in a way that best reflects the issues faced by their local communities. We propose that the noise controls (other than operating restrictions) currently set by the Government, such as departure noise limits, continuous descent approaches and noise-preferential routes, are transferred to the airports. This would be consistent with other airports and would see Government's involvement focussed on strategic decision-making. […] To provide greater transparency to communities about where and how often aircraft are actually flying, and to make it easier to see changes over time, we are proposing that the designated airports should publish data on their departure routes and track keeping performance. […] The Government's aim is to ensure that the airspace policy framework is up to the challenges ahead in modernising airspace and delivering the new northwest runway at Heathrow. (DfT, 2017c, p. 6-7)

Meanwhile;

> Government has focused on providing high level direction and support for modernisation, as well as taking a bottom up approach to facilitating individual airspace changes by ensuring that the relevant policies and procedures are fit for purpose. Current government policy leaves industry to propose their own modernisation schemes and progress airspace changes, which are independently assessed by the CAA. (2017a, p. 54)

> The new Independent Commission on Civil Aviation Noise (ICCAN) will improve the foundations of decision-making by facilitating more effective engagement and accessible communication of noise impacts and management options. This improved dialogue will feed into decisions not only at a local level, but through the CAA and Government alike. ICCAN will also drive improvements in the standards of on-going noise management, providing best practice so that decisions on noise controls can be made based on the latest information and options available. […] The creation of an Independent Commission on Civil Aviation Noise (ICCAN) - an important step to rebuild the trust lost in industry by communities. The body will help ensure that the noise impacts of airspace changes are properly considered and give communities a greater stake in noise management. In order to ensure appropriate measures are being taken to address aviation noise issues, a review of ICCAN within two years of set-up will include further consideration of statutory powers for the body. We have listened to the concerns raised through the consultation process and have decided that ICCAN will be set up as a new non departmental public body of the DfT, rather than an independent body within the CAA. (DfT, 2017c, p. 7)

Ultimately, the CAA takes direction from Government regarding precise ways of balancing the spatiality of aircraft noise pollution, and also which areas should be 'scarified' for the purported economic benefits of the UK. As argued by Andrew Haines, Chief Executive of the CAA, airspace management needs guidance from the political realm simply because "who should suffer most and least from noise is a political decision" (Hayling Insider, 2016). Likewise, the Department for Transport DfT defers to the Government and the CAA for higher-level guidance on such proposed changes, such as those proposed in 2017, stating only that the Department is "currently reviewing existing airspace and noise policies and will consult on proposals in due course (2017, pp. 6-7).

5.5 Chapter summary

Meanwhile, the use of airspace above the urban region is also guided by essentially place-blind intentions of minimising the number of people significantly disturbed by aircraft pollution. However, these two layers of urbanisation – development and planning on the ground and airspace planning and management – are fundamentally disconnected from each other. Instead of an integrated, long-term vision of the functional urban region, which includes its airspace, battle lines are drawn. It certainly remains to be seen whether the

reforms recently proposed by the DfT reconcile these two realms of urbanisation – vertical and horizontal – or if they will, as I suspect, simply provide legitimation for looming airport expansion and airspace modernisation.

Chapter 6

London and Heathrow Airport: The urban-airport interface within the city

6.1 Profile

Heathrow is by far Europe's dominant international airport, and the central hub in global the "hub and spoke" network of British Airways and its alliance. Since it opened as "London Airport" in the 1940s, the airport has expanded its terminal capacity with multiple, massive new terminals, but so far has not been able break past its current perimeter fence and expand its runway capacity. Meanwhile London has risen to an Alpha-level global city and the centre of a booming and over-heated property market. However, its location within the city proper has made it perhaps one of the most controversial and polarising pieces of infrastructure ever built. Located in the Borough of Hillingdon in West London (see Figure 6), the airport opened in 1929 and currently serves 75.7 million passengers per year travelling to 194 destinations in 92 countries (Heathrow Airport Ltd., 2017). Meanwhile, for many years there have been looming proposals to expand the airport with an additional runway.

Although many of these have come and gone, the current Government may be on the verge of approving the much-discussed third runway. If supported by Parliament, the proposed plan, which was endorsed by the Airports Commission in 2015, would be implemented with a number of 'world-class' mitigation measures in terms of aircraft use and state-of-the-art navigational techniques. Yet, there is reason to be sceptical about the potential of these advancements to make the persistent challenges to the spatial integration of airports disappear, let alone to counteract the negative effects of a 50% increase in runway capacity. The airport openly admits that noise remains a persistent problem:

> Heathrow is the busiest two-runway airport in the world with about 1,300 combined take-offs and landings a day. Efforts to limit noise mean that fewer people are affected by noise today than at any time since the 1970s. However, noise remains an issue for people living near or under the various flight paths used for take-offs and landings at the airport. (Heathrow Airport Ltd., 2016)

At different times the airport's owners have claimed that a third runway will and will not be sought after, and although the location of a new London airport has been discussed for decades, there has never been a serious proposal to replace Heathrow.

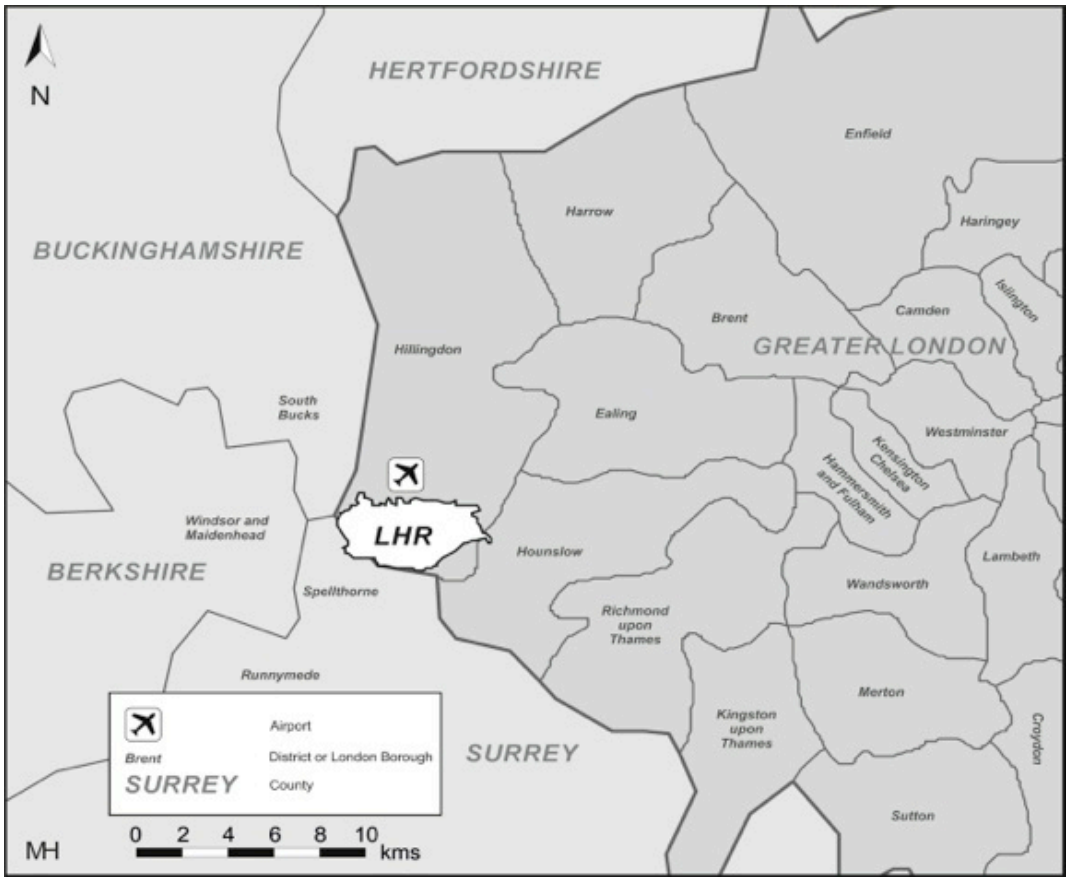


Figure 6: London Heathrow Airport and surrounding political boundaries. Map by Malte Helfer.

The incremental approach has again left the urban region with high demand for airports in the 'wrong' places (Budd, 2007, p. 9), with the highest demand being for Heathrow, which has arguably developed at the worst possible location (in relation to the concentration of nearby residential areas). The Office of the Mayor of London and the London Plan continue to express opposition to the expansion of Heathrow, if not airport expansion elsewhere in the South East. As outlined in the 2017 Draft London Plan, Mayor Khan "supports the case for additional aviation capacity in the south east of England", such as at Gatwick, "providing it would meet London's passenger and freight needs, recognising that this is crucial to London's continuing prosperity and to maintaining its international competitiveness and world-city status" (p. 433). With regards to expansion, the Draft London Plan 2017 stipulates

that “environmental impacts of aviation must be fully acknowledged and the aviation industry should fully meet its external and environmental costs particularly in respect of noise, air quality and climate change; any airport expansion scheme must be appropriately assessed and if required demonstrate that there is an overriding public interest or no suitable alternative solution with fewer environmental impacts”, and the Mayor “will oppose the expansion of Heathrow Airport unless it can be shown that no additional noise or air quality harm would result, and that the benefits of future regulatory and technology improvements would be fairly shared with affected communities” (Greater London Authority, 2017, p. 433).

A planner for Greater London elaborates on the difficulty of integrating the Heathrow Airport with a large city and urban region growing concurrently around it:

> If you have that ability to build an airport from nothing, and could plan land uses around it, then you could do a better job than if you didn't try and plan it. But, that is not the situation that you've got at Heathrow, you have established residential areas which are directly under the flight paths, and there is no mechanism that I am aware of, or can even visualize, that would allow that type of land use to change, because numbers of homes, thousand of homes, A) should those people be forced to move? and B) where are you going to find land for those thousands of homes? [Heathrow’s] current operation massively impacts the health of London and West London in particular. It contributes a massive proportion of Europe’s noise and massive contribution to London’s breach of the EU air quality levels, and in our view, any expansion of Heathrow would worsen those problems. So, Heathrow is probably not a block on homes, but the quality of life for the people living in those homes is affected by Heathrow’s operation. […] The uncertainty has led to blight. We want to produce a plan for Heathrow, for the wider area around Heathrow, it would include Ealing, Hillingdon, Hounslow, possibly even Richmond as well, a very extensive area, but without knowing what's going to happen with Heathrow, it's not possible to plan properly. Also, if you include areas outside of London, like Slough for example, which wants to expand Heathrow, because it feels the benefits it will get will massively outweigh any environmental impacts. So, there's no agreement amongst the councils in the area as to what you should plan for: do you plan for a closed airport? Do you plan for an airport the same as it is now? Do you plan for a two-runway airport with more flights? Do you plan for a three-runway airport? Do you plan for a four-runway airport? Because Heathrow’s own modelling presumes it will be full by

> 2030, some say they're planning that it [in a way that] presumes it will be full when it opens, so, how many plans do you produce when you don't know what the core function within the area is? (Greater London Authority, personal communication, 8 July 2016)

The location of higher income residents with the social capital to bring attention to these issues may also be a contributing factor to this relationship:

> If you look at the geography of house prices in London, apart from the ring structure, one thing you might notice is there's a finger of relatively high house prices which runs from central London down through Kensington, Richmond, Twickenham into Surrey, which is where some of the most heartfelt opposition to Heathrow comes from… They can reasonably say that the property prices are just a capitalization of these benefits and disbenefits and they're not different from each other. So, if you happen to be rich *and* sensitive then you attach a higher value to it than if you happen to be poor and sensitive, that's part of the story. (local expert, personal communication, 9 November 2016)

In the context of Airports Commission public consultation meetings, Heathrow Airport Limited's CEO John Holland-Kaye has claimed that one of the ways that the expanded Airport's negative local environmental externalities will be offset by the creation of new green space around the site:

> Heathrow, as we all know, has grown up organically, a little bit at a time, and it is not the way that you would ever plan for an airport to sit within its communities. This is a chance to fix that: to find a better way of Heathrow linking in to local communities, putting businesses closer to where they ought to be and putting hotels closer to where they ought to be, so that we can reduce the number of cars on the road. The same applies with the opportunity for open spaces. Our master plan is at a fairly high level at the moment; we have filled in some of the detail but we have a lot more work to do over the coming years to make sure that we have something that really works. We cannot answer all of the questions that people might have yet, but we will work together to do so. Part of the master plan is that we have a 15-mile green ribbon around the airport which allows both the re-provision but also the connection between open spaces. Some of that is current open land that people can use; some of it is not – some of it is existing farmland. That will allow us to improve the amenities for local people. I am not suggesting for a moment that everything that is lost will be re-

> provided – we will do as much of that as we can – but we do have an opportunity to enhance and to make things better. (Airports Commission, 2014c, p. 25)

Colin Ellar, Deputy Leader, London Borough of Hounslow, has argued that the spatial mismatch of the West London hub is a strain felt at the borough-level:

> We have had a huge increase in our population. We have a huge number of children, and this is a phenomenon right across London, but it is particularly affecting West London. We are having to build 17 additional classrooms in our primary schools. This bulge, and it is many hundreds of children, is going to move up into our secondary schools. We do need another school. We are going to have to build them. We have an additional cost of about 15% or 20% more in the actual building costs because we need additional soundproofing. The cost of public building, as building regulations say it has to be, soundproofed to an effective level, we, the local authority, have to pick up that cost. We do not get any help with that either from Government or from the industry, so I am having a moan about that. (Health and Environment Committee, 2013, p. 36)

To the airport's opponents, Heathrow is simply in the wrong place:

> We should not be flying over major urban areas, but I am in no way saying we should remove flight paths from one area to impact somebody else, because I know what the impacts of noise are, and how intrusive and devastating it can be, so I would not want somebody else to suffer, but we need to be looking at more creative [mitigation methods]. The R-NAV and the concentrated flight paths are not to the benefit of anyone underneath them, this is strictly for aviation, to save on fuel, to save going around in circles as well. Yes, it has minimal environmental impact, but if you are going to build a third runway and throw more flights into the sky, I would say that's negligible. Of any sort of impact, the only benefit is on fuel prices for airlines, there's very little up-side where the respite that is offered through different flight paths where the same people are not impacted everyday helps, but on that as well, we're seeing Heathrow saying 'well, we'll offer respite', but you can't offer respite to people that have never been overflown before, and then put planes over their head (Heathrow campaign group representative, personal communication, 25 July 2016)

6.2 Areas of conflict

In contrast to the view that noise pollution may be less severe in urban environments, there is also a also a strong awareness that residents of London already disproportionately experience significant levels of noise pollution. For example, in the words of London Assembly member and Chair of the Health and Environment Committee at the time, "out of all the environmental issues, it is the noise during the night which disturbs Londoners the most and causes the most problems" (2013). Residents claim that they "wake up and go to bed with plane noise, it's so bad it rattles the windows." (Residents Action Group Elmbridge: RAGE! (Smurthwaite, 2015). Likewise,

> Many people in the aviation industry seem to fail to appreciate the depth of the problem aircraft noise can cause certain people. I do not think this us just an industry trying to defend itself. There appears to be a genuine failure to understand that aircraft noise can be a very real problem for people. I remember a senior person working for BAA, the owners of Heathrow Airport, saying to me that she had never thought people were really complaining about noise; she assumed their noise complaints were just a front to cover their dislike of aviation in general and Heathrow in particular. Another senior aviation lobbyist once asked me if the noise complaints were less about noise and more about the fear of aircraft crashing. (Stewart, 2011, p. 102)

In prevailing westerly winds, as many as 40 aircraft per hour approach Heathrow aligning at a shared "joining point" above East London and continue their descent over East London (International Transport Forum, 2013, p. 24). The extension of this point from central to East London is referred to as the 'trombone-ing' effect.

> There are no formally defined routes between any of those stacks and the end of runway, so what happens is, internal control… the controller will place them roughly 8-10 miles out… the airliners go to minimum stack level is 7,000 feet, then the controller will take them place them. [With] dynamic tactical vectoring, you've got a guy using his skill to get those aircraft in, that's why you get the trombone-ing effect. Now, as it gets busier, the join point tends to go further out, so if 30 years ago aircraft were getting onto the centre line at eight miles, these days, sometimes aircraft do, some aircraft are getting onto the centre line fifteen, eighteen miles out, because that's just the way with so many aircraft, to get them down the same pipe effectively, in busy periods, they're joining further route. (CAA, personal communication, 4 May 2016)

This change in vectoring is very similar to the change that to Gatwick's arrivals path, which brought the joining point further out, and over the town of Royal Tunbridge Wells, which will be discussed in the next chapter.

> There is probably no golden rule that can be applied to all airports. My own preference is for dispersal. It is usually more equitable and eases the biggest problem for those living under the flight paths: the sheer number of planes overhead. Most people can cope with a plane every now and again; few can bear a constant stream of planes overhead. (Stewart, 2011, p. 104)
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> […]
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> The first big change took place around 1995. Until then planes landing at Heathrow used to join their final approach path around Barnes. But in the mid-1990s the joining point was pushed much further east, to the Southwark/Lewisham borders. It didn't mean that every plane joined that far out but a lot did. It resulted in areas between the joining point and Barnes getting a stream of planes they never had before. No consultation was required with residents and none took place. And there was no compensation. Life changed for tens of thousands of people. (Stewart, 2010, p. 3)

6.3 The Airports Commission

In his announcement of the Airport Commission's recommendation, Davies urged the Government "to make an early decision on its recommendations", suggesting that further prevarication 'will be increasingly costly and will be seen, nationally and internationally, as a sign that the UK is unwilling or unable to take the steps needed to maintain its position as a well-connected open trading economy in the 21st century" (UK Government, 2015).

Likewise, the Secretary of State for Transport, Chris Grayling echoes this sentiment:

> Britain is a great, global trading nation – home to one of the largest economies in the world with strong international trading links. At the heart of this lies an aviation sector which has led the way for generations. The UK was home to the first scheduled air services and is the birthplace of the jet engine. Today we have one of the largest aviation networks in the world and UK companies manufacture some of the most advanced aviation technology. This is an industry that contributes billions to our economy, supports thousands of jobs, strengthens the Union and develops skills [and] as the Airports Commission noted, we need to continue to grow our domestic and international connectivity. (DfT, 2017, p. 4)

Economic success and global transport connectivity appear to be unquestionably linked by the current Government. Besides balancing global and local pressures, the urban-airport interface in the UK is also a composite of public and private interests, and neo-liberal and protectionist arguments espoused by actors ranging from local pressure groups to the Government to the aviation industry and the airlines. According to the Department for Transport, "the fact that the UK is the most liberalised aviation sector" provides "a competitive advantage and helped our continued success" (DfT, 2017, p. 9). Again, economic connectivity remains the main stated benefit for airport expansion, as stated by Lord Tariq Ahmad of Wimbledon, Minister for Aviation from 2016 to 2017:

> A strong aviation sector is crucial for enabling trade, creating jobs and building an economy that works for everyone. But growth of the aviation sector must be sustainable. For communities living near airports, this means the impact of noise must be managed and in particular, night noise, which we know people find particularly disturbing. […] Given both the costs and benefits of night flights, the Government has set night flight restrictions at Heathrow, Gatwick and Stansted for many years, balancing the interests of communities, passengers and the wider economy. (DfT, 2017, p. 9)

According to Heathrow Airport,

> Britain's other airports have an important role to play but cannot compete with foreign hubs which make long-haul flights viable by mixing transfer passengers, direct passengers and freight. So Britain faces a choice. We can have the confidence and vision to develop our own hub into a world-class gateway for the 21st century, or we can accept that in future much of the world will not be able to fly to Britain direct. (Heathrow Airport Ltd., 2014, p. 48)

Sir Howard Davies' announcement of the final recommendation of the Airports Commission began with the claim regarding local-airport expansion conflicts, that "developed and developing countries face similar issues and have nonetheless been better able to provide infrastructure to keep pace with the growing demands of an expanding aviation market" (2015, p. 3). The announcement follows,

> The independent Airports Commission was set up in late 2012 with a brief to find an effective and deliverable solution, and to make recommendations which will allow the UK to maintain its position as Europe's most important aviation hub. We believe we have now identified a solution which can command widespread support. Over the last

> two and a half years we have reviewed the evidence afresh, without preconceptions, and consulted widely. The approach we took was inclusive and integrated. So the Final Report covers developments in the aviation sector in some depth, but sets them within a broader economic and environmental context. In assessing the case for expansion in particular locations the Commission has examined its implications across a wide range of factors including noise, surface transport, employment, air quality, housing and local communities. At the end of this extensive work programme our conclusions are clear and unanimous. While London remains a well-connected city its airports are showing unambiguous signs of strain. (Airports Commission, 2015, p. 3)

Not unlike the Roskill Commission, the Airports Commission did not consider Stansted Airport a viable choice for the next phase of expansion, either with a second runway at Standsted, or as a larger mega-hub that could replace Heathrow. This is said to be mainly due to its location, in an affluent area of Essex, north east of London, with a smaller catchment area and less regeneration potential (2014, pp. 193-195). Perhaps curiously, even though the Commission estimates that Heathrow, Gatwick, London City and Luton would reach their capacity limit by 2030, its Interim Report noted that Stansted currently has significant capacity with its single runway, and would not reach capacity until at least 2041 (2014, p. 121).

Figure 7: Timeline of the expected years that each London airport is expected to reach full capacity (Airports Commission, 2013, p. 114).

Meanwhile;

> Heathrow is operating at capacity, and Gatwick is quickly approaching the same point. There is still spare capacity elsewhere in the South East for point-to-point and especially low-cost flights, but with no availability at its main hub airport London is beginning to find that new routes to important long-haul destinations are set up elsewhere in Europe rather than in the UK. Other UK airports are increasingly

> squeezed out of Heathrow, with passengers from the nations and regions obliged to transfer through other European airports, or Middle Eastern hubs. That costs them time and money, and is off-putting to inward investors. Without action soon the position will continue to deteriorate, and the entire London system will be full by 2040. (2015, pp. 3-5)

The previously discussed rationales of global connectivity are featured prominently in the reports of the Airports Commission. Heathrow is the UK's only hub airport, meaning that a large percentage of passengers only pass through the airport to transfer from one plane to another, usually within the 'hub-and-spoke' network of a national, 'flag-carrying' airline such as British Airways, and/or of an airline alliance. The Airports Commission links the economic benefits of "international-to-international" passengers, arguing that it provides a mutual benefit to London-based business-related travel, as London, "as a global city provides airlines based there with access to currently the biggest OD [origin-destination] market in the world" (2013, p. 134). The Commission also warns that if Heathrow Airport is to remain constrained to a two-runway airport, its number of "highly selective" transfer passengers "will stagnate first, then decline", dropping from 22.6 million transfer passengers in 2011 to less than 4 million by 2050 (2013, p. 93). The implication of this is that this would reduce London's connectivity, as a global city, with the emerging markets where a direct connection to Heathrow would not be viable based on point-to-point traffic alone. Paris-Roissy-Charles de Gaulle, Amsterdam Schiphol, Frankfurt and Dubai International are each expected by the Commission to successfully compete against Heathrow Airport for transfer passengers if capacity remains constrained. The following segment of Davies' Foreword to the Heathrow recommendation succinctly illustrates the economic motivation:

> Good aviation connectivity is vital for the UK economy. It promotes trade and inward investment, and is especially crucial for a global city like London. The service sector, whether the City, the media industry or universities, depends heavily on prompt face-to- face contact. There is strong evidence that good transport links, and especially aviation connectivity, make an important contribution to enhancing productivity, which is an important national challenge. So a new runway in the South East is needed by 2030, which means a firm decision is needed soon, as bringing it into operation will take a decade or more. One new runway, even fully utilised, is compatible with continued progress towards reducing carbon emissions, and putting it elsewhere in the country would produce a far less efficient outcome. It will provide the capacity we need until 2040 at least. Beyond that, the position is uncertain, and

> will be strongly dependent on the international policy approach to climate change. Although an entirely new airport in the Thames Estuary had been considered earlier on in the Airports Commission's research, in the end [Gatwick is] well placed to cater for growth in intra-European leisure flying, but is unlikely to provide as much of the type of capacity which is most urgently required: long-haul destinations in new markets. Heathrow can provide that capacity most easily and quickly. The benefits are significantly greater, for business passengers, freight operators and the broader economy. All passengers will benefit from enhanced competition.

Heathrow expansion has of course been recommended before, and subsequently set aside in the face of local opposition. To make expansion possible the Commission recommends a comprehensive package of accompanying measures, which would make the airport's expansion more acceptable to its local community, and to Londoners generally. The package includes a ban on night flights, more reliable respite for overflown communities, and a limit-based and legally-binding noise envelop that would "stipulate that the total number of people affected by noise under expansion should be no higher than it is today", according to the Commission. Such limit-based noise contour limitation structure would force the airports and the airlines to "become more noise efficient if the airport is to grow" (2015, p. 31). The report also recommends creating "a statutory independent aviation noise authority, and a noise levy to fund a far stronger and more generous set of compensation and mitigation schemes" (2015, pp. 4-5).

Concerning proposed mitigation measures, the Commission outlines the following:

> Combined with improvements to aircraft technology, which are reducing noise and emissions over time, and new traffic management procedures, all this means that an expanded Heathrow would be a better neighbour for local communities than the airport is today. A bigger Heathrow would not inflict noise nuisance on more people than the airport does today, and the people affected would be far better compensated. Expansion and the mitigation of the airport's local impacts go hand in hand, as the former can provide the financial resources needed for the latter.

Mitigation measures are used discursively as a way to enable airport expansion, figuratively 'going hand in hand'. Nevertheless, in sheer numbers the Commission conceded that Gatwick airport would be a better option with regards to noise pollution alone:

> Although an expanded Gatwick would see more people affected by noise than today, its overall noise impacts would still be much less significant than those around

> Heathrow. In terms of the total number of people affected, an expanded Heathrow would see more than 550,000 people within the 24-hour 55 LDEN contour in 2030 compared to just over 22,000 at Gatwick. That reflects Gatwick's more rural location, which presents challenges in respect of the airport's effects on tranquillity, but does not outweigh its overall noise advantage. (2015, p. 27)

According to Heathrow Airport, expansion will provide an opportunity to roll-out new mitigation measures:

> Combined with improvements to aircraft technology, which are reducing noise and emissions over time, and new traffic management procedures, all this means that an expanded Heathrow would be a better neighbour for local communities than the airport is today. A bigger Heathrow would not inflict noise nuisance on more people than the airport does today, and the people affected would be far better compensated. Expansion and the mitigation of the airport's local impacts go hand in hand, as the former can provide the financial resources needed for the latter. (2015, p. 5)

The Final Report relies heavily on the recommendation of mitigation measures, which can be interpreted as the Commission's rationale for expansion and a pragmatic response to persistent spatial integration challenges, and can also be though of as the internalisation of local concerns into the beginning of pro-expansion spatial policy.

The Airports Commission's logic mirrors Heathrow's stated rationale for expansion, that Heathrow could indeed become 'a bigger and better neighbour' through technological and operational innovation (2015). Likewise, the Final Report advocates creating a firm noise contour around Heathrow, which provides a more tangible restriction to noise level increases than the government's 'significantly affected' policy. Such a firm contour, or 'noise envelope', the Commission suggests, "should be agreed and Heathrow Airport must be legally bound to stay within these limits. This could include stipulating no overall increase above current levels" (p. 10). The Final Report recommended that an "independent aviation noise authority should be established with a statutory right to be consulted on flight paths and other operating procedures" (p. 10). Claiming that this body should be given "a statutory right to be consulted on flight paths and other operating procedures", the Report recommended that this new body "be given statutory consultee status and a formal role in monitoring and quality assuring all processes and functions which have an impact on aircraft noise, and in advising central and local Government and the CAA on such issues" (p. 32). The Davies Commission's belief in the potential role of an "*independent* noise authority"

seems to have either anticipated the opposition to the Heathrow recommendation, but also suggest recognition that, in practice, there has been a discrepancy between the intention of the government's policy and the lived experience of the issues which the CAA was created to regulate.

The rationale behind the Commission's recommendation appears to hinge on the potential of a combination of novel and conventional local airport mitigation measures. While such a polarising issue has clearly aggravated simmering tensions here, there can be no doubt that the Commission has received the complaints of Heathrow's opponents, and *internalised* concerns over such existing local problems. The substantial emphasis that the Commission gives to mitigation measures can of course be interpreted, depending on your position, as a pragmatic method to deliver an actionable recommendation, or conversely a cynical attempt to anticipate and proactively address and ignore the concerns the concerns it received during the extensive consultation period. As the Final Report acknowledges,

> Environmental effects of aviation, particularly in relation to noise and air quality, have consequences for health and wellbeing which need to be carefully considered and addressed wherever possible through effective mitigation and compensation. Over the coming decades the noise impacts of Heathrow are forecast to reduce significantly, as new and quieter aircraft come into service and as flight paths are redesigned and improved. With expansion, the overall number of flights would grow, but new approach and departure paths could enable the noise impacts to be dispersed more widely, limiting the impacts on any individual community. It would be possible to ensure that noise from the airport, with either option for adding runway capacity at Heathrow, would not exceed current levels across a wide range of metrics, both during the day and at night […] In addition, expansion would make it possible to eliminate arrivals in the early morning before 6am, which are seen as particularly damaging by local communities. […] In reaching these conclusions, however, the Commission is acutely aware that the concerns of local communities must be taken seriously, by tackling long-standing issues such as night noise, increasing long-term funding for compensation and insulation, giving local people a real say in how the airport operates and ensuring that the new jobs and training generated by expansion are made available to those living nearby. (2015, pp. 26-30)
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> […]

> In general terms, the impact of aircraft noise is a function of the number of planes flying overhead, the technologies being used within those aircraft and the paths the aircraft take when approaching the airport. Also important are measures used on the ground to limit the effects on people. There is a clear trend over recent decades of reductions in aviation noise due to technological and operational improvements, which is predicted to continue and has been incorporated into the Commission's assessments. (p. 169)
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> […]
>
> The effects of expansion at Gatwick on daytime noise are greater than at Heathrow in percentage terms, but the aggregate numbers of additional people affected are much smaller across all metrics. For example, looking at the 57 decibel daytime contour, the two expansion schemes at Heathrow would see an increase in the population affected of 16-37,000 people in 2030 against the do minimum case, compared to fewer than 3,000 at Gatwick. The same pattern is seen in the number above contours, with the population experiencing more than 50 flights in a day whose noise impacts exceed 70 decibels rising by 12-28,000 people with expansion at Heathrow, as opposed to just 3,600 people with Gatwick expansion. The latter is approximately a trebling of the baseline level compared to an increase of less than 20% at Heathrow, but that does not outweigh the stronger performance of the Gatwick scheme in aggregate terms.

I attended a public consultation session in Putney, West London on 24 February 2017, and although there was a plethora of visual material illustrating the organisation of airspace and the expansion proposal for Heathrow, none of the staff from the Department for Transport there who I spoke with could tell me which parts of London would be newly effected by aircraft noise from the new flight paths once the additional runway was built.

Significantly, *if* the Airports Commission's decision was indeed based on noise alone, it appears that Gatwick would actually have been their preferred choice:

> Due to its relatively rural location and sparsely populated wider local area, expansion at Gatwick would affect considerably fewer people in total than either of the two Heathrow schemes. This pattern does not change substantively across the different metrics considered. Focusing on the 55 Lden metric, for example, as this covers the full 24 hour period, the Gatwick scheme would affect approximately 22,000 people in 2030, rising to almost 25,000 by 2050. In contrast, the two expansion proposals at

> Heathrow would affect more than 550,000 people in 2030, rising to between 570-640,000 by 2050. (p. 172)

Likewise, in early 2016 the Secretary of State for Transport claimed that looming decision on the location of a new runway would not be made on environmental considerations alone.

The Airports Commission addresses the issue of ambient noise:

> The Commission's overall assessment is while Gatwick expansion generates a larger relative change in percentage terms and performs less strongly in terms of respite and tranquillity, the far smaller aggregate numbers of people affected and the more limited changes compared to the baseline mean that the Gatwick scheme performs more strongly in terms of its noise impacts than the options for expansion at Heathrow. (2015, p. 180)

However, the Commission reasons that although in sheer numbers an additional runway at Heathrow would impact more people, there would be a significant difference in the degree of aircraft noise, relative to its surroundings would be better at Heathrow than at Gatwick:

> Overall, against the Commission's objective **to minimise and where possible reduce noise impacts** [emphasis in original], the Gatwick Airport Second Runway scheme performs best, due to the much smaller total numbers affected, and the smaller increment over the baseline across the majority of metrics. The scheme would, however, see higher noise levels than are currently experienced around the airport, and its impacts would be felt in some quieter and rural locations. (2015, p. 186)

Meanwhile,

> The improvements in noise impacts forecast to be delivered by new technology and improved operations at Gatwick are outweighed by the increases resulting from growth in flights and by the location of the new runway close to the northern edge of Crawley. In contrast, the additional capacity at Heathrow is smaller as a proportion of current capacity and the location of the new or extended runway would be more advantageous in respect of managing noise impacts, meaning that while the background noise reductions would be offset to some degree, they would not be eliminated. (2015, p. 178)

However, with regards to night flights, the Airports Commission suggested that Gatwick performed worse across this metric, as it has a greater share of low-cost airlines established there, whereas Heathrow would continue to be dominated by British Airways and long-distance flights from other 'flag carriers' abroad:

> At Gatwick, night flights include arrivals and departures and the number of flights varies significantly between the summer and winter seasons, with an average of 40 a night during the core night period of 11:30pm to 6:00am. Low-cost airlines use night flights at Gatwick to enable them to fit in three or four waves of services in a single day and to maximise the use of their planes to reduce costs. The vast majority of nighttime services at Gatwick are therefore to and from short-haul destinations. While there may be potential for an expanded Gatwick and its airline community to evolve their business models over time, it is unlikely that any significant reduction in, or a ban on, night flights at an enlarged Gatwick would be a credible option in the immediate term. The level of rescheduling required would reduce the efficiency with which aircraft can be used, increasing costs in a price sensitive and highly competitive environment.

In contrast to Gatwick, as a long-distance hub airport, Heathrow is subject to unique time constraints due to global geography, time zones, and the time it takes to fly from, for example, Southeast Asia, in order to sync with the airport's morning departure wave:

> At Heathrow, under current arrangements, the quota system heavily restricts the number of flights that use can use the airport and the noise levels that they may create during the core night period from 11:30pm to 6:00am. In addition, the airlines using Heathrow have signed up to a voluntary agreement that no flights should land before 4:30am. This has led to an average of 16 arrivals from long-haul destinations between 4:30am and 6:00am each day and no departures. (Airports Commission, 2015, p. 185)

Taking a cue from the Airports Commission's Final Report, this announcement also stipulated that "following consultation a six-and-a-half hour ban on scheduled night flights will be introduced for the first time at Heathrow", which Heathrow Airport had on following the Final Report's recommendation for a ban on night flights. Previously, Heathrow Airport's position regarding that particular recommendation was only to "agree a package which will significantly reduce night flights", in the words of Heathrow's Sustainability and Environment Director (Martin, 2016). However speaking to the House of Commons' Environmental Audit Committee, Secretary of State for Transport, Chris Grayling clarified the current state of the continuing airport expansion saga (which remains current as of late 2017):

> Chris Grayling: We have not currently taken a decision. It is important to state where we are in the process. We have made a recommendation. That recommendation then has to be put to the country in the form of a national policy statement. There is a

> public consultation. There is parliamentary scrutiny by a specially appointed Committee. There is then an indicative vote in Parliament. The decision is not taken until after that indicative vote. I personally, if I am still in the job, am taking that decision. At that point, that is when the decision is a clear one. At the moment we have only made a recommendation. What we do now is set forward all the evidence for consideration as part of the process that happens over the next 12 months.
>
> Chair: So when it says, "Government decides on new runway at Heathrow" on the Government website, it is not a decision.
>
> Chris Grayling: No, it is not a formal decision. It is a recommendation from a committee of the Cabinet that we believe this is the best option, that we have accepted the recommendation of the Airports Commission report and we are now moving ahead with the formal process with that recommendation around the third runway. (2016, pp. 24-25)

The leader of London Borough of Hillingdon Council Ray Puddifoot highlights that "even the Airports Commission has to agree that runways need flight paths. If you approve one you have to approve the other. "It will be unlawful for any Government to approve a new runway without publishing detailed flight paths data so the communities affected can exercise their legal right to scrutinise the plans. This is a major obstacle that can't be put off much longer." Similarly, the leader of Wandsworth Council Ravi Govindia argues, "the law is very clear. Communities have to be consulted on air space changes and once those maps are finally published the backlash will completely change the course of this debate. "It's very hard to justify why a two year aviation investigation failed to unearth this key piece of information. We've made it very clear to the prime minister that the commission's recommendation can't be followed until it is out in the open for all to see" (Hillingdon, 2015). The day of the Airports Commission's announcement, London's then-Mayor Boris Johnson reacted to the Commission's recommendation by arguing that;

> Expanding an airport on the outskirts of a major city in the face of public opposition was the kind of thing that could have happened in China in the 1950s but would be impossible to deliver in London because of the legal challenges, environmental cost and human rights issues. (The Guardian, 2015)

The final recommendation stipulated that expansion should be accompanied by a number of conditions to make Heathrow more spatially integrated than it is at present, certainly a bold, some might say unrealistic, vision:

> As the commission also identified, there are environmental and social measures, which they hope will make it a more acceptable proposal. So, banning night flights, although Heathrow, we're not sure about that, but certainly reducing night flights, this whole concept of respite, of switching around the flight paths, we never had that previously. They are trying to make it a more acceptable proposal around, but […], all these things could happen tomorrow at a two-runway airport, whether Heathrow would be motivated to introduce all this, I don't know, because they're motivated to give these social and environmental 'goodies' in order to get their third runway through, but there's no reason why Government couldn't intervene and say, 'look, night flights need to be banned before six o'clock tomorrow night. (Heathrow campaign group representative, personal communication, 6 April 2017)

During the 2009-10 Heathrow expansion debate, climate change had also been a significant issue, with the Airport and the Government being viewed by environmental groups as complicit in increasing green house emissions. I asked a Heathrow campaign group member about why they think the issue of carbon emissions (in comparison to noise pollution) seems be less of a polarising issue during this expansion proposal debate:

> I think the other thing that the industry's very cleverly done, is that they have framed the debate not on 'do we need a need a new runway', but, 'of course we need a new runway, should it be Heathrow or Gatwick?' and so the discourse, the debate, amongst the politicians, in the media, is 'Heathrow or Gatwick', its not whether we need a new one, but where it should be. For a while there was the question of the Estuary Airport, "Boris Island", but even that was 'where should it be', 'what do we think about Boris island, what do we think about Heathrow, what do we think about Gatwick?' […] In 2010, when the Government wasn't building runways, the industry went back and I think re-assessed their position and their tactics, and I think they thought they have to re-frame this debate, which I think they have successfully done. (campaign group representative, personal communication, 4 May 2017)

Even for those who ostensibly benefited from the Airports Commission's final recommendation for Heathrow, there is a significant degree of pessimism regarding public consultation and the intention of the motivation of the Commission. The Commission acknowledged the role that the public were said to play in its decision, and remembered;

> to thank the many thousands of individuals and organisations who have responded, often on a voluntary basis, to our discussion papers and consultations, participated in

> our public events or taken the time to meet the Commission and explain their views. Their input has been a crucial element of the Commission's process and has had a significant impact on the findings in this Final Report.

Adams (1971) came to a similar conclusion in response to the modernist logic behind the Roskill Commission's search a third London airport decades ago, which could very well have been written in 2018 in response to the Airports Commission:

> Two quite different views of the rocketing growth rates of demand for air and surface travel suggest themselves. The Commission's view is that they represent some process of natural growth. Not to cater for them by providing new airports and motorways would be to *suppress* them. But clearly if the airport system were not expanded the forecast growth in air traffic would not take place. Viewed from another perspective, these traffic increases that are *generated* by the provision of the facilities themselves. Whether a decision not to expand is viewed as suppression of something that is normal, natural, and right, or simply as a refusal to generate more traffic depends largely on one's view of the benefits of more traffic [emphasis in original]. (p. 491)

> *Looking at Airports Commission's work, do you think the views of the Gatwick adjacent communities were listened to? I know there was a lot of consultation.*
> Not really. Howard Davies is an economist, he's a businessman, he's actually doing what he was briefed to do. He wasn't really worried about people on the ground. He's worried about business. He made his decision based on business. (Gatwick campaign group representative, personal communication, 5 July 2016)

> The growth is so phenomenal at the moment in London and the South East, London is just expanding like crazy. It is so phenomenal that I think there would have to be very severe demand management to stop the projected growth. So, on balance, whether I like it or not, in the real world there will be the call for a new runway somewhere in London and the South East. (Heathrow campaign group representative, personal communication, 6 April 2017)

Many of the campaign groups from both Heathrow and Gatwick take a 'no-new-runways' position with regards to the runway dilemma, a continuation of an established "anti-expansion coalition" in the urban region (Hayden, 2004, p. 6). On the other hand, there are "there are very few MPs who would adopt a 'no new runways' position, and faced with the

NPS that we're essentially locked into this new runway at Heathrow, that's taken out of the Government's hands, it's taken out of politics, it's handed across to the National Infrastructure Commission, it's a big and immediate threat to the Heathrow communities and to the Heathrow local authorities, in that context a 'no new runways' argument has been harder to make" (campaign group representative, personal communication, 4 May 2017).

In practice, the negotiation of these three-dimensional spatial relations, such as trajectories of urbanisation in London and the South East and the governance of airspace, remain a pressing problem for governance at the local and national scale. This is evident in both the runway debate, as well as changes to airspace design. Not unlike the high-rise, the intensification of traffic through urban flight paths exemplifies the perpetuation of unresolved urban struggles with new technology within the urban realm. Reminiscent of the idealised *tabula rasa* upon which new districts of high-rise blocks were envisioned in central Paris (Parker, 2005, p. 61), or the 'meat axe' with which modernist planners such as Robert Moses would carve out inner city expressways from densely populated areas in order to facilitate transport flows (Berman, 1982, p. 294), perhaps the decision to expand such an airport, within London's concentrated built-up area is, on some level, based on imagining urban airspace with similar 'blank slate' rationale, *empty space* removed from urban fabric below, ready to be managed and re-purposed as 'airspace'. Certainly, making decisions on runway expansion without knowing *where* the flight paths to a new runway will be is an approach that relies on a significant hubris that it will be possible to satisfactorily design and manage airspace.

The drive within government for airport expansion in the UK is clearly led by a predict-and-provide rationale, supported by a belief that an increase in capacity can be achieved without 'significantly' affecting the existing residents of the urban region. Expectations of technological and operations improvements (such as the roll-out of quieter aircraft and the night-time ban) appear be the cornerstones for the significant increase in the amount of aircraft which will use an expanded Heathrow.

The 2014 respite trails with HACAN, NATS involved "no fly zones that would alternate from week to week […] The trial had mixed results. 100,000 people were given some respite from aircraft noise but equally we found those who were not regularly overflown before experienced more noise. It was a lesson in the delicate balancing act that needs to be observed when trying to address the issue of aircraft noise around an airport" (HACAN,

2015). Since then, from the perspective of the Teddington Action Group south-east of Heathrow,

> 1. Heathrow has altered the flight paths in and out of Heathrow, thus altering the use of air space, without going through the required notice and consultation process. In addition Heathrow has not minimized noise from planes below 4,000' as required by the Government's Guidance of January 2014
> 2. Heathrow has made untrue statements and withheld information that cover up these alterations and lack of observance of the Guidance
> 3. The residents and communities around Heathrow have been cheated out of their rights to have and participate in the required consultation process
> 4. Heathrow have not properly investigated most complaints about noise from residents, many are simply auto loaded onto their Salesforce system and result in a standard automated response
> 5. As a result of this the residents around Heathrow have suffered enormous increases in noise around them that is damaging to health and mental stability.
> (Teddington Action Group, 2016)

Actors within the aviation industry, too, have an interest in reducing aircraft noise. From the perspective of British Airways, operating the "the safest, quietest, lowest emission aircraft available offers benefits to local residents and its hub airport" (Heathrow Noise Forum 2015). The airline argues that upon landing, the Airbus A380 "is as quiet as the smallest short haul aircraft we use", creating "half the noise footprint with 40% more passengers". According to the Airport's Sustainability Programme Lead Matthew Gorman, "Heathrow's noise standards at night are the toughest in the world. They are the de facto standard for aircraft design" (Greater London Authority Health and Environment Committee, 2013, p. 6). Indeed, the A380 is considered "a vital piece in the jigsaw for the airport" as the airport strives to eliminate noise at the source (Heathrow Airport Ltd., 2012).

The design of the Airbus A380 is one example of this interscalar influence, from the level of local concerns to the level of manufacturer's aircraft design. According to the Sustainable Aviation industry group, "noise requirements strongly influence the design of engines, effectively narrowing the design space and impacting on fuel-burn. For example, engine design parameters for the Airbus A380 were influenced by the requirement to meet QC 2 departure noise levels at London airports, to the slight detriment of fuel-burn and thus CO2

emissions. (The Airbus A380 is still significantly more fuel efficient than the aircraft it replaces)" (2016, p. 32).

Conservative Richmond Park MP Zac Goldsmith states that residents are weary of Government "pandering to the slick lobby machine that is Heathrow Ltd", [and suggests that the Department for Transport] "resist the one-size fits all approach being pushed by vested interest and lazy thinkers" (New Statesman, 2013, p. 16). Goldsmith frames the issue as one of 'greed and laziness" versus "overwhelming arguments on congestion, noise, pollution, safety and the quality of life" of his constituents". Rather than simply being NIMBYs, there seems to be a reluctant but pragmatic resignation of the presence of the airport in West London. However, although some may accept "one of the world's busiest airports on their doorstep because of the contribution it makes to the regional and national economy", expansion is another matter:

> *Do you feel that the government will be listening to these concerns and groups in the future, or that there reasons to be hopeful regarding a greater awareness of the local impact of aircraft noise?*
>
> I think there are, partly because we did win last time around, and suddenly Government and everybody else looked at us in a different light. We had a kind of credibility with Government, the aviation industry, and the media, that we never had before, so yes, Government are painfully aware that we won last time around, and therefore they realise that the issues we are raising are ones that they are to seriously deal with. How they will deal with them is the $64,000 question. They may decide that the opposition is so great at Heathrow, that they will go for Gatwick, that's really why they are keeping Gatwick in the frame, or if they really want to go for Heathrow, they'll try and deal with them through giving us what I call the "goodies", the ban on night flights, respite, etc. etc., but I think fundamentally they realise that we are playing now in the game, and that they will need to deal with us one way or another.
>
> […]
>
> Respite, where appropriate. We are not saying it is necessarily the answer for every community everywhere in the country. But we do believe it will give people back their lives in SE London. And it can be done without aircraft moving to new areas. Take another look at the green areas on the map. Divide them into 4 lines. Rotate those lines. And you have got respite for existing communities, without impacting

> new people. (Heathrow campaign group representative, personal communication, 6 April 2017)

According to Councillor Colin Ellar, Deputy Leader of the London Borough of Hounslow, his borough is most acutely effected by aircraft noise as it lies directly to the east of both of Heathrow's runways. While there are indeed pros and cons to being located so close to the hub airport, there is also an unequal power dynamic between the airport and the local level of government:

> I have had meetings and relationships with Heathrow, with the various chief executives and various people over more than a decade, and generally there has been very good engagement. From our perspective, of course we have the annoyance of Heathrow, but we also have the benefit of Heathrow. It is a tremendous economic driver and certainly we would not want to lose Heathrow. I have to put that on the record, that we do acknowledge the economic benefits this brings to the United Kingdom and especially to West London. That said, I do not think we have ever had a really truly effective voice in terms of noise, movements. I think we have really always been a minority voice on the outside, where you have a very powerful industry lobby, where you have the Government of the day that takes the decisions and really we are pretty much excluded from that. (Greater London Authority, Health and Environment Committee, 2013, p. 26)

6.4 Interscalar integration and negotiation

Heathrow Airport's "Noise Action Plan", a guiding, internal technical strategy aimed at reducing the airport's noise footprint outlines five key strategies summarised in the report "A Quieter Heathrow" (2013); (1) promoting the use of modern, quieter planes through incentives in its fees to airlines; (2) "quieter procedures. Encouraging the quietest practicable take-off and landing procedures"; (3) "operating restrictions. Fewer planes after 11 and quieter planes in the early morning"; (4) "mitigating noise and land use. Effective noise insulation schemes and influencing planning to minimize the number of noise-sensitive properties around the airport"; and (5) "working with local communities". Heathrow clearly has an interest in reducing its noise footprint, although the Airport's ambitious "Noise Action Plan" should be contextualised by the Heathrow's pursuit of the third runway.

The dominant rationale of the airport is reflected in the following statement, "there isn't a choice between more flights or less noise. Heathrow can deliver both" (Heathrow Airport Ltd., 2014, p. 25). The airport's PR, unsurprisingly, promotes the view that "Heathrow is at the forefront of international efforts to tackle noise. On the other hand, as stated by a local planner;

> The airport has a massive budget and large number of skilled people promoting its view, but there is still an effective counter-balancing force, which contests that. […] It's not a fair fight, but there is still a strong, visible opposition to Heathrow expansion, and if the Government decides to go ahead with Heathrow, then that will massively increase. For the moment, it's a hypothetical situation. (Greater London Authority representative, personal communication, 8 July 2016)

As a result, even though the number of planes has gone up, Heathrow's noise footprint has shrunk considerably over the past few decades. But despite these efforts we know that noise remains an issue" (Heathrow, 2017). Pressed for a response to persistent local noise conflicts at a session on aircraft noise and mental health that I attended at Parliament in 2016, Heathrow's Sustainability Programme Lead expands on the airport's position:

> Historically we have measured noise through average noise contours, and those have reduced significantly over a period of many years now, and that's an important trend, but I think, our view is that's not the only measure of noise annoyance, and I suppose my personal opinion on this is that's not the only measure that might contribute to health outcomes, I think the time of day of flights, periods with and without flights, you get predictable breaks in the noise, I think are important as well, and we need to look at how we can develop a menu of interventions I think that we can make. (2016, UK Parliament)

Critics of the Heathrow Airport have suggested that the cancellation of the airport's previous expansion project has motivated Heathrow to be more proactive in its relationship with the surrounding community:

> I think last time around Heathrow just thought they would get the third runway through, they'd never failed to get any of the their previous proposals through, the forth terminal, fifth terminal, and I just think they thought they would get them through. It was a huge shock to their system that the third runway was defeated, and I think they spend, as you'd expect, a couple of years re-assessing their approach, and the new approach to the third runway, is still they want the third runway, but as you've identified, and as the commission also identified, there are environmental and

> social measures which they hope will make it a more acceptable proposal. (Heathrow campaign group representative, personal communication, 6 April 2016)

Equally, the failure of the previous expansion proposal at Heathrow Airport appears to have led to an unexpected degree of collaboration between the airport and one of it's main opponents:

> I think that airports themselves, certainly Heathrow, have had to dramatically change their attitude towards local communities and local community campaigners […] I think that there was a period a few years ago, when the last Government has said 'no' to a third runway at Heathrow, and everyone was a bit shocked by it, 'don't get it, this has come from the Conservative party based on, what?' Everyone assumed that all businesses felt this was essential, yet you had David Cameron in opposition making statements that, 'Really, what was the value of a hub airport to the UK beyond the coffee that people buy in the airport lounge?', and I think they were taken aback by it, and Heathrow kind of laid low for a little while, and perhaps it was during that period that they thought, 'We're never going to get anywhere with this until we do something very significantly different in terms of engagement with the local community', and because the runway was off the agenda, perhaps that cleared the way a little bit for some of the long-standing noise concerns to be discussed and considered. So they said, 'look, we recognise that noise is an issue, we're not going to tell you that this is something that you should learn to live with, but we really want to have a constructive conversation about what is it that you think we as a responsible airport should be doing, so for example, they began some trials that were agreed with some of the local groups. […] Then, you started to see these kind of joint initiatives between the airport and HACAN, and one was quite recently that they issued a paper jointly, calling for the creating of an independent noise authority, and it's one of those things that would have looked unequivocally like the right thing for a community group to be doing at any other time than in the few months before there's going to be a consultation on a big, new runway, to which HACAN is still officially opposed. It's interesting, the politics of that dynamic and how it's changed over time. (campaign group representative, personal communication, 4 May 2017)

Cautious optimism is of course not shared universally. Responding to the same question, an anti-expansion Heathrow campaign group member contends that:

> With Plane Stupid over at Heathrow, you have these campaign groups that see what's happening to residents, and see that residents have really been removed from the

> planning process, not just in aviation, in most things, consultations now are just a box-ticking exercise, the public have been removed. By the time it's got to consultation, they know it's happening, and they know what way it's going to go, there's very little that a consultation's going to change, and, really, the only option to residents is to judicially review the consultation, which takes tens of thousands of pounds, so unless you're in a reasonably wealthy area, or have reasonable backers, that's not going to happen. So I can understand where you have groups like Plane Stupid or Transition Heathrow, or Climate Watch, all these groups going out and having to take action against businesses because they know residents have been removed from the process, and the only way that residents will get media attention or in the newspapers or have their issues heard in the public domain is if that was the story behind it, and unfortunately nowadays, the story needs to be a headline-grabber. 'Mr Smith down at number 23 complaining about noise from aircraft' is not going to make the news, whereas 'Mr Smith is chained to Heathrow's runway' will. There's a perception that somebody's going to take notice of that, unfortunately. It should not be like that but that's the way it's gone. (campaign group representative, personal communication, 4 May 2017)

An opponent of airport expansion in London insightfully referred to this as the "wilderness" of the unknown, full implication of flight path concentration in combination with increases in the total number of flights from an expanded airport:

> People don't understand the impacts until it's actually arrived at [full capacity]. People won't know what's actually coming, and by that stage it's too late, so they'll be complaining about noise, wondering what's happened, but the decision had been made five years previously. So, it's this wilderness of the reality of what [the airport has proposed], and what actually happens in the meantime, that the ordinary person on the street doesn't understand. (Heathrow campaign group representative, personal communication, 25 July 2016)

6.5 Chapter summary

Whereas opponents to the expansion of Gatwick Airport argue that the Home Counties are an inappropriate place for increased airspace activity, the interface between Heathrow and its surrounding communities and built environment reveals a similarly fraught relationship, but a greater degree of acceptance of the existing, 'legacy' uses of airspace here. There is a vague,

tenuous social contract with Heathrow Airport and its presence in West London, that is undermined by various forms of intensification and expansion besides the both proposals for a third runway, such as new terminals, night flights, informal airspace changes. However, the gradual "population encroachment", in the terminology of the aviation industry, suggests a degree of acceptance for Heathrow as an existing, 'grandfathered' use of space in West London. Inevitably, the threat of both third runways proposals and other more gradual forms of expansion exacerbate this tenuous relationship.

There has been a degree of resignation around Heathrow and its imperfect location that has been undermined by the decades-long push for its expansion, while further out in the South East the proposed expansion of Gatwick and its recent airspace trials and changes have proven to ignite an effective groundswell of opposition not only to the expansion of the West Sussex airport, but to the broader process of airspace modernisation as well. In the meantime, Government acknowledges that people have become more 'sensitive' to aircraft noise pollution, and has even conceded that its own approach up until 2017 has 'failed' to mitigate aircraft noise pollution, as the next chapter will explore. An honest conversation about the conservation, protection and preservation of the character of the Green Belt and development in the Home Counties may be overdue.

Chapter 7

The South East and Gatwick Airport: The urban-airport interface on the edge of the urban region

7.1 Profile

Gatwick Airport's recent airspace trials and changes highlight the issue of relative aircraft noise pollution around London's Second Airport, and *how* it is managed in an area that has been protected from London through Town and Country planning. The absence of noise associated with urban centres is the most significant contributing factor to the volatility of the urban-airport interface in this context. While Heathrow Airport has firmly established itself as the dominant and largest airport (its original name was simply "London Airport"), Gatwick, like the other four airports in the London system, has carved out a niche, instead finding success as a connection to holiday destinations, and later with the arrival of low-cost airlines such as Easyjet. Located in West Sussex County approximately one hour south of Central London by train (see Figure 8), the airport opened in 1953 and currently serves 43 million passengers per year travelling to 228 destinations in 74 countries (Gatwick Airport Ltd., 2017). Whereas Heathrow is the basing point for British Airways' hub-and-spoke network and that of other airlines and alliances, Gatwick Airport exemplifies the point-to-point airport model, which was encouraged by the liberalisation of air travel in the early 1990s.

The Airports Commissions 2013 Interim Report short-listed options to either build a third runway at Heathrow Airport or to double the length of the northern existing runway, and/or to build a second runway at Gatwick Airport. This report acknowledges that it is quite possible that national airlines may gradually move away from hub-and-spoke business models and instead focus on the point-to-point services that have proven lucrative with the low cost carriers. The report also states that the introduction and success of mid-size, fuel-efficient and long-distance aircraft such as the Boeing 787 Dreamliner and the Airbus A350, (which are known as 'hub-busters') may reduce the need for a hub altogether, as airlines can fly directly to popular destinations without any need to route to contain a critical mass of

passengers indirectly into its hub, in order to develop a viable route needed to fill the much larger Boeing 747s or the Airbus A380s.

In the meantime, Gatwick Airport has two terminals, but operates at an average of 85% of its potential capacity due to its single runway. At peak times such as in the summer, the airport is already effectively 'full', as it is constrained by runway capacity (Airports Commission, 2013). Whereas Heathrow practices "runway alternation" (using one runway for landings, the other for take-offs, then switching each runway at 15:00) in dominant winds in order to provide a degree of respite, Gatwick inevitably needs to concentrate all of its movements onto one runway, which makes alternation impossible and provide less potential options for providing respite. The Gatwick Area Conservation Campaign (GACC) responded to the Government's 2017 airspace modernisation reform proposals by announcing that they are "delighted that the consultation paper suggests that the Government policy of promoting concentrated flight paths is to be amended to permit multiple routes", as "over the past four years the introduction of concentrated flight paths based on satellite navigation has caused great distress around Gatwick", adding that moving forward "the CAA should make approval of any new flight path conditional upon the sponsor agreeing to pay full compensation, as assessed by ICCAN, on the basis of the Land Compensation Act (GACC, 2017).

7.2 Areas of conflict

If Heathrow provides an extreme case study of attempting to integrate an aircraft into an urban area that generally surrounds it, Gatwick, as the world's busiest single-runway airport (Gatwick, 2017), likewise presents an extreme case study of attempting to integrate an airport with a rural and ex-urban environment and,

> like Heathrow, Gatwick was far from optimally sited. True, it was on the flat lands of the Sussex Weald, and it had a good direct train service to Victoria [in Central London]. But it was too close to built-up areas, and as early as 1947 the government had determined to build a new town at nearby Crawley. Additionally, the land to the north and west, especially around Leith Hill, was, and is, a traditional pleasure-ground for Londoners. (Hall, 1980, p. 19)

On the ground, Gatwick, not unlike the development of other forms of property in the Green Belt, has been surrounded by distinct constraints that have shaped its relationship with the South East. In 1979 the airport entered into the 'Gatwick Agreement' with West Sussex

County Council, which prevented expansion beyond a single runway until 2019 (Airports Commission, 2013, p. 76). Commenting on the incremental approach which the UK has taken with regard to airports:

> If we worked in a world where actually we were creating new airports in new areas, then it would be perfectly possible to integrate the airport into an area where you haven't really got any infrastructure to fit in with. Gatwick initially was a military airfield in the Second World War, or an aerodrome. It was never intended, never expected to be the major international airport that it is today, so because of that evolution over time, the surface access infrastructure, the infrastructure that exists around the airport, reflects the fact that it was never built for that purpose. Crawley wasn't purpose built to fit with the airport as it currently sits today, and to deal with the volume of passengers that they're dealing with today, so those incremental changes to the airport are exactly what happened with the transport network. (West Sussex County Council representative, interview, 4 August 2016)

This incrementalist approach has exacerbated the airport's relationship to its local surroundings:

> The area just to the south of Gatwick itself is predominantly an area for industrial employment development, so you'll see those areas are supposed identified or allocated for non-residential development generally, because residential development isn't a particularly compatible land use with an airport. And lots of the challenges around planning in a place like Crawley are around the encroachment, I suppose, of residential development into areas that are close to the airport. […] People living in West Sussex wouldn't consider it to be urban or suburban unless you were talking about somebody who perhaps associates themselves with one of the towns, who would describe the town as an urban area, but the county as a whole is rural, and whilst Gatwick is associated with London it is definitely outside of London, quite some distance really, and it is located adjacent to an urban area, Crawley, but it's surrounded predominately by rural area with a very dispersed pattern of development, relatively small settlements. We're talking about villages and hamlets really, where noise from the airport can be very intrusive. [West Sussex is] different from an area like West London, where people are living in very much a city but dealing with the same sort of noise issues such as at Heathrow. (West Sussex County Council representative, interview, 4 August 2016)

Whereas Heathrow Airport is located as it is almost entirely in the formal boundaries Greater London Area, Gatwick Airport is not in London, but in West Sussex, and clearly separated from the Greater London Area's boundaries by the Counties of Surrey and Kent and the Green Belt. CAGNE (Communities Against Gatwick Noise Emissions) connects airport expansion to the "urbanisation of Kent, Surrey and Sussex" (2017, p. 3). As in the 1940s, the CPRE continues to contribute to the discourse on land use outside of the UK's large cities.

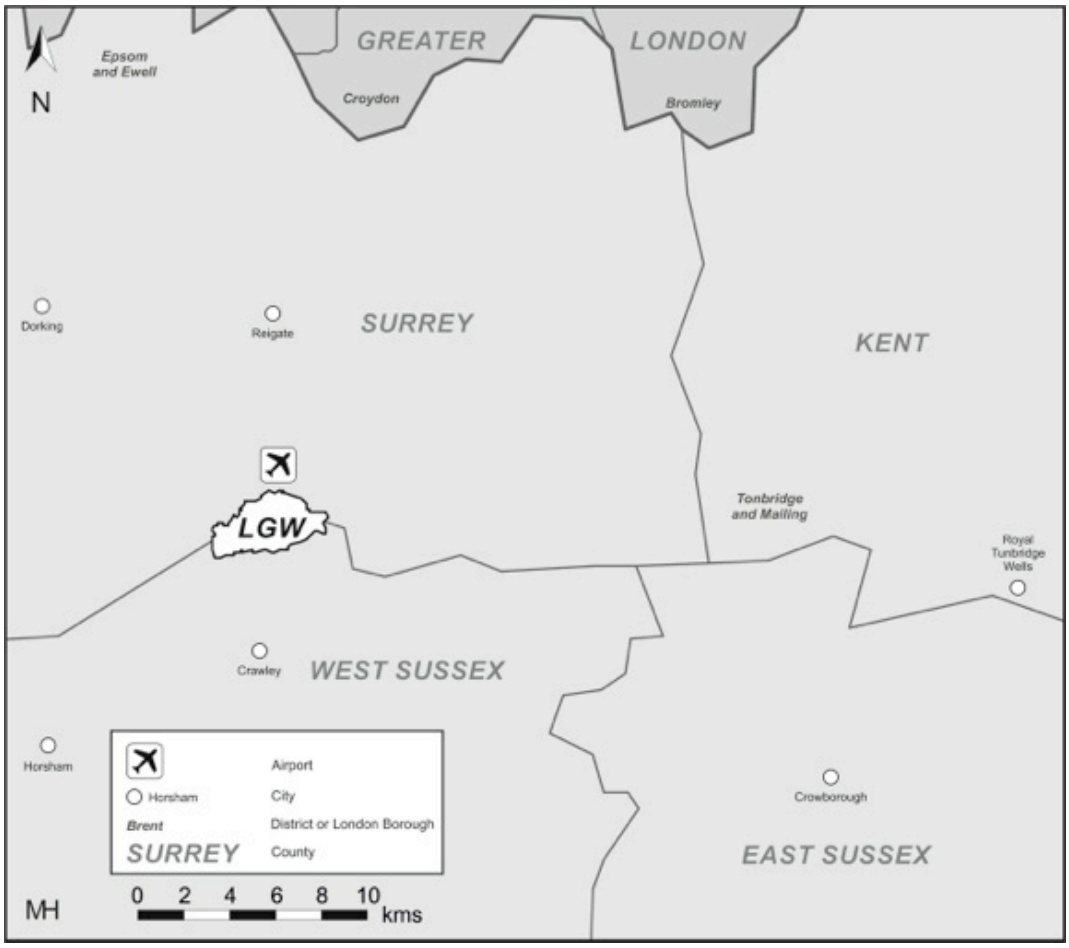

Figure 8: London Gatwick Airport and surrounding political boundaries. Map by Malte Helfer.

In response to the founding of the perceived threat of the airport expansion proposals that were being seriously considered in 2013, the CPRE highlight the value of rural tranquillity:

> For those who appreciate the English countryside, the choice of a "constellation" of large airports around London or a super-hub is no choice at all. Your proposed measure of airport efficiency – the number of households disturbed per flight – fails

> to value rural tranquillity, an increasingly scarce joy in an ever more crowded island. […] for longer distance travel, including aviation, the invisible hand of the market still seems to reign. […] No new runway capacity is needed for the foreseeable future. (CPRE, 2013, p. 19)

Like Heathrow Airport, the West Sussex airport's current action plan offers a multi-pronged approach to tackling its biggest local externality. Gatwick Airport's "Noise Action Plan 2013-2018" outlines the following strategies:

> 1. Reducing noise impacts wherever practicable. This includes:
>
> a. Quietest fleet practicable
>
> b. Quietest practicable aircraft operations, balanced against NOX and CO2 emissions
>
> c. Effective and credible noise mitigation schemes
>
> 2. Engaging with communities affected by noise impacts to better understand their concerns and priorities, reflecting them as far as possible in airport noise strategies and communication plans
>
> 3. Influencing planning policy to minimise the number of noise sensitive properties around our airport
>
> 4. Organising ourselves to continue to manage noise efficiently and effectively
>
> 5. Continuing to build our understanding of aircraft noise to further inform our priorities, strategies and targets
>
> (Gatwick Airport Ltd., 2013, pp. 7-8)

As argued by a local Tom Tugendhat, MP for Tonbridge and Malling in Kent, aircraft noise remains particularly difficult to ignore in otherwise quiet, predominantly rural environments, despite the technological improvements to aircraft flying into and out of Gatwick: "The improvement in the quality of aircraft is noticeable, but that is not enough on its own. The change from a rural idyll to an aerial motorway in a few moments can be particularly stark, and never more so than at night" (2016, p. 2). For example, one local campaign group, CAGNE (Communities Against Gatwick Noise Emissions) describes airport expansion as the "urbanisation of West Sussex" and the threat of the "devaluation of vast swathes of areas that are currently buoyant, successful, and nice places to live" (2015). In public consultations for the Gatwick proposal, residents often emphasized the conflict between the rural character of the noise effects of flight paths there, too: "rural areas are priced on tranquillity and the surrounding beauty and its countryside. […] This is not London, nor do we want it to be"

(Airports Commission, 2014b, p. 24). The previous quote suggests how the countryside, or the idea of being outside of the urban realm (as opposed to within its functional urban area or commutershed) is socially constructed, and reinforced by spatial planning. In contrast to the North American archetype of suburban sprawl, the rigid protection of the Green Belt around London has selectively protected the South East from certain forms to development.

With respect to noise pollution, this legacy of protection has made the South East a place where one would expect noise pollution to feel particularly intrusive. However, an often locally unpopular reality is that although South East is not always perceived as part of 'the London area', the commuter towns within this space arguably, in practice very much part of London's functional area and urban region. A local expert develops this idea further:

> Certainly when you're outside of London, you have a particularly strong, rural, conservationist, preservationist agenda, so it's certainly pretty difficult to build in the English countryside [where there is sense of] entitlement to be insulated from change, pretty strongly, once you're living in a Surrey commuter village. A large part of the County is Green Belt, and given that the Green Belt has been very strongly defended, unusually strongly actually in UK planning policy… We don't have zoning, we have 'material considerations', which are just a whole heap of factors you take into account including policy but other things as well as to whether a development would be appropriate, but although the Green Belt is just one of a number of material considerations, it's one that's given great weight, and so if you lived in an area with lots of Green Belt, given the history of the weight given to Green Belt policy since it was initiated you feel relatively secure that the Green Belt wasn't about to be seriously challenged. There's an irony at Heathrow that if you extend the runways, one of the reasons there's space to extend the runways is because you'd extend them into Green Belt, and one of the few times [the Green Belt] does get challenged or overridden is for national infrastructure, so a new high-speed link to the north of England, High Speed 2, would go through Green Belt. (Personal communication, 11 October 2016)

This comment seems to confirm the contrast in trajectories in the South East, between the continued protection of natural spaces and the continued extension of infrastructure associated with the urban into and above these same areas, which are described as a choice between;

> ...a very strong policy of protecting the Green Belt and the fact that it's often big scale infrastructure that overrides Green Belt. It's one of the few things that successfully

> overrides Green Belt to any significant extent… We have a very rural, preservationist agenda [that has resisted urban sprawl]. An important part of the story in terms of Gatwick is this history of really seeing ourselves primarily as a rural country, even though we urbanised quite early on, so we give this great weight to rurality, so therefore those kind of, let's say they're ex-urbs, still tend to be relatively compact and relatively dense compared to those that you might see elsewhere because of the difficulty of them expanding out, because of constraints on land use on the surrounding area. (Personal communication, 11 October 2016)

Regarding ambient noise and population density, the Gatwick Obviously PR campaign featured images of empty, rolling hills with only scattered trees and houses, juxtaposed to the a depiction of a dense city to represent London:

> It's obviously a good political argument, 'keep the noise where it's already noisy', even though it's a very generic explanation… It's whether your description of your location is accurate, and a resident's description might be very different from a geographer's description, so most residents are not thinking in a neo-Lefebvrian sense of urbanity, are they? It's like, 'I live in a village, I live in suburbia, I live in the city centre', so it's that difference between how they're conceived, but beyond that, even if a resident was thinking in a neo-Lefebvrian sense, a resident would still have an interest in framing their area in a different way, as particularly small, or rural, or quiet, or suburban, and have limited recourses to take refugees, etcetera, because there's clearly a political interest in a sense, of having a sort of hyper-definition of their area, a very closed definition of their area, so it's a sort of political tactic, it makes sense. I suppose your interest is the way that places are depicted, again this goes back to Lefebvre again, whether we're thinking about spaces depicted by planners, and local authorities, or whether we're thinking about lived spaces on the parts of residents, and how suburban, ex-urban, urbanisation feeds into those different conceptualization of how space and place are described. They live a parallel life in practice. (local expert, 11 October 2016)

In a recent documentary on the airspace of the South East that aired on the BBC, *Skies Above Britain: London Skies,* Martin Barraud of Gatwick Obviously Not led a large protest, telling the crowd through the megaphone, "the aviation industry thinks it's their sky. I think it's our sky. Who's sky do you think it is?" he asks the crowd, who chants in reply '"our sky!". Barraud then explains to the gathered protesters, "I have not given up a year of my life for nothing. And we will stop at nothing to bring back that tranquillity" (Whitehead, 2016).

Campaign groups link the aircraft concentration-versus-respite quagmire to a deeper challenge of national priorities arranged in space. As it was explained to me, there may be a blindspot with regards to whether noise is appreciated, versus it being understood:

> I'd say [noise is] the main issue that isn't appreciated, it's fully understood, but the first time we went to see the DfT, we got in there, and we saw a pretty important person, she wasn't a minister, she was one-down from a minister, she walks into the room, and you can quote me on this, and she said, "okay, you lot…", there we were [and explains the Department's dilemma], "I've got this block of noise, what do you want me to do with it?". So she was throwing it back at us, and, you know, quite right, we're not going to close Gatwick or Heathrow, aeroplanes are going to keep coming, what do we do with the noise? Jump right to the end: our philosophy is that you spread the pain, that's what we're trying to achieve now with everything we're doing. Government policy was to concentrate, in the UK, and it so happened that technology suited that, because moving from ground-based guidance to satellite-based guidance, you get much better control and you get more planes in, hence the airlines and the airports love it, and we're saying, 'no, hang on a minute, spread them out'. That's everything we're after. […] Around Gatwick there are three conservation areas called AONBs, and they're not supposed to fly below 7,000 feet - if they can help it - now obviously they've got to land the planes, so they're going to have to… it's a complete muddle, really. We have to decide as a nation, do we want to add commerce, or do we want to protect our tranquillity? There is no solution, apart from closing Gatwick or Heathrow, and that's not a solution. It's very difficult. (Gatwick campaign group representative, personal communication, 5 July 2016)

Along with a first-hand account of conscious and sub-conscious effects of aircraft noise, the following quote highlights the dissonance between the between noise and sound framed along urban-rural lines:

> The other thing that is a factor is not just the lack of ambient noise, but your ears are tuned to things like birdsong, when you're in a countryside-type environment, suburbia within a town, you're listening for things like bees, you're listening for things like birds, and then you hear jet engines. [At night] it's not only that you're woken up, but your sleep pattern is actually affected by aeroplane noise even when you're not aware of being woken up. They found that, with various health studies. In cities you're tuned into racket, here pleasant things like bees, children, etc., and then you get

> this interruption, this grossly discordant sense of intrusion. (Gatwick campaign group representative, personal communication, 5 August 2016)

A fellow member from the same campaign group elaborates on this theme: "There's a sense that within a city, aircraft noise is in a sense appropriate to the setting… utterly inappropriate to places like this, town and countryside around here" (Gatwick campaign group representative, personal communication, 5 August 2016). The Green Belt is viewed as an escape from the city for residents and visitors alike:

> Visit places like Hever, Penshurt, all of the people from London to go walking in the downs, in these AONBs just outside of places like Tunbridge Wells and Gatwick, and they go there for recreation really, and they go there for quiet, and natural sounds.
>
> [Visitors to the Green Belt] don't go there to experience an aeroplane overhead, they go there for a rural experience, which I think is a kind of human right in a way. South Londoners, come out to these areas for walking, and just general peace and quiet, I think it's human need actually, to experience rural sound. I think we were, if you like, developed in a natural setting, originally, and I think we do need doses of natural environment rather than urban environment. People have always travelled out of the towns to go and relax That resource is in the process of being destroyed, particularly by aeroplanes of course and motorways, but aeroplanes have more capacity to destroy [because] it's a bit of a free-for all up there. (Gatwick campaign group representative, personal communication, 5 August 2016)

The idea that the Green Belt provides respite from the stress of the urban is developed by the Campaign to Protect Rural England:

> Everyone should be able to access space where they can 'get away from it all', away from the noise and bustle of modern life. It is therefore important that areas of tranquillity are protected from aviation noise, whether in large parks or accessible natural green space in or near urban areas, or more generally in the countryside. It highlights the need to strengthen the performance of our visitor economy in the areas where it is relatively weak, in order to maintain the international competitiveness of the UK as a destination. It is therefore critical that our protected landscapes and wider areas of tranquillity are protected from intrusion by aviation. (2011, p. 7)

The following exchange in Parliament between Conservative MP Jeremy Quin, who represents Horsham, adjacent to Gatwick Airport, and Labour MP Andy Slaughter, who represents Hammersmith, in West London, exemplifies the urban versus non-urban arguments on an appropriate location for aircraft noise;

> Quin: I hope the hon. Gentleman accepts that the impact of ambient noise has a profound impact on one's experience of aircraft noise.
>
> Slaughter: It does, but I took slight umbrage at the point that was made in an earlier contribution about those living in rural areas suffering more because they have a quieter environment. Urban areas that are not affected by aircraft noise at the moment, but will be affected for the first time, will also suffer greatly, particularly outside peak hours in the early morning and later at night. Some urban areas, including parts of my constituency, are extremely quiet and will be affected by noise for the first time. (Westminster Hall, 2016, p. 6)

7.3 The Arrivals Review

According to Gatwick Obviously Not, a campaign group founded to counter the expansion campaign of Gatwick Airport, 'Gatwick Obviously', what became known as the Arrivals Review was a concession to the growing coalition of opposition to expansion in the South East. From Gatwick Obviously Not's perspective, the independent review was the result of "pressure from us to Sir John Major, who Chairs the Advisory Board to GIP [Global Infrastructure Partners], the owners of Gatwick, the Chairman of Gatwick (Sir Roy McNulty) then wrote to us offering a full Review of arrivals into the airport" (2016).

> […] They offered us the Arrivals Review. […] It was a way of getting us off their back. So in a way, yes they have been more conciliatory, they have offered us the Review, the Review is, basically: return the airspace to what it was. So yes, I can say they have been more conciliatory, but there's a reason. They're not doing it because they like us, they're doing to it because they want us off their backs. They don't care about us at all. We know that. It's business. (Gatwick campaign group representative, personal communication, 5 July 2016)

Sir Roy McNulty, Gatwick Airport chairman, argues that:

> "The review has proved to be a very constructive process and I am very pleased both by the positive nature of its recommendations and by the positive reception it has received. […] When implemented, these will reverse the changes of 2013 which have severely damaged the lives and livelihoods of so many in Tonbridge, Edenbridge and surrounding villages. Of particular importance is the widening of the flight path, and I

> am delighted that Gatwick are minded to accept this recommendation provided that National Air Traffic Service (NATS) can implement it (Kent News & Sport, 2017).

Regarding the measurement of aircraft noise pollution using the standard 57 dB Leq contours (see Figures 14 and 15), the consultants stated that "many local communities, especially those in rural areas, believe that current noise metrics, including the use of average noise contours, do not fully reflect their particular experience of aircraft noise". Ultimately, the Review, too, came to the conclusion is that the Government's lack of limit-based noise restrictions and other policy holes at the time were a contributing factor to the Gatwick's noise conflicts. Its Final Report recommended, "airspace planners will be expected to ensure a fair and equitable dispersal to deliver respite to residents and, to minimise the effect of any concentration. The policy caveat here is that this should not lead to significant numbers of people *newly* affected by noise, a trade off which seems to be intractable. The Report found that the term 'significant numbers' is highly subjective and hence open to widely varying interpretations" (2016, p. 53):

> The trouble is, now you've got an arrival swathe out here, so all the people who live there are going, hold on a second, why are we now being overflown? Where's the airspace change? It's not an airspace change. It's just a change in controllers manoeuvring practices. The whole airspace is designated for them to do what they want to do to get the aircraft down safely; all they decided is to do it there. [Some residents argue] 'Well that should be an airspace change'. No, because an airspace change is something we have to approve, we haven't got a legal right to approve or to dis-approve them from doing that. That's part of their licence, their job to do that safely and efficiently. If they decide if that's what they've got to do in that particular area that's designated for their use, that's what they do. That might, in future years, fall under the tag of an airspace change, they may change things so that we have to approve such things and do consultation on that kind of stuff. [In the meantime, to residents] 'It seems like something's changed'. Well, actually, there's been no formal change. It's the way the airspace has evolved, because traffic levels have gone up. (CAA representative, personal communication, 4 May 2016)

Drawing some parallels to the Airports Commission, the independent Arrivals Review consulted with stakeholders on issues of contention specifically regarding arriving aircraft and suggested a number of measures through which the airport could improve its relationship with its surrounding communities. Not unlike the form of the Airports Commission's

eventual recommendation, the consultants published a well-publicised Final Report, which concludes that;

> the complex structure of air transport policy, regulation, operation and oversight creates a naturally fragmented environment within which misunderstandings and even organisational conflict can develop. This situation can be exacerbated when the institutions and residents involved find themselves in an adversarial position, which on the basis of the findings of the review, appears to have been the case on occasion for Gatwick arrivals. (2016, p. 6)

It has seems to be that other unrelated obligations from the government, for example to increase housing stock or to identify land for a new school or hospital, mean that effective use of Land Use Planning tools in this context is extremely difficult to achieve. The report therefore includes the following recommendations intended to improve the effectiveness of such policies:

> That planning authorities for communities impacted by aircraft noise from Gatwick, coordinate to conduct their own joint review of the application of land use policy in context of Gatwick aircraft noise, with the objective of identifying steps that will enable the increase of its effective use and the improvement of the aircraft noise awareness for existing and potential land users. That Gatwick develop, publish and maintain with annual updates an information booklet intended for planning authorities, home buyers, estate agents and conveyancing solicitors, to provide reference information on flight routes, terminology and other aspects of the airport operation relevant to communities. [And pursue a] holistic approach to planning and land management would see attempts to limit aviation noise at source and adapted operational procedures combined with a strategy to over time reduce the number of people living in areas where noise mitigation will always be challenging. If this were implemented by Government and strictly controlled, first through the National Planning Framework, and then adopted by local authorities, there is the potential over time to significantly reduce the population affected by annoying levels of noise at many airports. (2016, pp. 9-10)

The Arrivals Review addressed the quandary of the concentration of aircraft flows (the current practice of airspace management) rather than equitable dispersal and distribution of such flows. For example, the Final Report juxtaposed two positions on concentration and tactical vectoring with the following two quotes, the first from a representative of Penshurst

Parish Council (located rather close to Gatwick), and the second from the Tunbridge Wells Anti-Aircraft Noise Group, a campaign group representing Royal Tunbridge Wells, a large, affluent town in Kent that has been effected by the recent extension of the joining point to Gatwick:

> It appears that as far as arrivals are concerned Gatwick Airport Limited is intent on changing the current tactically vectored flight paths across a broad swathe to a single flight path (depending on wind direction) from a new so called Point Merge and suggesting this could be supported by a respite flight path. As there are no indications as to where these would be we cannot support this concept. It would be grossly unfair on those whose lives would be devastated with a continuous stream of overhead flights from a Point Merge when they previously had substantial relief from the tactically vectored flight paths across a broad swathe. The current system is a proven, safe and a fairer distribution of incoming flights.
>
> […]
>
> We continue to ask for an exclusion zone over Tunbridge Wells... The Tunbridge Wells Community represented by TWAANG does **not** request maximum equitable dispersal rather than a concentration of flight paths [emphasis in original]." (Redeborne & Lake, 2016, p. 49)

The second quote addresses the understandable concern that flight paths should avoid large communities based on population size. This is, after all, one of the main rationales behind new airspace management and navigation technologies. A similar argument is also made for the implementation of exclusion zones over Areas of Outstanding Natural Beauty.

Nevertheless, the Review ultimately found that such proposals to "establish exclusions zones around individual towns and villages […] have not been selected as deliverable options" (2016, p. 53). In the consultant's judgement there "is no rational and fair basis on which to select one community for exclusion over another" (p. 53). In terms of vectoring, the Review found that;

> …residents reported to the review that they have asked both GAL and NATS to reverse the change of vectoring methodology, which led to a chain of events that ultimately resulted in an application for a Judicial Review. These requests for a restoration of the pre-2013 situation were also widely made to the review team. The Arrivals Review has carefully considered the factors driving the original change and the options now available. This has confirmed that increasing the size of the arrival

> swathe, by locating closer to the airport the minimum distance from touch down for an arriving aircraft to be established on final approach, can be expected to deliver significant overall noise improvements for those currently most effected on the ground and should enable a fairer and more equitable dispersal. (2016, p. 50)

Regarding concentration, the Review advocates "a balanced mix of concentration and dispersal", which they anticipate will be "most likely to deliver a meaningful, fair and equitable distribution of noise, and will provide an opportunity for respite" in practice (p. 50). In response, Gatwick eventually conceded that "more work" will be required for the airport to "identify feasible steps toward 'fair and equitable dispersal' of aircraft in the near-term, ahead of new technology making dispersal more predictable and consistent post 2022" (p. 50). Ultimately, the key conclusion of the Arrivals Review can be found in the following statement, which speaks to the adversarial relationship of the urban-airport interface here, which makes it difficult for the objective observer "to envision a situation where any community faced with the prospect of a concentration of all arriving flights, with no procedures for fair and equitable dispersal of noise, and no defined respite periods, would do anything other than protest in the strongest terms" (p. 53).

7.4 Interscalar integration and negotiation

> Basically there's a big issue with trust, trust in the aviation industry, people are saying we need an independent specialist body to make decisions on airspace change, that's us, but they don't believe that we are independent, which is why we're currently consulting on a new airspace change process. It's a lot more involved, a lot more open and transparent but a lot longer. […] A recent change to the joining point for aircraft approaching Gatwick from the east has created concerns for some residents [in Tunbridge Wells]. That change affected the point at which aircraft join the instrument landing system that leads down to the runway. Although that will have meant that some people have experienced fewer aircraft, for others it will have led to an increase in noise as a result of a narrower and more concentrated swathe on the final approach. As he will be aware, the Government believe that it is usually better to concentrate aircraft over as few routes as possible in order to minimise the number of people affected. That has been Government policy for many years and works well for many airports across the country. (CAA representative, personal communication, 4 May 2016)

GACC was founded back in 1968, and in the twenty-first century has taken a stance against this form of airspace modernisation. In response to NATS' plans for airspace concentration, argues that spatial distribution of aircraft flows comprises "a totally unfair system instead of people having one or two planes in a day, the poor people under the new route get all 60… To be under low flying planes on a constant stream in unbearable, you can't live beneath. Whoever thought this idea had only one agenda, to get more planes in the skies as possible to profit the airports and airlines. It is not for the benefit of the people with constant stink of jet fuel, emissions, health risks and noise, noise, noise, every minute with no respite!" (Jopson, 2014). Negotiating airspace remains,

> A really difficult dilemma, and it brings you up against the NIMBY issue, [the perception that you are simply moving] the problem over another victims really. But there is an issue with PBN: are flight paths going to be dispersed? Because the other pressure groups, what they want is not for PBN to be used for concentration per se, but to use them dispersal, so that you get multiple paths, with multiple respite, rather than just 1 or 2 concentrated paths, avoiding [densely populated areas]. That is the subject of great debate, there's no doubt about it, concentration will be a hugely and totally negative experience, and I would argue that people who are significantly affected by concentration should all be very adequately compensated, just as when you have a land-based motorway, because it's the same effect, well it's worse, even. But there's no compensation worth talking about for aircraft noise. (Gatwick campaign group representative, personal communication, 5 August 2016)

From the perspective of GACC, "that is the problem with all flight path issues – they tend to set one community against another. Because GACC represents the whole area around the airport, we have never taken sides in arguments about moving flight paths from A to B. We have, however, supported the principle of dispersal (where aircraft are spread across the sky) or respite (where different routes are used on different days) – but not over areas previously unaffected by aircraft noise" (GACC, 2017, p. 1).

One spatial strategy that has been proposed as a result of the introduction of PBN at Gatwick is to retain the existing NPRs, but to use satellite-enabled technology to disperse aircraft within these three-kilometre-wide swathes (Plane Wrong, 2014, p. 4). Respite remains a controversial mitigation measure, as stated by the following Gatwick campaign group member:

> We don't like the word respite, because respite accepts that there is a main route. We don't accept that there is a main route, and also, we think every airport and every side of every airport should have their own rules according to what the community wants, because if you take an airport that, say, has no villages on one side, why not have it narrow? Or, say, it's on the coast, and you have them coming in a straight over the sea? No problem about that - makes sense, but if you're coming over an average populated area, like England, the South East, busy, busy place, if you do that, if you have a main route, we call it a noise ghetto, and it is. That's a term I coined, and it's slowly getting out there. We're trying to get it out into the lexicon of the language, and we think that it should be dispersed; we talk about fair and equitable dispersal, that's our copy line. We're trying to define that now, which is quite complicated, but that is our driving mantra, that it should be fair and equal, not a single route with maybe one respite route. We haven't won that argument, but it's being discussed, it was discussed in Parliament. (Gatwick campaign group representative, personal communication, 5 July 2016)

Around Gatwick, too, the established NPRs and conventional navigation practices once provided a greater degree of certainty and acceptance of the airport's presence, as argued in the following two quotes:

> The deal between the airport and the local population is critical here, the local population basically know that they live near an airport, so they're not surprised to see the occasional aircraft in the sky, some of them bought their houses knowing that they lived under flight paths, but the way that the flight paths were operated were much more dispersed, because they used the old navigation system, and planes flew differently, pilots flew differently, it was much less precise, it gave a kind of natural dispersal, which meant that nobody was too badly effected, so that was tolerated. (Gatwick campaign group representative, personal communication, 4 April 2016)

> Many of our members would dearly love to see a return to the random distribution of flight paths as pertained before the introduction of satellite navigation, but we recognise that satellite navigation is here to stay. Multiple PBN routes should ideally be used to create dispersal. If used to provide respite, this should be based on a daily schedule – for example, route 1 on Mondays, route 2 on Tuesdays, and route 3 on Wednesdays – with the schedule published well in advance so that people can organise their lives to avoid the noisy days. (GACC, 2017, p. 3)

Tugendhat seemed to respond to the Arrivals Review and Gatwick Airport's general cooperation with its recommendations with a sense of relief: "I am pleased that Gatwick has listened to the community's views on the airports Arrivals Review and has accepted each of the recommendations". The MP sees the Airport's acceptance of the Arrivals Review's recommendations as a victory, which will "reverse the changes of 2013 which have severely damaged the lives and livelihoods of so many in Tonbridge, Edenbridge and surrounding villages" (Kent News & Sport, 2016). The implementation of these recommendations also shows how local pressure groups such as Gatwick Obviously Not influence the shape and direction of transport flows, and ultimately co-constitute this space, too.

Responding to a question concerning if the airports have become receptive to re-thinking it's policies regarding aircraft noise pollution, and if there are any issues on which campaign groups and/or environmental NGOs have been able to get achieve traction, opponents to expansion contend that;

> There's a huge diversity in terms of the extent to which the airport engages with local people or not, but certainly at some of this bigger airports they're getting better at it. I think Gatwick's made some really bad errors in the context of all this airport change stuff, I think everyone acknowledges, I've heard the CAA acknowledge publicly, 'Gatwick's made some bad mistakes', and in some cases actually misinformed members of the public about what was going on, partly because they were doing several different trials at the same time of different things, but they're certainly getting much more switched on about this issue and they've set up this noise management board, and yes its controversial and all the groups are arguing with each other, there has been at least progress on the issue of engagement, I think some of the airports at least recognise the issue to engage. (campaign group representative, personal communication, 4 May 2017)
>
> *In your engagement with Gatwick Airport, do you have fine that they have become any more receptive to your complaints?*
>
> Right, so, yes, but they want the second runway. So this is where we do affect the second runway, I said we couldn't effect it [but then the noise complaints they had received] went from 3,000 to 25,000 in one year, through our campaign and through various campaigns, because there was a problem. I can't make you complain. People did it because they wanted to complain. That did not look good for their second runway application, so they've done everything possible to ameliorate us, to make us

> go away and quiet us down, to help them get the second runway, so in that way we do affect it. (Gatwick campaign group representative, personal communication, 5 July 2016)

Assumptions about the separation between city and suburb are thus fundamental to such an understanding of the appropriate place and use of transportation infrastructure [and] highlighting the "extent to which urban and suburban places are constructed through flows" (Cidell, 2015, p. 147). It is suggested that this spatial conflicts has been exacerbated by conflicts between rather structured and predictable spatial planning, and the scale of the proposed changes, creating,

> a tension almost between very market-led governance [and] London as a world city, that kind of neo-liberal agenda for governance, very market-led governance, city marketing in London needing to compete. […] There's something interesting when this neo-liberal, free market agenda comes up against what suburbia is, or thinks it is, or the interests of suburban residents. There's that contradiction between the suburb as the product of markets, but wants to limit the market as well, so the need to stop the market having an entirely free hand to change the suburbs (local expert, personal communication, 11 October 2016).
>
> Whether it's politicians, and they're intensely aware of their voting public, and their voting public is also self-delusionary about, you know, 'I live in a lovely, beautiful market town'. No, you don't. There's two streets in this town which are not going to be demolished, which are a market town, but you live in a pretty ordinary, suburban extension with no services, doesn't look much like a market town [while through rhetoric residents may be] mythologizing the places they live in" (local expert, personal communication, 5 October 2016)

The selective growth of the South East since the Second World War has seen "the mobilization of opposition to development in some places, in some existing suburbs" outside of London, Cochrane (2011) suggests, "through the rhetoric of the 'containment of urban England'. In other words, the power of the existing suburbs is transparent in this context, and planning is used to resist the operation of the property market in seeking to extract full value from land" (p. 175). On the ground, the built environment of London and the surrounding region has been profoundly shaped by the post-war reform of the spatial planning regime into 'Town and Country Planning' as a reaction to the initial, so-called sprawl' of London and other British cities into the countryside. Since then, a rather protectionist regulatory

framework has resisted urban expansion through the creation of the London Green Belt and other selective planning mechanisms that privilege the countryside.

7.5 Chapter summary

The tradition of protectionist Green Belt policy and other forms selective growth has been surpassed by contemporary urbanisation. Meanwhile, the dynamic and unpredictable expansion of the airports in across the South East and their local airspace continues above London and the South East. Empirical research on the urban-airport interface around London Gatwick Airport shows that aircraft noise pollution is certainly as unwelcome outside of the city as it is in West London, if not more so. If aircraft noise pollution is exacerbated by relative noise, and the lack of ambient noise, the trajectory of protection of the Home Counties and the Green Belt from the sources of noise associated with "the city" by the absence of flows remains a significant contributing factor to the volatility of the urban-airport interface outside of London. Concerning the Arrivals Review, the coalition of airport campaign groups in the 'countryside' of East and West Sussex, Surrey and Kent have shown that it is indeed possible to 'fight back', and pressure the airport to reverse its decisions, or finish a trial early. This study of the production and effects of flows within and beyond the concentrated urban form and into the South East helped to develop an alternative understanding of the urban fabric, which challenges increasingly unhelpful and untenable categories of local and global, ground level and vertical, and city and countryside, despite their invocation in campaigns against proposed local airport expansion.

Chapter 8

Discussion of findings:
Constitutive tensions within the three-dimensional urban fabric

8.1 Summary

By exploring existing aircraft noise issues related to Heathrow and Gatwick airports, and governance of their three-dimensional 'noise shadows' from flight paths stretching above the complex geography of the surface of London and the South East, this qualitative urban geography project aims to critically assess the implications of proposed airport expansion, and to contribute to our understanding of the existing process and form of globalised urbanisation. As explored in the previous two chapters focused on Heathrow and Gatwick respectively, integrating airports with their local environments remains the principal obstacle to airport operation and expansion, whether it is within 'urban', 'suburban' or 'rural' settings. London's airport dilemma demonstrates the complex role of transport flows within a process of urbanisation, which continually carves out sometimes unexpected and contested spaces of socio-spatial transformation. While population growth continues outside of central London and across the South East, 'encroaching' on the airports, the spatial mismatch inherent in airport hubs exacerbates the conflicting trajectories of residential growth in relation to airport expansion.

Airport expansion and the intensification of locally-unwanted global connectivity at the urban periphery seem to be a fundamental element of 'the urban', revealing the spaces, scales and priorities of urban governance, as well as the changing shape of London and the South East, and indeed, the urban fabric itself. This project has explored urbanisation and aircraft noise in London in the South East by posing the following questions; (1) What are the practical challenges to airport operation and expansion? How does aircraft noise pollution affect people? How can large airports be integrated with their surroundings? (2) How are the existing issues related to aircraft noise managed? Which parts of London and the South East are most affected by aircraft noise? What rationales are employed to support the intensification of air traffic flows and airport expansion? How are national benefits balanced

with local externalities? What role do local institutions and actors play in this conflict? How is airspace created, planned and managed? (3) Are airport expansion and urban-regional expansion patterns compatible trajectories? How is the airport spatially integrated with surrounding communities and the broader urban fabric?

In practice, managing the urban-airport interface here has proven to a process of balancing this issue at the urban-regional scale and a paradox for decision-makers. Due especially to aircraft noise pollution, large airports remain difficult to integrate within their surroundings. Yet, as urban regions grow and become denser while also expanding outwards across the urban-region and encircling their airports, the challenge of the urban-airport interface is to somehow balance conflicts between economic imperatives and the normative view of greater global connectivity, with local impacts such as repetitive aircraft noise pollution.

The aim of this research has been to unpack the complexity of infrastructure and its associated flows as part – and an extension – of the urban by taking one particular area of contention of transport geography, in this case aircraft noise pollution, out of the abstract, technocratic realm and instead analyse it, and its spatial dimensions – airspace and airport expansion – aircraft infrastructure is part of the process of urbanisation and the urban fabric.
The empirical research presented in this text has sought to make sense of this infrastructure and its spatiality within the complex urban realm, which already extends far beyond 'London'. Meanwhile, there is no level of government that corresponds in any way to London and the South East, and regional spatial integration and the balancing of unwanted uses at the regional scale happens in a haphazard and often antagonistic manner in these areas of the urban region. Population growth is continuing both within and outside of central London, and across the South East, gradually 'encroaching' on both Heathrow and Gatwick Airports. The spatial mismatch inherent in airport hubs exacerbates the conflicting trajectories of residential growth in relation to these airports. Findings also demonstrate not only how global flows and growth pressures are internalised by a range of actors at all scales, but also that, in practice, the spatial distribution of these rationales influences and is influenced by existing local conceptions and imaginaries of urban and non-urban framings. This exploration of airspace and three-dimensional 'noise shadows', considered here as part of the urbanisation process, connecting aircraft noise to complex urbanisation patterns below the flight paths in London and the South East, which has interpreted urban flight paths as a contested vertical form of the extension of the urban fabric.

Local residential communities that are disproportionally affected by the negative externalities of increased air transportation flows are also pulled into this governance process. Such places are made central by the implications of expansion proposals and become central to debates and decisions regarding airport. I have found that "vertical blindspot" (Harris, 2015) also seems to exist in practice, as well as in our geographical imagination. From the perspective of urban and regional planning and planners, airspace infrastructure is abstract, difficult to predict and decided at the national level and in the political realm. Likewise, from the perspective of those who produce airspace, ground level urbanisation is measured in abstract metrics of population density and 'encroachment'. The unresolved problem of aircraft noise highlights our cognitive dissonance with regards to the governance of the relationship between vertical-expansive infrastructure while flight paths projected through the upper layer of the urban realm – and the lived experience in the residential areas on the surface of the earth below.

The dilemma of aircraft noise pollution demonstrates the inherent difficulty in integrating large-scale 'vertical' airspace activity and long-term ground level urbanisation without a governance structure and approach that can take into account the persistent conflicts between these two layers of the urban fabric, that ultimately reveal how transport flows are fundamentally constitutive of urbanisation in global city-regions. Meanwhile, findings here demonstrate the central role that transport flows play within the process of urbanisation, continually carving out new, perhaps unexpected spaces of activity and growth, with increasingly complex and contested spatial conflicts arising between static, ground level and high-speed, elevated layers of the urban realm.

Likewise, suburban, ex-urban and purportedly rural places within the blurry boundaries of London, and the urban realm, which are also constructed through the *absence of flows*, their protection from urban functions and the conservation of 'rural tranquillity' and silence. It has become apparent that noise needs to be *analysed in context*, that is, in relation to erstwhile lack of noise. Like infrastructure, silence is also the result of spatial governance. To the extent that the rural or suburban places have been defended from encroachment urban noise, whether it be the extension of transport infrastructure or the growth and concentration of population density, it is clear that where a place finds itself on a continuum of *silence-noise* is as socially produced as its degree of urban-rural or city-nature. Inevitably, when the sound of

an aircraft becomes 'noise', this always takes place with a specific geographical context. Noise cannot be fully understood outside of the relative degree of silence, or 'tranquillity' where it is received. Of course, it is entirely understandable that residents of an otherwise 'tranquil' village, suburban or town surrounded by Green Belt would expect the area to continue to be defended from noise pollution from airspace infrastructure, just as the area has been protected from unwanted urbanisation at ground level through the spatial planning regime. "In the Era of the Postmetropolis, it becomes increasingly difficult to 'escape from the city" (Soja, 2000, p. 242, cited in Mettke, 2015).

8.2 The urban-airport interface as a lens into the 'wilderness' of global-local, technocratic-managerial governance

The lens of urban governance and aircraft noise pollution here demonstrates the inherent difficulty in integrating large-scale airports and increased airspace activity with existing socio-spatial patterns and long-term trajectories of urbanisation 'on the ground' (Cidell, 2014). By reconstructing and unpacking the rationales behind expanding Heathrow and/or Gatwick airports and the airspace above London and the South East, we can see *how* spatial relations and powerful growth pressures are internalised infrastructure, and obscured the framing of human-machine conflicts as soon-to-be-resolved technical quirks, thereby creating an reasonable-sounding rationale for expansion.

The fragmenting effect of the various pro-expansion institutions that comprise on aspect of the urban-airport interface is constructed through these reports and PR, which together constitute a significant element of the uneven negotiation of this interface. I suggest that campaign groups such as those discussed in this text, rather than being simply 'NIMBYs,', constitute a step towards this debate, as does the performative and legitimising functions of the reports and public consultation material analysed here. Increased public involvement, discussion, and debate of the best use of space may be a good place for us to start this conversation. And yet, in practice this seems to be where this debate ends, while the eventual lived experience of this three-dimensional space is lost in the 'wilderness' of obscure decision-making and the long-term rollout of new technology and expansion plans. The biggest 'policy gap' at the moment is that the Government may be on the verge of approving a new runway at Heathrow, while many of these questions about airspace modernisation

remain, let alone that the long, technocratic process of the design of the flight paths for the new runway would not be conducted until *after* the decision is made.

It is very tempting to be optimistic about the potential of performance-based navigation. However, it would seem that any technology intended to more precisely direct aircraft along flight paths, if used imaginatively might eventually become part of a solution. However, in practice, there is a debate to be had about who should benefit from technological innovations such as PBN. This new technology, theoretically, could be used to design a rotating system of *equitably distributed* flight paths and periods of respite, although, in practice so far the trend has been to concentrate flight paths and their 'noise shadows' (McDonough, 2017, p. 7). The basic idea of a rotating system of parallel flight paths combined with areas of respite between 7,000 feet above sea level and the runway would seem to be the most equitable solution. However, extending airspace infrastructure into new areas, newly effecting residents is a form of expansion that there is very little will for – except with regards to an additional runway, which inevitably will effect some areas for the first time. Otherwise, the conflict between concentration and expansion presents a significant challenge, which the existing regime of spatial governance does not appear to have a solution for at the time.

The most distinct dissonance between the planning of airspace infrastructure and the spatial planning (on the ground) is that unpredictability of the former in contrast to the rather predictable and rigid character of the latter. Considering that 'town and country planning' in the UK provides a certain level of permanence to the built environment, it is understandable that residents who have grown accustomed to, or invested in the existing character of their communities would feel threatened by the local encroachment of airspace infrastructure. Meanwhile, it is the success of London and the South East at positioning the urban region on the global stage, in, for example, global finance markets and other global city functions, that has, in part, promoted population growth in the area. How can an urban region remain deeply entangled in global material and non-material flows, and maintain its existing character? This is the challenge that connectivity poses. Airspace and the urban region below are as profoundly intertwined at the local level as London and the South East are intertwined at the global level as well.

It is striking that in the UK there is no equivalent to the Dutch '*vrijwaringszone*' (housing-free zone) concept. While it would obviously be very difficult to find free space in London

and the South East to designate as housing-free, there has been no effort to integrate the planning system and airport contours. Meanwhile, there are massive areas of restrictive spatial planning in between Heathrow and Gatwick airports in the form of the Metropolitan Green Belt, but of course there is no guidance from Government about how to balance aircraft noise pollution there either, except to 'sacrifice the good of the few for the good of the many', which can be problematic, as previously discussed. Without a coordinated integration of spatial planning, and the integrated production and management of airspace, there would seem to be limit to the effectiveness of the latter. These intertwined layers of urbanisation can only be conceived independently from each other until spatial conflicts are become unmanageable. New technology can't escape geography. As explained by Knowles, "there has been a persistent mismatch between modelling assumptions and transport-settlement realities. Geography still matters. Location remains all-important as time/space relationships collapse differentially" (2006, p. 423). The entanglement of layers here represent constitutive elements of urbanisation, and the remaining need to understand urbanisation and flows, place and the outside that each co-constituted, over-lapping, and brought together in an antagonistic layers relationship over noise pollution. The contested relations across three-dimensional space can help us to understand such unresolved conflicts and mismatched trajectories of globalised urbanization.

Shaw and Docherty (2014) suggest that without strict local environmental mitigation measures,

> [the] price of aviation policy's degenerating into another form of Predict and Provide is far too high to contemplate. Residents of West London, Crawley [near Gatwick] and Bishop's Stortford [near Stansted] will clearly have their own views about the provision of new runway capacity for London's three main airports, and their situation reminds us that transport activity has environmental impacts other than CO_2 (p. 144-145)

The struggle for increasing global connectivity, flight paths, the resulting 'noise shadows', and the tumultuous extension of the urban fabric through transport flows are likely to remain a persistent challenge for urban governance in the future. The problem of traffic generation, even time-based arrivals (that otherwise seem harmless) ultimately contribute to capacity in that they enable the sheer increase in the number of aircraft movements to a given airport, which is currently supressed by airspace and runway restraints. Thus, greater efficiency can

be seen to generate increases in traffic, and can be expected to either increase levels of noise pollution or at least slow the rate of its decline since the 1970s.

The configuration of the proposed third runway's flight paths is still unknown as a decision has yet to be made, but it is the areas to the east and west of Heathrow, specifically London's most western Outer Boroughs, and parts of Berkshire and Surrey, that are expected to the most acutely affected, perhaps "it is not surprising that an individual or family who have moved to the outer suburbs to avoid the congestion and hassles of 'the city' might be opposed" to increased transport infrastructure as its presence also serves as "an uneasy reminder of the urban in what is supposed to be a tranquil, suburban environment [and] highlighting the extent to which urban and suburban places are constructed through flows" (Cidell, 2015, p. 147).

8.3 Outlook

Whether or not you accept the argument that such privileged places that have been protected from the tentacles of the urban by Town and Country planning are more sensitive to noise pollution and therefore should be protected from Airspace Modernisation as well, it is clear that so far these two regimes do not integrate such constitutive elements of globalised urbanisation: urban and non-urban, local and global, places and flow, and the property market and economic, global connectivity. Despite technological improvements to aircraft and airspace design, greater coordination and some kind of coherent, long-term vision is needed to reconcile the realms of spatial planning, and infrastructure planning and airspace management.

Ultimately, because the most critical decisions regarding the spatiality of the urban-airport interface are made at the national level, it may be tempting in the beginning to look at the local community and local levels of government as being on the 'receiving end' of top-down power relations. Incrementalist airport planning, and specifically the reluctance to make what will be to a certain degree a locally controversial decision with regards to airport expansion, as well as changes in airspace, shows a degree of negotiation, if not genuine public participation. Flight paths and their noise shadows are likely to remain a persistent challenge for urban governance concerning the airports. The intensification of flight paths and modernisation of London's airspace will certainly be contested whether or not a third runway

at Heathrow is approved. Despite technological improvements to aviation technology, analysis of the urban-airport interface reveals an unresolved tension between this externally relational, interscalar form of urbanisation and local sustainability:

> Any London plan must start by recognizing that the future London will grow out of the present London, and is in large measure fixed by it. That is true even over the longest of historical terms: roads built by Roman legionaries twenty centuries ago still serve as London's main arteries, the financial centre still clusters round the site of a bridge built around the year 300, desirable residential areas (and now hotels) spread west of the centre to avoid smoke pollution of a bygone age. (Hall, 1971, p. 136)

Within this context, there remains a pressing need for a clear definition of 'significantly affected' by the Department for Transport. This would require taking into account the real impact of the intensity of peak noise events (the loudest planes) versus noise averaged over a long period, and perhaps most importantly a 'tough' decision over whether airport expansion and aircraft noise 'belongs' in urban environments where there may be more ambient noise, or in the purported 'countryside' where there are less residents. All of these issues will become unavoidable if a decision is made in Parliament over the runway proposed for Heathrow, the full reality of the implications will not be felt until the airport once again reaches full capacity. Until then, the 'wilderness' in between the proposal stage and the full project implementation presents an enduring realm of uncertainty and a continuation of the UK's airport capacity dilemma.

Rationales for the growth in aviation rely on almost futuristic visions of "sustainable aviation" and quieter aircraft, essentially employing the idea of the technological fix, that "it is merely a matter of finding the right technologies" (Harvey, 1996, p. 59) to reconcile problems such as aircraft noise. However, we should be cautious about overstating the degree of negotiation in practice.

Meanwhile, the ostensible confidence in the potential for machines and human ingenuity to improve society was a fundamental aspect of this optimistic futurism. Urban planning during the high modernist era especially was greatly influenced by the logic of technology and the rationales behind the production of transport flows, even as these 'solutions' began to mutate in practice. For example, rather than reduce traffic congestion, new motorways often led to the phenomena of traffic generation through the promotion of even more users, and

inevitably, further congestion. Yet, the intention and impacts of present-day airport expansion rationales – and the creation and intensification of urban flight paths – is consistent with this normative planning logic behind predict-and-provide strategies.

In summary, it has been shown from this review of how policies concerning aircraft noise that there remains many significant issues of contention. While the interface between urbanisation is not top-down, it is certainly not a model of participatory or democratic spatial integration either. There is still a rigid regime with uneven power relations that exist here. There may a difference between reconciling an issue for those affected, and *appearing* to reconcile the issue to those who are not directly affected. In the meantime, the public is left to negotiate in the 'wilderness' of proposed changes and new technology in this time of certainty.

Ultimately, the Airports Commission's decision to recommend building a new runway at Heathrow – and not at Gatwick – is complicit with other ways that the Green Belt and places in the Home Counties around London have been protected from locally unwanted development. The current Government's preferred choice of Heathrow may also be influenced by – or is at the very least consistent with – the long-term, protectionist trajectory that has shaped the Green Belt and the Home Counties outside of London. This is embodied in the issue of relative noise, and the understandable argument that aircraft noise pollution is indeed 'out of place' in such protected areas that are distinctly outside of the Greater London Area.

The expansion of Heathrow Airport has been proposed many times previously, by various official studies. If history has taught us anything, it is that from this pattern we can expect the Government to eventually shy away from building a new runway at Heathrow, despite the recommendations from the DfT and the many other studies. Although aircraft noise pollution has been reduced since its peak in the 1970s, the volume, frequency and overall intensity has increased, concentrated population and noise remain fundamentally incompatible. Meanwhile, people seem to be becoming more sensitive to noise pollution, and new technologies such as PBN's greater degree of concentration of aircraft flows raises new concerns to which we still do not have answers for. The question of airport expansion has cleverly been subsumed under the question of *where*, rather than *why*. The Airport Commission's pro-growth outlook and drawn-out research, short-listing and deliberation process successfully managed to cypher opposition to airport expansion in London and the

South East into a choice between an additional runway at Heathrow or Gatwick. This allowed the debate to be re-framed along urban versus non-urban lines, with each side being forced into an adversarial stance and open to 'NIMBY' critiques. Similar questions are raised with the implementation of satellite-enabled technology. If the guiding policies dictate that 'the few' are to be 'sacrificed' for the good of the 'many', how shall government decides who and where should be 'sacrificed'? Furthermore, the question of relative or ambient noise remains pressing as well.

This local history and geography both seem to show that Heathrow is ultimately too close to too many people already to be expanded in a democratic society. There is, in my view, another more convincing way to 'share the benefits of noise reduction between industry and communities in support of sustainable development': no new runways. As a pragmatic compromise, technological improvements to aircraft can be used to make better use of the existing 6 airports and 7 runways in London and the South East. The 'no-new-runways' remains one of the more coherent positions with regards to the effect of airport infrastructure on either urban or non-urban environments (and likewise, the contribution of increased aircraft flows to the effects of local air pollution levels as well as global carbon emissions with regards to reducing the pace of on-going climate change). In my view, across, all metrics, expanding Heathrow is the worst possible option given the millions of residents who would be impacted by a third runway. If the Government indeed accepts the Airport Commission's argument that one new runway is needed by 2030 and another by 2050, building second runways at both Gatwick and Stansted would certainly affect fewer people in terms of repetitive aircraft noise pollution, although those who would be affected in these generally quieter parts of the urban region would be acutely affected by relative noise.

However, considering that only one of the six airports serving London are at full capacity, a more moderate and politically-deliverable solution in the meantime might be to abandon the predict-and-provide approach endorsed by the Airports Commission and instead to decline to build a new runway by 2030 altogether. Instead of building a new runway at Heathrow or Gatwick, policy could focus on making more efficient use of the other four airports already serving London and the South East (Stansted, Luton, London City and Southend). Ultimately the seven runways at six airports already serving London and the South East could together comprise a competitive multi-airport system, although with less focus on hub-and-spoke functions at Heathrow. This would leave a greater period of time for the expected and already

celebrated benefits of new aircraft and aviation technology to be realised and shared with the public and albeit sacrificing a degree of 'connectivity'.

Like many urban regions, London and the South East provides an example of – if not dominance – of pressure from above from rising demand for inter-city air travel and its associated infrastructure – and a parallel concentration and extension of the urban population within London and deep into the South East. With a view to expanding runway capacity in the South East by 2050, a legitimate urban-regional plan could be designed by then which would include a long-term vision for new runways at Gatwick and Stansted. In the end, London would be left with three competing two-runway airports (*and* three smaller airports, London City, Luton and Southend) within a coherent regional plan, which remains lacking beyond the Greater London Area. This chapter in the decades-long saga of airport expansion in London and the South East, form the search for London's third airport to the current search for London's *eighth runway* exhibits one very consistent pattern: various government organisations and studies recommend expansion at Heathrow and the Government of the day backs down from supporting the recommendation.

Up until the Airports Commission chose Heathrow over Gatwick in 2015, it seemed possible that the airport expansion could happen outside of the London, although now it is be even more difficult to predict. An integrated urban-airport regional plan may also find a greater degree of acceptance with regards to aircraft noise pollution if it demonstrated that the benefits of technological developments were indeed shared with the aviation industry and the public and if these benefits and unwanted externalities could be fairly distributed in regional terms.

It is also difficult even to imagine, considering the relatively short span of election cycles, an honest conversation between the public and Government regarding *where* the city should expand and concentrate growth which is long overdue. The arguments against airport expansion both in London and outside of London both have merit. It would be reasonable to accept that since Heathrow already directly effects by far more people in terms of noise pollution than any other airport in Europe, it is simply too big for its urban location already and expansion should be ruled out. Likewise, Gatwick's opponents make a convincing claim that aircraft noise pollution has a more sever effect in quiet rural areas, and expansion there

would be incompatible with the fundamental intention of the Green Belt. A conclusive decision on the runway issue could, however, be a first stop towards a greater degree of coordination and integration between airspace and land-use planning, which the findings of this project suggest are definitely needed.

If the intention of the founding of the Airports Commission in 2012 was to de-politicise and 'manage' this issue as is done outside of the UK, then it is doubtful if that goal was ever achievable. If we pay closer attention to the stratified layers of the process of urbanisation and the socio-spatial urban fabric, we as urban geographers can see three-dimensional space, which reveals that the urban not realm is 'not only vertically sprawling' (Graham, 2016, p. 129), but that the uneven and interscalar negotiation of the relationship between places and flows and urban and the purportedly non-urban are, far from existing in a top-down hierarchy, are negotiated by actors at various scales. In practice, it may be unlikely that the fundamental constitutive tensions, between a nation which sees itself as globally interconnected and economically dominant on one hand, and home to a social-spatial, extended urban fabric resistant to the local intensification of global material flows through local airspace on the other, can possibly be reconciled by technocratic-managerial airspace planning, or incremental spatial planning and decisions on major infrastructure projects.

Likewise, with regards to airspace modernisation, one could accept that flight paths should be designed to keep noise away from concentrated urban environments, away from otherwise quiet rural/non-urban environments, *and* away from Areas of Outstanding Natural Beauty and other public refuges from 'the city'. There are similar debates to be had about using new technology to equitably disperse aircraft flows (and newly effecting some areas), versus strategically concentrating and 'sacrificing' a small number of unfortunate residents. On the other hand, it is possible to use these technological improvements to develop a *rotating* series of flight paths that are also limited to the existing routes and noise envelopes. These are very difficult questions, and an inherently political quagmire. Yet, there simply does not seem to have been the sufficient political will to build a new runway in London and the South East. It is not difficult to see why politicians have been reluctant to make any bold decisions on such a politically toxic subject, especially considering that even if a decision for expansion *somewhere, anywhere* is made, a subsequent Government may cancel that project and the study-decide-cancel cycle may be resurrected.

The Department for Transport's October 2017 reform proposals do indeed show an awareness of many of the most disputed issues related to airspace design and in particular aircraft noise pollution, such as metrics for measuring noise disturbance, the use of PBN, respite, and most of all the shift in altitude priorities between 4,000 and 7,000 feet above see level. 'Balancing' efficiency and noise between 4,000 and 7,000 feet had become an unworkable 'space-blind' policy, and these proposed reforms signal a change in the right direction, specifically a nuanced understanding of aircraft noise pollution in its spatial context. However, the ambiguity of the term 'significantly affected' by aircraft noise remains the most widely used, but ambiguous term. Furthermore, viewed within the context of the current Government's acceptance of airport expansion and expansion at Heathrow Airport in particular, it is tempting to question whether these reforms are really intended to address and resolve the problem, or are a intended shift public opinion in order to enable expansion of the existing, unresolved spatial conflict.

Firstly, there may be a need to re-evaluate whether airspace trials should continue to be exempt from the public consultation process that applies to airspace changes. Yes, these temporary trials provide an opportunity for innovation and, potentially, reductions in the levels of carbon and noise emissions. However, it is not realistic to expect the airports, regulators or industry to be objective, and a greater degree of institutionalised public input into airspace changes may make the airports 'better neighbours' in terms of these externalities. Secondly, London and the South East is a functional urban region that lacks a jurisdictional body to argue in its interests. Failing this, it should not be surprising that important decisions become adversarial conflicts over resisting locally unwanted uses of space. It may indeed be that by short-listing runway options for Heathrow and Gatwick, the Airports Commission expected to appeal to urban-versus-rural divisions and antagonistic feelings among the public, rather than to question the rationale for the expansion of London's system of six airports and seven runways altogether. Regardless, a greater degree of legitimacy for regional questions such as these could be achieved with the creation of some form of urban-regional political body or planning authority to represent the interests of the integrated urban region.

Given that Heathrow Airport is unlikely to close, the West London airport may indeed continue to implement innovative noise mitigation measures, such as slightly steeper approaches or using satellite-enabled navigation technology to provide a degree of respite.

Whether or not such measures can possibly counteract the sheer increase in the number of flights which a third runway would enable remains to be seen, either way I strongly advocate for deeper institutional integration of the airspace production and management regime (in other words, the 'vertical' realm in practice), and the erstwhile spatial planning regime below (the horizontal, land-use realm). So far, this has been hindered on one hand by the airport expansion saga, which has made long-term urban-airport spatial integration difficult to achieve for spatial planners. Likewise, the selective concentration and dispersion of infrastructure, jurisdictional division and urban-rural and regional fragmentation creates an additional 'blindspot' when planning large-scale infrastructure. In practice there is a clear fragmentation between, on one hand, rigid and two-dimensional Town and Country planning of the static built environment on the ground, which is represented birds-eye-view maps such as this.

Ultimately, these urban-airport conflicts are an unwelcome 'geographical expression' of uncoordinated trajectories of urbanisation and a fragmented, and selectively defended and 'sacrificed' parts of London and the South East. In more practical terms, and in order to work towards greater coordination and integration of the urban region and the coordination and integration of the vertical and horizontal dimension, I propose integrating noise contours with planning strategies for the region such as the London Plan, and greater transparency and collaboration between, for example, the CAA and Greater London Authority towards a fully integrated three-dimensional regional plan that incorporates noise, flows and long-term trajectories. However, even this would be limited by to the Greater London Area itself within jurisdictional boundaries, as opposed to a truly regional level of government that corresponds to the urban region.

Chapter 9

Conclusion:
Between policy and lived experience

9.1 Reflections on the spaces and scales of global flows

As an urban geographer, my intention for this project has been to develop a conceptual framework to understand the operation and extension of airspace infrastructure, and one which does not reify essentialist distinctions between global and local, or urban and non-urban. This research has proven that by taking airspace out of the abstract technical realm, and looking at the spatial relations between flows and place revealed through noise, the shape of the urban fabric and inter-urban transport flows in practice continues to expand three-dimensionally, in terms of depth, breath and length. The project of researching urban governance as inter-scalar, complex spatial relations across this three-dimensional urban fabric is intended to provide a novel contribution to urban geography and transport geography, and practical recommendations regarding the uneven management of constitutive elements of the urban in global city regions – places (in this case residential population) and flows.

Focussing on aircraft noise pollution here has foregrounded the transitional space between the runway and global flight path networks, between the airport and its neighbours, and between the local and the global realms. Managing aircraft noise pollution is thus interpreted as part of the inter-scalar project of spatially integrating the airport with its surrounding local realm. When analysing the rationales behind airport expansion given such persistent global-local spatial conflicts, these externally relational infrastructures inadvertently contribute to an adversarial relationship with its surrounding communities. This research shows how local places are not subservient to global flows and processes, such as the rationales of global connectivity through the extension of aviation infrastructure over their 'backyards'. These conflicts are nowhere near a resolution either.

This project has demonstrated that the urban regional and global-local spatial negotiation of aircraft noise 'expresses social relationships but also reacts back upon them' (Harvey, 1973,

p. 306, cited in Soja, 1980), part of the *socio-spatial dialectic* to a certain degree, in that this space is shaped by social relations, and in turn shapes the experience of actors we well (see Soja, 1980, p. 207). Airspace (and the sky above the urban region that may become airspace) then, is as much part of the urban problematic of urbanisation as the Green Belt and other areas that comprise the urban periphery. In spatial terms, the urban-airport interface, yes, is co-constituted by a variety of actors at variegated scales (local, national, global, etc.), but their particular interaction, negotiation and contestation *here*, within the unique history and environment of London and the South East also comprises an influential element of the constitution of this interface, as do trajectories of rural protection and urban concentration.

Within the space between the ground and the aircraft itself, the negotiation of place unfolds here through uneven urban governance, while across the urban regional, from a 'horizontal' perspective, the space within and beyond London is selectively and unevenly urbanised or protected. At both airports local actors possess a considerable degree of social capital and ability to influence the process and negotiate with the other actors in the urban-airport interface. The competing interests of global connectivity and local lived experience and property both remain privileged and influence realms with considerable overt and unspoken influence. I suggest that the role of external transportation flows in general, and the discursive and socio-political interface between inter-city and global aircraft flows in particular is an often under-theorised aspect of the 'wicked problems' of globalised urbanisation today, and the overlapping, sometimes incompatible uses of space and uneven spatial relations within the process of urbanisation.

The complexity of the urban airport-interface may ultimately be a reflection of the 'mutually dependent relationship between the local and global realms' (Hesse, 2006, p. 591). Responding to the imagined global-local antagonistic spatial conflicts, and the perceived local-global tensions therein, Massey is reluctant to reify such binaries. Her work supports "an understanding of the world in terms of relationality, a world in which the local and the global really are 'mutually constituted'", which, she suggests, "renders untenable these kinds of separation. The 'lived reality of our daily lives' is utterly dispersed, unlocalised, in its sources and in its repercussions. The degree of dispersion, the stretching may vary dramatically between social groups, but the point is that the geography will not be simply territorial" (Massey, 2005, p. 184). A parallel can be drawn to planning policies of the previous century in the South East, which ostensibly sought to protect countryside from

development, and in effect promoted its attractiveness and a trajectory of 'counterurbanisation'. Today, the combination of rigid spatial planning and the economic success of London and the South East as a global city-region has clearly fuelled the housing market, but it is the degree and intensity of these global interconnections manifested in material, aircraft flows, and the threat of their local extension and concentration that remains such an apparently intractable spatial conflict here. Not only can the infrastructure expand faster than any other form of urbanisation, and the spatial organisation of flight paths can change literally overnight, but these two layers of urbanisation – airspace and ground level planning – are fundamentally disconnected from one another.

9.2 An unwelcome geographical expression

This dissertation in geography has presented an evolving paradox for urban governance in terms of *where,* at the local level, the social and environmental costs of global connectivity are to be paid. Meanwhile, economic benefits of connectivity continue to be dispersed at the regional or national levels. Increasing frequency and concentration of continuous and unwelcome aircraft traffic over such relatively quieter residential areas exacerbates the existing problem of aircraft noise – and also confronts our geographical imagination of the "shape of the city" (Sewell, 1993), or more accurately, the shape of contemporary urbanisation (McDonough, 2017). Following Wachsmuth's (2014) critique of 'dinosaur categories' such as the city, the suburbs, and the countryside beyond in urban geography, I agree that in the case of London and the South East, that it seems increasingly arbitrary to think that 'city', or the urban realm, or what we imagine when we talk about 'London' actually ends at the political boundaries of the Greater London Area (the 'city limits'), the peripheral M25 London Orbital Motorway, or even the Green Belt. In the words of Lefebvre,

> Unitary Urbanism only had a precise meaning for historic cities, like Amsterdam, that had to be renewed, transformed. But from the moment that the historic city exploded into peripheries, suburbs – like what happened in Paris, and in all sorts of places, Los Angeles, San Francisco, wild extensions of the city – the theory of Unitary Urbanism lost any meaning. (Lefebvre, 1997, p. 5)

In this sense, transportation flows such as flight paths represent yet another form of urbanisation that has 'exploded' from its original city form, and in this case, 'horizontal' form. Flows and the experience of noise interrupt these established geographies and ways of thinking of - and planning for - the growing urban region. Scholarship on extended and

planetary urbanization has usefully problematized how geographers have a tendency to "*examine the traditional concept of the city in the context of urbanization processes that exceed it*" (Wachsmuth 2014, p. 75), and reify distinct categories of the city, the suburb and the countryside.

The urban region that is London and the South East has certainly outgrown the territorial boundaries of the Greater London Area. Elsewhere in England, the official standard regions of administrative and regional planning jurisdictions conform more coherently to historical or regional identities, but the urban-regional development across the three regions of London, the South East and the East of England best exemplifies regions are produced by flows in practice (Tewdwr-Jones, 2012, p. 110), and ways that "globalisation becomes internalised as regionalism', in that "the work of globalisation is done in and by the local and regional regimes" (Keil, 2011, p. 2509). The South East of England is said to be "made and remade by political processes that stretch beyond it and impact unevenly […] the 'lodging' of a wide range of political actors drawn from the national as much as the local domain that gives a regional presence to the new governance arrangements" (Allen & Cochrane, 2007, p. 1172).

Without a coherent regional plan or a level of government that corresponds with the phenomena of regional growth, national-level concerns and the abstract goal of increased global connectivity are left to influence the siting of aviation infrastructure within the urban region. Airspace infrastructure then is more than an extension of the city, of the dropping down of global aviation networks. In practice, the space between traditional, compact city and the region and periphery are internalised, and made central by noise as an unpleasant reminder of constitutive elements confronting each other, interrupted by the other's trajectory.

It may indeed be that part of the reason that aircraft noise pollution is as much of an intractable spatial conflict as it appears to be because by flowing over the contested, fragmented and unevenly horizontally-arranged urban regions and their ostensible periphery, aircraft taking off and landing through three-dimensional space become an unpleasant reminder of the unending project of spatial integration of disparate constitutive elements of London and the South East. These elements of globalised urbanisation have allowed the urban region to become successfully, yet uneasily positioned at the global scale. Just as the urban realm cannot exist without the countryside, places and flows cannot exist without the

other. In complex urban regions that are globally intertwined within external material and non-material flows, spatial integration requires, at the very least, a more nuanced understanding the local geography of globalisation, roles of transport flows, rationales for their expansion and intensification, and the intertwined layers of urbanisation between ground level and approximately 7,000 feet above sea level.

In London and the South East of England, aircraft noise from Heathrow and Gatwick airports presents an unwelcome 'geographical expression' of a globally connected urban region. Rather than taking on 'a life of their own', the logics of global aviation flows and the global, international and inter-city nodes we call airports are in fact also hyper-local. From the constructivist perspective of this project we can see that balancing aviation infrastructure within the urban region is a complex, interscalar project that is shaped by a constellation of actors ranging from local campaign groups to national government to the pro-growth, neo-liberal logic of competitive global cities and regions. By introducing the additional 'y' axis of the vertical city to the relational perspective established by the spatial interaction within the port-city interface, the lens of the urban-airport interface and the focus on aircraft noise pollution here has revealed a reluctant form of regionalised urbanisation extending far past the runways and the airport perimeter fence. In spatial terms, airspace becomes a contested terrain where these fundamental constitutive tensions literally overlap with each other and present a paradox to the status quo of political and technical-managerial integration of these variegated, powerful elements of the urban fabric. The selective urbanisation of the South East outside of the Greater London Area, above the protected and quieter areas of the Green Belt and the Home Counties especially seems to be a dilemma with no easy solution.

From a constructivist perspective, this research demonstrates that the local cannot be considered subordinate to global, top-down logics, although the forces for growth and expansion of aviation infrastructure do indeed seem to have greater resources. Rather, the spatiality of aircraft noise pollution and the three-dimensional urban-airport interface are unevenly co-constituted by a constellation of groups and rationales. Along with local air quality issues, aircraft noise is one of the most difficult and volatile issues around any major airport, and one that remains particularly unresolved despite technological progress and innovative mitigation measures. This research has proven that processes of urban and regional growth are fundamentally tied to the three-dimensional form of the built and natural environment. Aviation flows in particular posses the ability to be quickly altered, trialled or

redesigned, depending on the direction of the wind, or the influence of the various actors described in this text who co-constitute the urban-airport interface.

In contrast to the planning of an airport terminal, or any other static piece of infrastructure, airspace is continually negotiated, just as airspace flows are continually drawn into the local realm. Because this takes place within specific local histories and trajectories, the spatial negotiation of this conflict relies heavily on urban and non-urban categorisation and division. Rather than reduce the official institutional approach of the project urban-airspace integration to abstract noise level averages, or population density, a more nuanced understanding of the urban and its relationship with continual transport flows may be a good starting point towards re-thinking spatial negotiation in this context and the production of aircraft noise.

9.3 Implications for research and action

As an urban region, London is very unique in that it has not two or three, but six commercial airports serving its growing market, which since the early post-war period have each grown to find their respective niches. This trajectory has taken place without any official, long-term vision for London's airport system, or a conclusive designation of London's third airport, or most notably, a decision on large-scale airport expansion. While Southend, and later Stansted became, effectively, London's third airport by default, the question of where (or if) to build a new runway remains as pressing as ever. There are also other related issues that are not addressed by current policy.

With a decision on airport expansion looming over the heads of residents of London and the South East for decades, and in lieu of any coherent regional spatial strategy (for London *and* the South East) other than the Green Belt perimeter, it is understandable that local residents would expect the continuation of the established trajectory of urban containment. In place of a coherent vision for integrating a larger volume of aircraft flows within the existing airport system and the existing urban-regional built form, such debates over the local siting of nationally significant infrastructure instead confront established tropes of the protected countryside versus the noisy city. To a large degree, the organisations that produce, manage and regulate airspace, as well as the Airports Commission and the myriad of campaign groups, consultants, and other public and private actors and institutions are performing selective, *ad hoc* three-dimensional urban-regional spatial planning. In terms of urban

governance, these complex coalitions for or against the extension of aviation infrastructure in specific parts of the urban region co-constitute this space through the continual negotiation of urban and regional airspace.

For better or for worse, the 1947 Green Belt plan was a bold, long-term statement of priorities concerning the spatial distribution of new development and housing. This research has placed a critical eye on the technocratic-managerial priorities and strategies of airspace and land use planning, in contrast to the technocratic and institutionally fragmented approach, which limits its capacity to respond to the challenge that this three-dimensional urban-regional geography of flows and places poses. In the 'real world' of uneven power and vague guiding policies, the urban fabric here is produced through incremental infrastructure planning and often rather parochial, protectionist spatial planning, and the inherently political decisions regarding the 'winners and losers' of aviation infrastructure planning is left to a patchwork of technocratic management, national-level government and an overall complex constitutions of local agency and opposition. This conclusion would confirm Storper's description of neo-liberal urban governance as *bricolage,* or 'tinkering' (2014) rather than pro-actively making 'tough' and long-term decisions regarding tensions about urbanisation, the concentration of infrastructure and the continued restriction and protection of some places in the urban region, while inevitably 'sacrificing' others. In other words, there is a realistic discussion and debate to be had about how the 'winners' and 'losers' of infrastructure expansion are chosen, and about how to share in technological benefits of aviation technology, and the distributing of infrastructure within the urban region.

The urban-airport interface presented here remains co-constituted, fragmented, and clouded by institutional and cognitive blindspots and inevitably adversarial spatial relations. This study of the production and effects of flows within and beyond the concentrated built environment and into the South East contributes to our understanding of the extended urban fabric and its social production, which reveals increasingly unhelpful and untenable categories of local and global, ground level and vertical, and city and countryside.

While we as urban geographers have in the past been guilty of reifying the city and being blind to our regional reality, the jurisdictional fragmentation and lack of cross-border cooperation in some ways mirrors 'the tenacity of the city concept despite the explosion of the city form' (Wachsmuth, 2014). The horizontal and the vertical, the global and local and

the urban and non-urban are already deeply intertwined. The challenge now, in terms of governance and the project of spatial negotiation, is to reconcile the form, flows and lived reality that comprise the urban fabric with the institutional divisions and socially-produced divisions 'blindspots' that shape our reality and experience of the urban. The three-dimensional spatial relations presented here, between layers of the urban realm, between ground level and airspace, and between the central city and the periphery interrupt our imaginary of territorially distinct and separated realms of the urban fabric. As geographers engaged in the study of the unfolding of space in complex real-world dimensions, we have an opportunity to contribute new ways of understanding spatial conflict and the urban realm, and to work towards overcoming the spatial mismatch between the practice of urban governance and processes which shape the lived experience of the urban fabric.

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APPENDIX A

Index of abbreviations

ABP	Altitude based priorities
AONB	Area of Outstanding Natural Beauty
AEF	Aviation Environment Federation
BAA	British Airports Authority (predecessor to Heathrow Airport Limited)
CAA	Civil Aviation Authority
CAGNE	Communities Against Gatwick Noise Emissions
CPRE	Campaign to Protect Rural England (formerly the Council for the Preservation of Rural England)
DfT	Department for Transport
dB	Decibel
FIR	Flight information region
GACC	Gatwick Area Conservation Campaign
GLA	Greater London Authority, top-tier administrative body for Greater London
LAMP	London Airspace Management Programme
LCY	London City Airport, located in the London Borough of Newham
Lden	Day Evening Night Sound Level, average noise over a 24- hour period
LHR	London Heathrow Airport, located in the London Borough of Hillingdon
LAeq	Average noise level
LULU	Locally-unwanted-land-use
LGW	London Gatwick Airport, located in West Sussex
LTN	London Luton Airport, located in Bedfordshire
M25	London Orbital Motorway circling most of the Greater London Area
NATS	Formerly National Air Traffic Services
NIMBY	‘Not-in-my-back-yard’

NPR	Noise preferential route
PR	Public relations
PBN	Satellite-enabled performance-based navigation
RNAV	Satellite-enabled area navigation
STN	London Stansted Airport, located in Essex
SEN	London Southend Airport, located in Essex
3Di	Three dimensional inefficiency
16hr	Average sound level of aircraft noise in decibels over a sixteen-hour day

APPENDIX B

Maps and tables

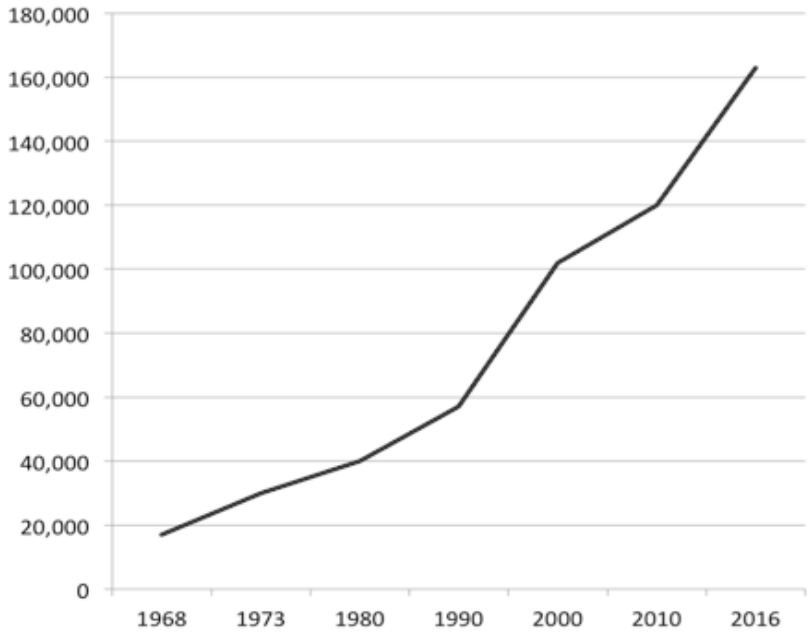

Figure 9: Passengers at London's airports (per million) (CAA, 2015b).

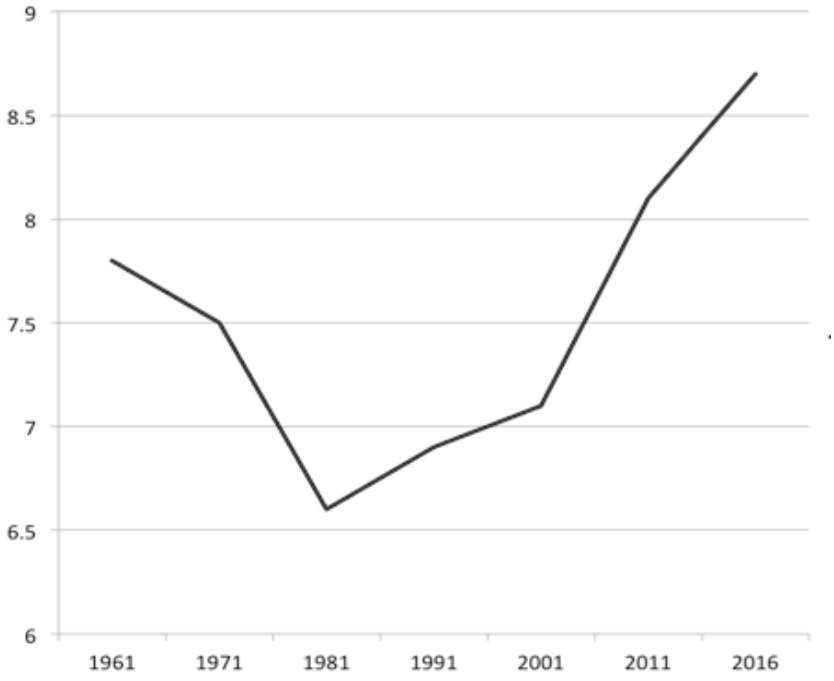

Figure 10: Greater London's census population (per million), (ONS, 1961-2016).

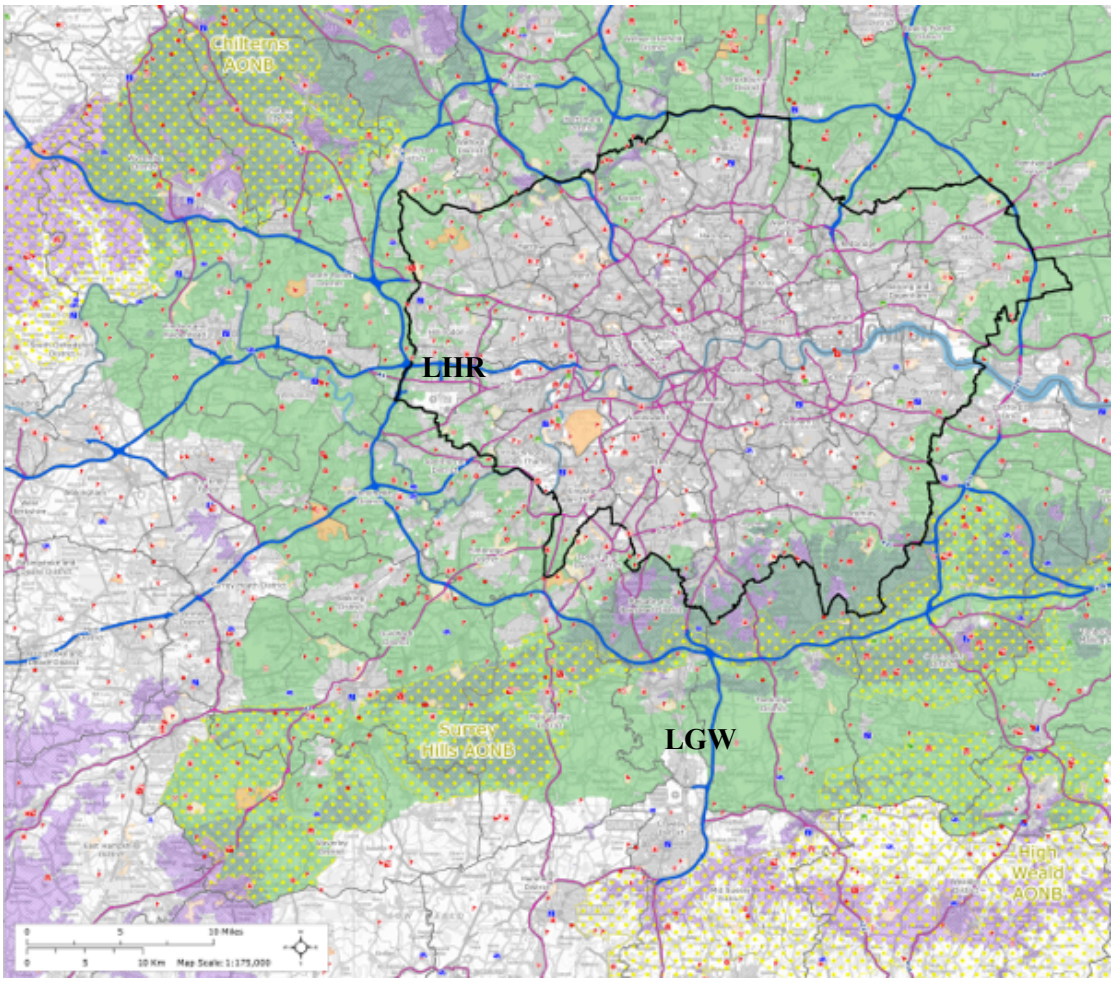

Figure 11: Areas protected from development by the Metropolitan Green Belt and AONB status (London Green Belt Council, 2018).

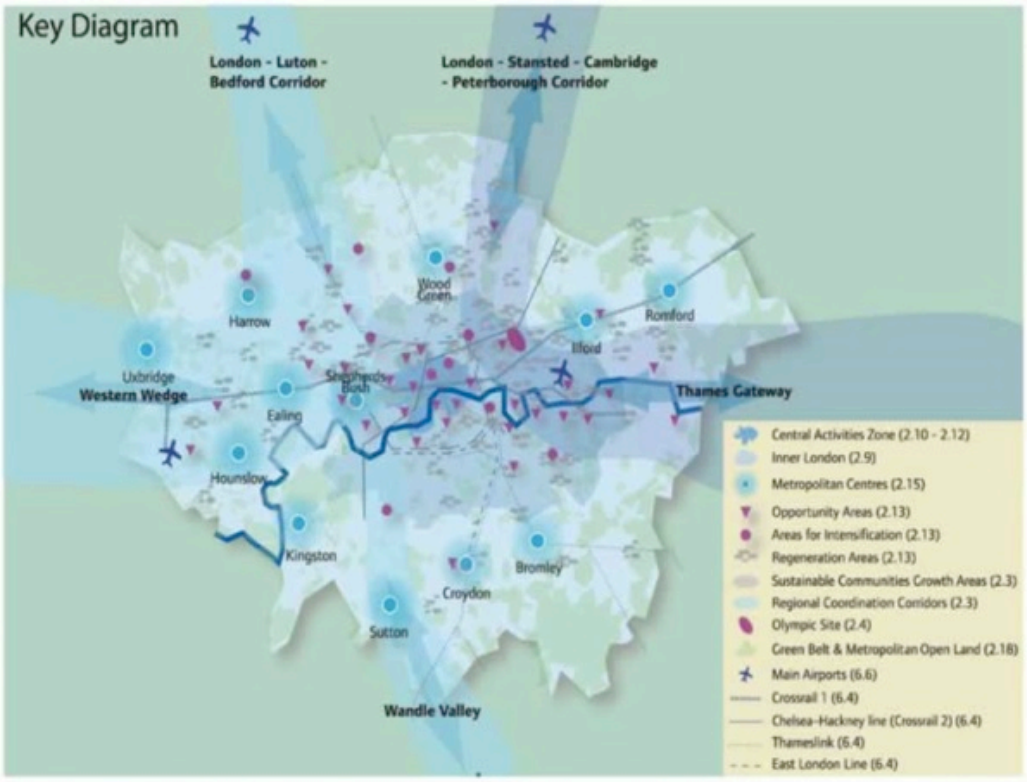

Figure 12: The London Metropolitan Plan 2016 (Greater London Authority, 2016).

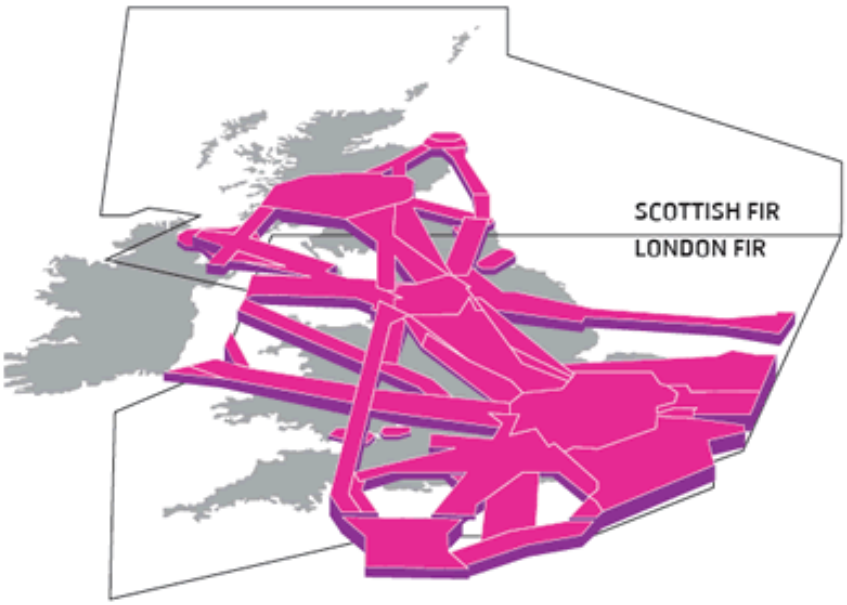

Figure 13: NATS' Flight Information Regions (NATS Ltd., 2017b).

Figure 15 Heathrow 2014, 2013 and 2006 annual 16-hour day N65 contours

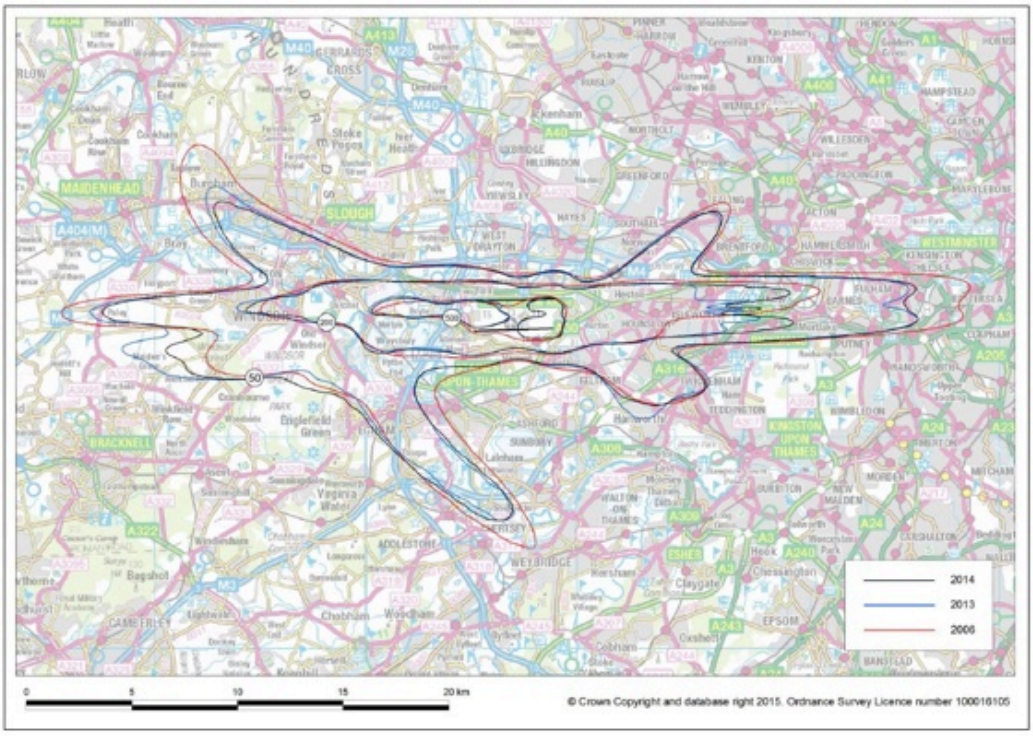

Figure 14: Heathrow Airport's noise corridor (Heathrow Airport Ltd., 2015).

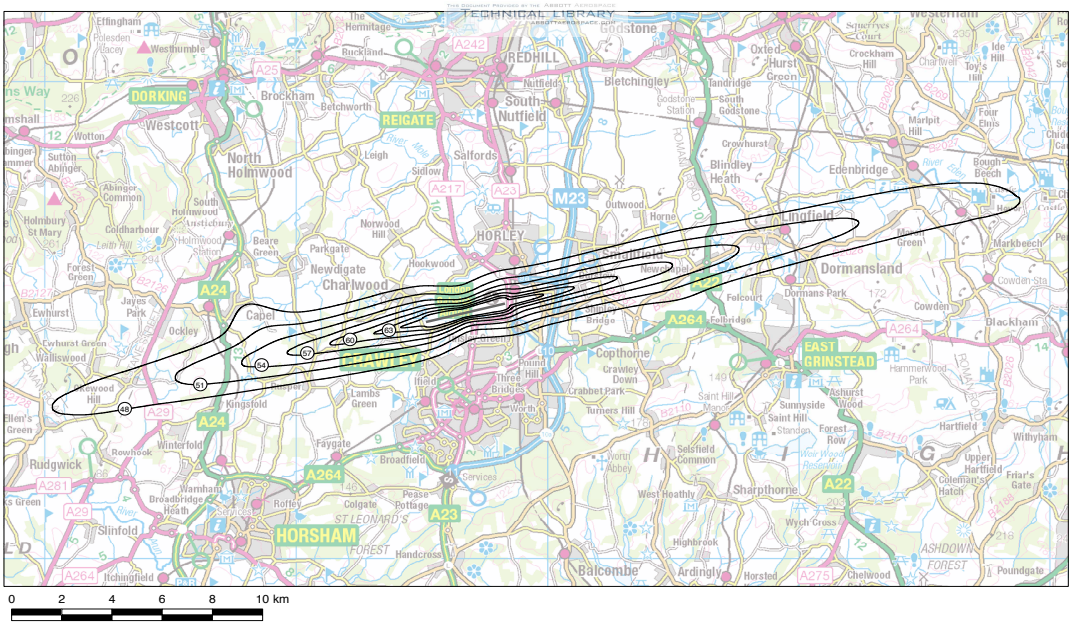

Figure 15: Gatwick Airport's noise contour (Abbot Aerospace, 2014).

APPENDIX C

Interview materials

PhD Project Description:
Global flows, local conflicts and the challenge of urban governance: Managing the urban-airport interface in London, UK

Evan McDonough
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Keywords*:* airports, urban governance, urbanisation, global city regions, urban and regional planning

With a focus on urban governance, my research connects urbanisation, transport infrastructure, global connectivity and specifically urban-airport planning challenges and conflicts to fundamental characteristics of urban geography and spatial planning such as space, scales and flows. Imagined here as the urban-airport interface, I suggest the contentious relationship between these transport nodes and their surrounding urban-regional environment is a pressing and under-theorised aspect of globalised urbanisation and contemporary urban-regional growth.

This project conceives of airport-oriented urbanisation taking place within two realms. One is the process of vertical urbanisation that takes place in the form of increasing intensity and concentration of urban flight paths through airspace modernisation and airport expansion,

with implications for overflown communities across the region in terms of aircraft noise pollution. The other realm is the horizontal urbanisation taking place on the ground, where spatial planning and other forms of urban governance attempt to integrate these internationally-oriented transport nodes within the existing and - also growing - urban-regional environment.

Empirical research for this dissertation in geography and spatial planning is focused on the governance of London's six commercial airports (Heathrow, Gatwick, Stansted, Luton, City and Southend), with an emphasis on current and anticipated spatial planning challenges, including flight path changes and expansion proposals for Heathrow, Gatwick and City. This research includes a series of semi-structured key informant interviews with a variety of actors and other experts in the field to compliment the large body of official material and other secondary sources on London's airports and urban planning and governance in the city region. This will be the crucial to understanding the unique planning challenges at the urban-airport nexus in London.

Request for expert / stakeholder interview: Global flows, local conflicts and the challenge of urban governance: Managing the urban-airport interface in London, UK

[DATE]

Dear Mr./Ms. _____,

My name is Evan McDonough. I am a doctoral student at the Institute of Geography and Spatial Planning at the University of Luxembourg. Under the supervision of Prof. Dr. Markus Hesse, I study urban geography with a focus on transport infrastructure, and in particular dynamics between the London city-region and the operation and proposed expansion of airports in the London city-region.

I am interested in your perspective and experience of the urbanisation concerning London's airports and spatial planning and urban governance issues based on your position as a _____ with the organisation _____. I would like to interview you for my project. This would consist of a conversation about the existing conditions and implications of proposed expansions of London's airports, and would last for approximately 45 to 60 minutes.

If you agree, I would like to record the interview for later transcription and analysis, in order to ensure accuracy. I will use this information in my dissertation, as well as publications and other disseminations for research such as conference presentations.

This information would be stored on a server at the University of Luxembourg. After the completion of my dissertation, I will share a copy with you.

If you have any questions, please do not hesitate to contact me via email at evan.mcdonough@unil.lu or by calling (+352) -- -- -- ----. If you have a concern about any aspect of your participation, you may also contact my supervisor, Prof. Dr. Markus Hesse at markus.hesse@uni.lu or (+352) -- -- -- ----.

Thank you for your cooperation,

Evan McDonough
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(General) Interview Guideline

Existing governance issues:

1. What is your position on the relationship between London's commercial airports and the local community?

2. Are there any issues that you believe are under-represented by the narratives of airport operation and expansion in the South East?

3. What do you think are the main challenges to integrating transport megaprojects such as airport with their surrounding communities?

4. How has increased airport activity affected the local environment?

5. How has the association between these and its surrounding communities changed in recent years?

6. Has the introduction of satellite-enabled aircraft navigation, other new navigation techniques, and newer aircraft altered the connection between the airport and its surroundings?

Expansion proposals:

7. How might expansion plans compliment (or contrast to) local initiatives and land use plans?

8. What are the implications for the proposed expansion of London's airport system?

9. In your view, how have local concerns been fairly considered in the research and analysis of the reports of the Airports Commission?

10. How would you assess the reports and final recommendations of the Airports Commission?

11. Do you believe airport capacity in the South East more broadly should be expanded with a new runway?

12. What are the most important considerations that should be made when deciding on airport expansion options?

13. What is the best use of the area that is being considered for airport runway expansion?