A study examining the proportion of affordable housing in London’s recently permitted tall buildings

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A study examining the proportion of affordable housing in London's recently permitted tall buildings

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Being a dissertation submitted to the faculty of The Built Environment as part of the requirements for the award of the MSc Urban Design and City Planning at University College London: I declare that this dissertation is entirely my own work and that ideas, data and images, as well as direct quotations, drawn from elsewhere are identified and referenced.

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LIST OF ABBREVIATIONS

CIL	Community Infrastructure Levy
DPH	Dwellings per Hectare
FOI	Freedom of Information
GLA	Greater London Authority
HRS	High Rise Solutions
IPLP	Intend to Publish London Plan
MHCLG	Ministry of Housing, Communities and Local Government
NLA	New London Architecture
LDD	London Development Database
LLR	London Living Rent
LPA	Local Planning Authority
LSE	London School of Economics
PBSA	Purpose-Built Student Accommodation
PIL	Payment in Lieu
PSI	Potential Strategic Importance
SHMA	Strategic Housing Market Assessment
SPD	Supplementary Planning Document
SPG	Supplementary Planning Guidance
S106	Section 106 Agreement

1. ABSTRACT

Driven by the need to deliver 43,000 new affordable homes annually, there has been a surge in new residential tall buildings over the last 10-15 years in London. Advocates claim they are necessary to cope with housing demand whilst critics argue high construction costs impact affordable housing contribution. Using primary data on over 850 planning applications referable to the Mayor between 2011-2020, this study examines whether new tall buildings in London provide proportionally less affordable housing and are less likely to be built than mid-rise typologies. Data collected includes the maximum height and type of development, location, typology, Mayoral decision date and completion status. Findings show that, on average, the proportion of affordable housing is lower in tall building applications than lower-rise typologies. This is particularly marked for applications over 30 storeys and those of a tower typology, whereas developments of 10 storeys or less achieve the highest proportion of affordable housing, particularly those in terrace or linear block typologies. The influence of location is marginal, but main land-use and decision date play the greatest role where the proportion of affordable housing has increased in recent years. Using data from the London Development Database (LDD), the completion rate of tall buildings was found to be lower than mid-rise developments. Overall, this study argues that high-rise typologies provide proportionally lower levels of affordable housing and are less proficient at delivering them. On this basis, it is recommended that planning policy in London recognise the influence of height and typology in the provision and delivery of affordable housing.

2. INTRODUCTION

According to a report commissioned by the National Housing Federation, an estimated 2.1 million Londoners live in unaffordable, insecure or unsuitable homes (Bramley, 2019). With London's population predicted to grow to almost 10 million by 2041 (ONS, 2018), the need for more affordable homes in the capital is evident. In 2017, the Mayors' *Strategic Housing Market Assessment* (SHMA) identified the need for 66,000 new homes a year in London (GLA, 2017). Of these, the SHMA identified a need for 65% to be affordable. However, where and how best to deliver these new homes is ardently debated.

The *Intend to Publish London Plan* (IPLP) advocates for all developments to optimise site capacities and densities through a design-led approach (policy D3; GLA, 2019a). While higher densities can be achieved through many different typologies, one of the most familiar is through building tall. According to the New London Architecture (NLA), 525 tall buildings over 20 storeys were in the 2019 pipeline for London, close to 90% of which were residential. Maintained within the report, it is estimated that these could deliver up to 100,000 new homes (NLA, 2020).

Figure 1: High-rise: One the Elephant development

(Source: One the Elephant by Stevekeiretsu is licensed under CC BY-SA 4.0)

Nevertheless, due to their height, tall buildings are often politically contentious. This is particularly the case in London, historically a low to medium rise city. Thirteen of the fifteen applications decided at a Mayoral representation hearing between May 2016 – May 2020 cited excessive height as a reason for refusal by the local planning authority (LPA) (see Appendix A). This has led to several organisations and prominent urbanists advocating for densities to be delivered in different ways (Cordell & Barber, 2019; Create Streets, 2013; Derbyshire et al, 2015; Prince's Foundation, 2014). Proponents argue that mid-rise developments such as mansion blocks are a more contextually appropriate typology for London while still providing reasonably high levels of density. MHCLG's Building Better, Building Beautiful Commission recently advocated gentle density in the form of mid-rise and terrace streets in their *Living with Beauty* 2020 report (MHCLG, 2020a).

Maintaining that the number of new social rent homes have now fallen to historic lows, a paper by the housing charity Shelter has highlighted the need for more affordable homes (Strachan, 2018). Similarly, Mulheirn (2019) and Chance et al. (2015) argue that simply building more market homes is not the answer to Britain's housing crisis, instead making the case for increasing the supply of social homes. In addition, concern has been raised about the perceived low levels of affordable housing in tall buildings (Bailey, 2020; Marrs, 2019; Neate, 2018; Just Space, 2019; Wainwright, 2015). In particular, organisations such as the 35% Campaign in Southwark have campaigned on behalf of their residents arguing that many tall buildings do not provide compliant levels of affordable housing (35% Campaign, 2016).

Figure 2: Mid-rise: Bourne Estate development

(Source: Author)

With the need for more affordable housing and the ambition to optimise site densities, this study seeks to examine the number of affordable homes in, and completion of, tall buildings to determine whether, and to what extent, tall buildings provide proportionally less affordable housing than lower-rise alternatives.

Relevance of the research

Given the IPLP's move towards a design-led approach, identification of the strengths and weaknesses of different typologies is pertinent. This approach requires that *tall buildings should only be developed in locations that are identified in [boroughs] Development Plans* (IPLP, 2019a). As part of this, boroughs have been directed towards undertaking local character assessments to determine the definition of tall buildings as well as where they should be located. The intention is to move towards a more context-led approach to assessing what typologies are appropriate for different areas. *The Good Quality Homes for All Londoners Supplementary Planning Guidance (SPG)* (2020a) provides guidance to boroughs as well as setting out seven housing typologies to assist boroughs undertaking capacity studies. However, little is known about the average proportions of affordable housing that can be expected by these different typologies, particularly tall buildings.

This study intends to provide an insight into the levels of affordable housing that have been permitted for varying heights and typologies of buildings. Due to the lack of data on planning applications referable to the Mayor, a study including all referable tall buildings has not been possible up to now. However, given available data on all planning applications of potential strategic importance (PSI), this study seeks to undertake a comprehensive assessment of affordable housing in tall buildings. It is hoped this can be used to better inform local authorities and communities on the levels of affordable housing that can be expected for different types of developments as well as possible influencing factors.

Research question

This study seeks to examine the relationship between tall residential buildings and their provision of on-site affordable housing through the following research question:

> To what extent is there a relationship between the height of buildings and the proportion of affordable housing and are tall buildings less proficient at delivering affordable housing than lower-rise alternatives?

To address this question, the following sub-objectives have been set:

- Objective 1: To determine whether, and to what extent, a relationship between the height of residential permissions in London and the proportion of on-site affordable housing they commit to exists.

- Objective 2: To determine the extent to which any external mitigating factors or variables, excluding height, impact on the provision of affordable housing in tall residential developments.

- Objective 3: To determine whether, and to what extent, the completion status of projects with tall buildings within them is different to lower-rise developments in London.

Report structure and overview

This study examines the research question using publicly accessible primary data on affordable housing for all residential applications referable to the Mayor between January 2011 – May 2020. The delivery of permissions has been assessed using secondary completions data from the LDD. To support the explanation of the results, four exhibits (two lower-rise and two high-rises) have been used to highlight key findings. Two informal interviews with leading viability professionals were also undertaken.

3. LITERATURE REVIEW

Definition of a tall building

The definition of a tall building differs remarkably between different governments, regulatory bodies and geographical locations. While tall buildings have been defined by the Council on Tall Buildings and Urban Habitat as any building over 50 metres (Al-Kodmany, 2017), Craighead (2009) proposes any building extending higher than the maximum reach of available fire-fighting equipment (normally above seven storeys) be considered tall. Mostly recently, Policy D9 in the IPLP (2019a) has advocated for London boroughs themselves to stipulate the definition of a tall building. Boroughs such as Islington have defined buildings of more than 30 metres, or those that are more than twice the contextual reference height of surrounding context (whichever is the lesser) as tall (Islington Council, 2018) while the *City of London Draft Local Plan*, classifies buildings over 75 metres tall (City of London, 2020).

For the purpose of this study, a tall building has been defined as any building over the height threshold set out in the *Mayor of London Order (2008).* This legislation sets the threshold for referable applications on height as buildings of more than 25 metres adjacent to the River Thames, 30 metres high in the rest of London (except the City of London), and 150 metres high in the City of London (Mayor of London Order, 2008).

Affordable housing planning policy in tall buildings

Planning policy approaches to affordable housing have varied considerably since the inception of the first London Plan in 2004. From a strategic target of 50% affordable housing in 2004 (policy 3A.7), the 2011 London Plan removed this in favour of a 'maximum reasonable' approach (policy 3.12). Since 2017, an affordable housing threshold approach on individual sites has been adopted through the publication of the *Affordable Housing and Viability SPG*. The SPG reinforces GLA planning policy on affordable housing in which it sets the strategic target for half of all homes to be affordable with a threshold approach on individual sites at 35% (GLA, 2017).

Current affordable housing policy requirements therefore necessitates that all developments, irrespective of their height, achieve at least 35% affordable housing in a compliant tenure mix. To be classified as affordable, units must be no more than 80% of the market rate. In this regard, numerous individuals and organisations have highlighted the opportunity for tall buildings to contribute to solving London's housing crisis (Leeson, 2018; NLA, 2020; Price, 2018; Tower Hamlets, 2017). Andrew Southern, chairman of Southern Grove, for instance, believes that affordable residential towers will be the solution to London's housing crisis. As the real estate company behind the 26 storey 100% affordable development 55 West, Southern claims that "everyone must accept that building higher is the only way to generate the numbers of homes required" (Stevens, 2019). Dr Peng Du, Vice President of Academic Affairs & Strategic Initiatives at the Council on Tall Buildings and Urban Habitat, agrees, suggesting that London should view Singapore as an example in how to build "fantastic high-quality residential buildings at an affordable price". Du cites *The Pinnacle*, a social housing development of seven, 50-storey towers linked at the 26th and 50th floors by sky bridges containing communal gardens as a model for London to follow (Cole, 2019).

Nevertheless, with discretion in decision making processes and viability considerations, applications are considered on a case by case basis and therefore may be approved with lower levels of affordable housing if the benefits of a planning application are considered to outweigh any harm caused. A study prepared to inform the then forthcoming review of the new London Plan in 2016 (now the IPLP, 2019a) found a relationship between the on-site affordable housing provision and building height. Using 19 case studies, the *Lessons from Higher Density Development* study (GLA, 2016a) found a negative correlation between affordable housing provision and building height (illustrated in Figure 3). In one case study specifically, the report cited that reduced affordable housing was directly related to the scheme's viability in relation to height.

Often schemes propose the delivery of off-site or payment in lieu (PIL) sums instead of on-site affordable housing. However, this approach has been subject to criticism due to a lack of clarity over contribution calculations as well as the monitoring and use of payments (Saeger & Lowndes; 2016). Stated in the IPLP (2019a), off-site or PIL contributions should only be permitted in exceptional circumstances. Nevertheless, Wainwright (2015) argues that many developers often prefer off-site contributions to reduce costs and maximise profits.

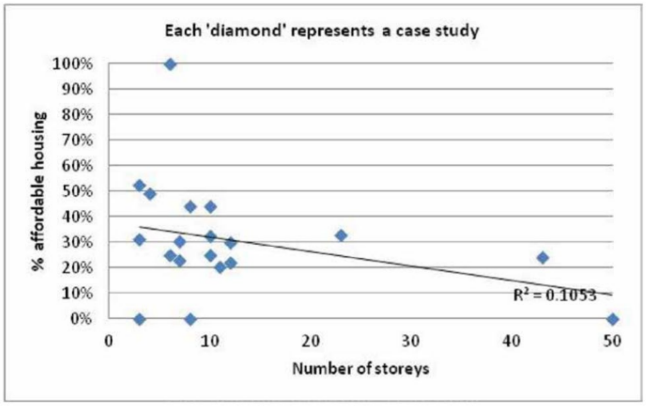

Figure 3: Relationship between affordable housing and height for 19 case studies

(Source: GLA, 2016a)

Similarly, in February 2019 under a Freedom of Information (FOI) request, a Tall Buildings Affordable Housing and Viability for Planning Policy paper was released raising concerns about the low levels of affordable housing in tall buildings due to viability. This paper, produced by a viability expert at the GLA, analysed 20 case studies and found that it was less viable to provide 35% affordable housing in the tall buildings due to their high build costs. This was particularly the case in lower value areas where assumed buildings over 15 storeys were found to be not viable (GLA, 2019b). Nevertheless, these studies only examined a small number of case studies and therefore may not be representative of all applications London-wide. In contrast, this study seeks to examine the relationship using all strategically important applications referable to the Mayor.

Cost of construction

> 'Building height is by far the most significant variable when it comes to build cost'
>
> (Source: Informal interview two)

The relationship in cost economics between building height and cost is widely established and understood with numerous studies and reports highlighting the reduced viability of building tall in comparison to lower-rise developments of the same square footage (Ali and Al-

Kodmany, 2012; Bradley and Bloxham, 2020; Mann, 1992; Sandland, 2011). Early studies examining this relationship reported that tall buildings are more expensive to construct than low-rise buildings of the equivalent floor area (Bathurst and Butler, 1980; Steyert, 1972; Tregenza, 1972). While in 1978, Flanagan and Norman (1978) argued that this linear relationship between height and cost was too simplistic. They argued there were various design variables and that while the cost for some variables increased with height, some decreased (at least initially). A roof for example has a lower cost per square metre of floor area in the two and three storey buildings than a one storey building.

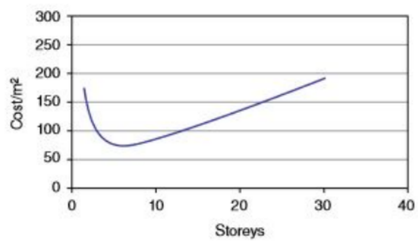

Figure 4: Cost (in £)/m^2 of gross floor area versus number of storeys

(Source: Flanagan and Norman, 1978)

Flanagan and Norman (1978) proposed a U-shaped total cost curve, illustrated in Figure 4, which theorised that costs per gross floor area would fall initially to a height of five to six storeys and then start to rise as the costs most affected by height come into effect. A study completed by Newton (1982) confirmed this observation, albeit concluding that the low point of the U-shaped curve was slightly lower at three storeys.

The relationship between height and cost has also been explored by Picken and Ilozor (2003) using Hong Kong as a case study. On the contrary, this study found that costs per square metre decreased until a height of around 100 metres (or just over 30 storeys) and rose thereafter. The authors acknowledge several factors that could have influenced their results such as that their study was carried out on public housing projects. Nevertheless, these findings suggest the influence of local issues such as workers' wages, material costs, expertise and type of project. The study also proposed that different cost–height relationships may be found in cities where intensive concentrations of tall buildings exist. In testing this theory, Blackman and Picken (2010) carried out a study on Shanghai data. Analysing the cost data for 36 buildings, they found costs per square metre bottoming out at around 24 metres (approximately eight storeys). Illustrated in Figure 5, these findings appear to support the notion that the relationship between height and cost can fluctuate between locations, dependent on the context and commonality of tall buildings.

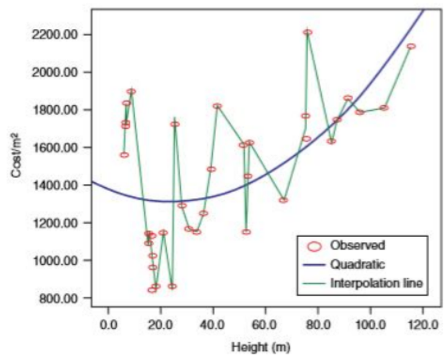

Figure 5: Cost (in ¥)/m² of gross floor area versus height

(Source: Blackman and Picken, 2010)

Elemental costs

In assessing the elemental cost of tall buildings, Ashworth (2004) found that the construction costs of tall structures are greater than those of low-rise buildings offering a similar amount of accommodation. Ashworth (2004) outlines a number of reasons for this including the increased provision of vertical transportation like hoists and cranes, higher costs of provision for building foundations and structural elements, less market competition due to the limited number of building contractors capable of undertaking the work, greater costs associated with fire protection and a greater number of wind loading factors which need to be taken into account and which can increase constructional difficulties.

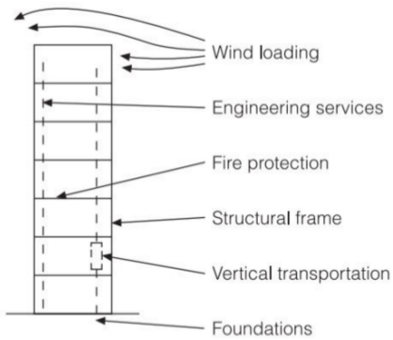

Figure 6: Reasons for the high construction cost of tall structures

(Source: Ashworth, 2004)

Paul Cohen, Partner at EC Harris concluded that construction costs per sq. ft between the 10th and 50th floor increase, on average, by 43% (Knight Frank, 2012), attributing much of this to the increased mechanical and electrical engineering costs as building heights increase. This is particularly apparent at around the 20-30 storey mark, in what Knight Frank (2012) describes as the cost 'step change'. In a study by Ahlfeldt & McMillen (2017), the construction costs per sq. ft of a 50-floor building were found to be about three times that of a 10-floor building, with costs increasing exponentially in height.

Noteworthy studies by AECOM on the economics of tall buildings have also reported that cost of construction for office buildings increases with height (Barton & Watts; 2013; Davis & Watts, 2010). Illustrated in Figure 7, the construction costs per square metre of floor area for a typical high-rise office building was found to be approximately a third higher than a typical low-rise building (Davis & Watts, 2010). In a later study comparing office and residential buildings, Barton & Watts (2013) found that while the shell and core costs were greater in office buildings, when fit-out costs were taken into account, the elemental costs were higher in residential tall buildings (illustrated in Figure 8).

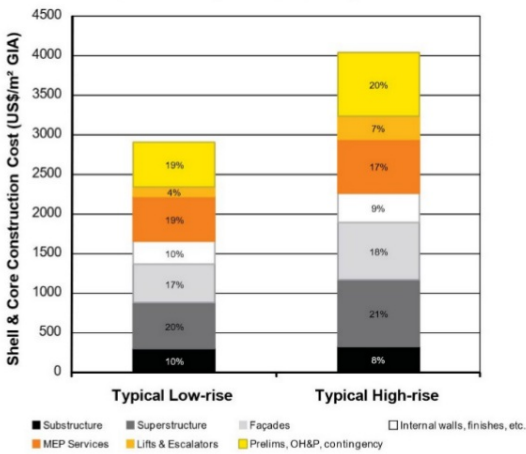

Figure 7: Relative elemental costs for low and high-rise office buildings

(Source: Davis & Watts, 2010)

Shell & Core elements	Typ. residential tower (£/ft² GIA)	Typ. office tower (£/ft² GIA)
Substructure	8	20
Superstructure	33	45
Façades	60	52
Internal walls, finishes & fittings	11	23
MEP services	21	42
Vertical transportation	5	18
Contractor's preliminaries, profit, contingencies	37	50
Sub-total: shell & core costs	175	250
Fit-out costs (developer's standard)	120	27
Total including developer's fit-out	295	277

Figure 8: Typical London office and residential elemental costs compared

(Source: Barton, J. & Watts, S., 2013)

Michael Swiszczowski, director at the architecture practice Chapman Taylor, contends that labour productivity on towers tends to be less than on low-rise developments due to logistical factors and increased health and safety measures (Swiszczowski, 2019). Nevertheless, advances in construction methods and technology are making it increasingly possible to reduce these costs. At the end of the 2019, the global consultancy and construction company, Mace launched 'Jump Factory' as part of their High-Rise Solutions (HRS) system. Due to this new offsite manufacturing approach, Mace contend that they can reduce design and construction programmes on tall building projects by 25%, vehicle movements by 40% and waste by 70% (Mace, 2019).

Design efficiency

Steidl (2015) argues that the key to high-rise design is efficiency. Similarly, Barton & Watts (2013) contend that more than any other metric, the wall-to-floor and net-to-gross ratios are the key to high-rise viability. This is because the percentage of space taken up by the cores and service provision areas are comparatively higher in tall buildings, therefore reducing the usable floorspace. Comparable findings have been highlighted by Mann (1992) in which the net-to-gross ratio and therefore the net usable space in a building was about 70% for high-rise buildings compared to more than 80% for low-rise buildings. Sandland (2011) also proposes that squarer plan buildings are more efficient than irregular plans due to their poorer wall to floor area ratio. As a result, tall buildings are often land-efficient but not floorspace efficient. This means that the effective revenue-generating space is less than in an equivalent lower-rise development.

Figure 9: Key design metrics to optimise viability for tall buildings

(Source: Bradley and Bloxham, 2020)

The layout of dwellings by floor can also be a critical influencer of cost. Barton & Watts (2013) suggest that by maximising the number of dwellings per service core, the shared costs for aspects such as stairs, lifts and other communal areas, is reduced per dwelling. In a study of office buildings, they found that the proportion of saleable space relative to space lost to circulation, structure, and services distribution is reduced with building height. Illustrated in Figure 10, this led to a reduced net to gross efficiency for tall buildings. Ali and Al-Kodmany

(2012) propose that these inefficiencies run the risk of low-quality towers where maximising floorspace is done at the expense of good design. Furthermore, Knight Frank (2012) note that the external envelope costs on a high-rise scheme can account for as much as a quarter of the total bill for the project as the cladding costs increase with height and the building slenderness ratio.

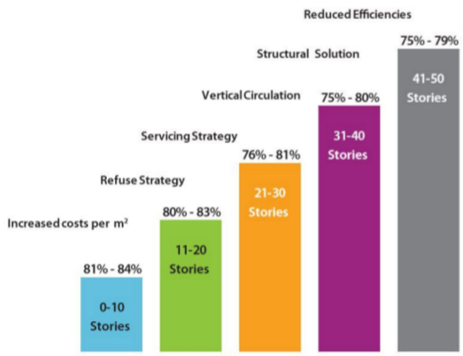

Figure 10: Office low-rise and high-rise efficiency comparison

(Source: Barton, J. & Watts, S., 2013)

Marketability of tall buildings

High construction costs of tall buildings can be offset by the higher market sales values that can be achieved for penthouse suites on the highest floors. Data demonstrates, for instance, that while little premium exists per extra floor for the first 10 floors of taller buildings, there are considerable premiums above the 10th floor where prices per square metre rise by between 1.2% and 2.2% per floor (Three Dragons Turner & Townsend Housing Futures; 2017). Knight Frank's Tall Towers (2012) study proposes that in terms of height, the general rule is the higher the apartment, the greater the price premium. Knight Frank's report suggests that the typical uplift in value per square foot, per floor is 1.5% (this excludes penthouse apartments).

For this reason, the placement of market and affordable units within developments is carefully considered where market units are often located on the upper floors while affordable units are located on lower floors or in adjacent buildings. This is illustrated in Figure 11 of an un-named

34-storey South London tower used in the Three Dragons Turner & Townsend Housing Futures (2017) study. This study concluded that on average, for a wide range of tall building types, there was an 5% uplift in sales values on the 10-15 floors, 10% uplift on the 16-20 floors and 20% uplift on apartments over the 20th floor. Crook et al. (2002) describe how many developers are concerned about the presence of social rented units next to market units impacting on the saleability of market units. An investigation in 2014 by *The Guardian* found that affordable units are often located in the less desirable parts of the site, many with separate entrances or 'poor doors' for the affordable units (Osbourne, 2014).

Figure 11: Sales prices achieved per floor in a 34-storey south London tower

(Source: Three Dragons Turner & Townsend Housing Futures; 2017)

A recent study by the London School of Economics (LSE) into the experiences of high-density living in 14 London residential housing developments found the majority of residents were younger than 40 and lived in one or two bed households (Blanc et al., 2020). Numerous studies have concluded that tall buildings are less suitable for children as well as low income groups (Conway & Adams, 1977; Du, 2015; Gifford, 2007; Newman, 1972; Prezza et al, 2001). Therefore, new tall buildings are often marketed to a different clientele than other typologies.

Funding structure for tall buildings

Securing funding for tall building projects can be more challenging than lower-rise developments. Former head of UK residential research at Knight Frank, Gráinne Gilmore, explains that the funding structure of a tower development is often much more capital intensive than a lateral or low-rise development due to the lack of opportunity for phased completion (Knight Frank, 2012). For this reason, Gilmore describes that tower schemes often only become viable in areas where sales prices are upwards of £800-1,000 per square foot (Knight Frank, 2012). As a result, it is often necessary for developers to secure the sale of at least 30% of units off-plan.

Development and construction strategies also differ between high-rise and lower-rise developments. Kunze (2015) suggests that there is less flexibility in changing the high-rise construction strategy as well as limited scope for phased investment. Kunze (2015) contends that tall buildings expose developers to a higher degree of risk as they do not enable interruption of the construction process without significant costs. On the contrary, Farrell (2017) argues that lower-rise developments such as mansion blocks lend themselves to be built in phases. This typically results in improved funding and delivery options whilst targeting several different markets to spread the risk. Furthermore, construction time for taller buildings can be greatly increased due to more complex logistics and increased travel time for both materials and labour. Sandland (2011) suggests that substructure costs can dramatically increase for taller buildings due to the requirement to support increased vertical and lateral loads.

4. METHODOLOGY

To address the research question and sub-objectives, primary data has been collected on all residential planning applications referable to the Mayor between January 2011 – May 2020. Under the Town and Country Planning (Mayor of London) Order 2008, these applications of potential strategic importance (PSI) include all developments of over 30 metres in height[1] as well as applications with over 150 homes. The data within this study therefore includes every residential application with one or more buildings over 30 metres in height[2] providing a good basis to analyse the levels of affordable housing in tall buildings (shown in Figure 12).

Primary data collection

The study's raw data is located on the London Datastore at https://data.london.gov.uk/dataset/referral-planning-applications-since-2011. Collected as part of a Referable Planning Applications Analysis project[3] to inform the Mayor of the outcomes of the planning service at the GLA, this data has been collated using information from GLA stage 2 reports and LPA committee documents for each planning application. Publicly available on the GLA website, these stage 2 reports can be found on the GLA Planning Application Search.[4]

Figure 12: Location of referable applications

(Source: Author)

[1] This also includes applications of over 25m adjacent to the River Thames and 150m in the City of London
[2] See previous comment
[3] The project has been led by the author of this report
[4] This can be found at https://www.london.gov.uk/what-we-do/planning/planning-applications-and-decisions/planning-application-search

The information compiled has been scrutinised and checked throughout the data collection process to ensure accuracy. Where Mayoral decisions were made before August 2018, application data has been collected by the author of this report. For applications referred to the Mayor at stage 2 since August 2018, data has been entered into a central database by GLA case officers responsible for each case. This has subsequently been accuracy checked. The following key metrics, collected for each application, have been used within this study:

- Number of affordable and market housing units by tenure
- Highest floor count
- Postcode and borough
- Residential density
- Type of application
- PIL contribution
- Decision or recommendation date
- Completion status

In addition, the following metrics have been collected separately from the Referable Planning Applications Analysis project for the purpose of this study. The data collected, listed in Appendix B, includes the following:

- Building typology
- Main use of development
- Value band

Only applications recommended for approval by the Mayor (the *decision date*) are contained within this study with 4th May 2020 considered as a suitable cut-off date for data collection as the last *Mayors Planning Decisions* meeting of what would have been the end of the Mayor's first term. The Mayor's term has since been extended until 2021 due to the global COVID-19 outbreak (Mayor of London and Assembly Elections, 2020).

While PIL contributions for off-site affordable units have been recorded where applicable, this study primarily focuses on on-site residential units that have been granted planning permission. For the purpose of this study, six applications listed in Appendix C were removed from the analysis as they involved the refurbishment or extension of a tall building rather than a new build. Applications with fewer than 10 units, not applicable under the 35% threshold approach, have also been removed. Discounting these, the following analysis was undertaken on 855 residential applications.

Linear regression analysis

It is acknowledged that many factors influence the provision of affordable housing in tall buildings. In particular, the density and size of application may impact on the affordable housing provision, given the interplay between density, size and height. Accordingly, a regression analysis has been used to determine whether these variables play a greater role in determining the affordable housing provision than height. A linear regression analysis for each variable, rather than a multiple regression analysis has been used to avoid overfitting and the potential for multicollinearity.

Measurement of height

For each planning application analysed, the height of the tallest building in floors has been recorded. In applications with multiple buildings, the building with the highest floor count has been used. Given the multitude of different typologies and numbers of the buildings within each planning application, this was the most appropriate metric as to record every building height within each application was not considered feasible in the given timeframe of this study.

Affordable housing metric

Affordable housing has been split into low-cost and intermediate units as defined by the IPLP (2019a). The two methods used to calculate the average affordable housing contribution of applications are outlined below.

Average affordable percentage

The first method determines the average of the affordable housing percentages. This analyses the average affordable housing percentage for a grouped set of applications but does not consider the numbers of residential units within each application. Applications using this method are all treated uniformly, irrespective of the number of units.

Affordable average of total units

The second method analyses the total number of affordable units as a proportion of the total number of residential units. This method considers the total number of affordable units within a group of applications and does not differentiate between applications. Applications with a greater number of units therefore have a greater influence on this average.

Residential values methodology

As London has a large range of market sales values, a set of value bands have been created to differentiate between the higher and lower value areas. These value bands were established in the *Three Dragons' London Plan Viability Study* (2017) in preparation of the IPLP (2019a). Ranging from A to E, these value bands have been derived from an analysis of 2015-2016 Land Registry data and then adjusted to July 2017. Based on recent prices paid for land by floor area, these value bands give an approximate sales value for the different areas of London. Using postcode data of each referable application (using the methodology described in the study), each application has been assigned a corresponding value band for its location (illustrated in Figure 13). As outlined in the *London Plan Viability Study* (2017), several postcode districts were not assigned a value band because of a lack of new build sales data during that period. For these areas and for the purpose of this study, a nearby postcode has been used in its place to provide an approximate sales value and therefore assigned value band. The value bands and postcodes used are listed in Appendix D.

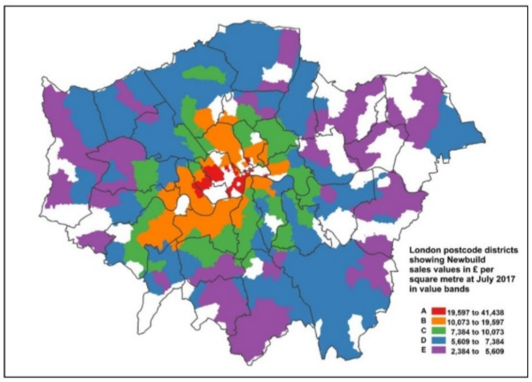

Figure 13: Distribution of sales values by postcode

(Source: Three Dragons Turner & Townsend Housing Futures; 2017)

Density and typologies of referable applications

The complex interplay between density and built form is well known (Berghauser & Haupt, 2004; Carmona, 2014; March, 1972; Martin & March, 1972; Steadman, 2014). To help categorise the different applications, the residential density and typology of each application has been collected as a proxy for the type of development it is. Residential density has been calculated using the site area and total number of units on site as set out in Gordon et al. (2016) and recorded in units per hectare. Each application has also been split into those that are residentially and not residentially-led. Considering only residentially-led applications, enables a more accurate measure of density as seemingly low density mixed-used schemes are excluded.

Figure 14: Typology classification used[6]

(Source: Author)

[5] Cluster typology includes a mix of detached, semi-detached or stacked maisonettes
[6] For examples cited above see Appendix E

A typology classification has been used in addition to the maximum height and site density to further assist in categorising each application. These seven classifications, shown in Figure 14 are based on the characteristics detailed in *Module A* (Optimising Site Capacity: A Design-led Approach) of the Good Quality Homes for All Londoners SPG (GLA, 2020b) illustrated in Figure 15.

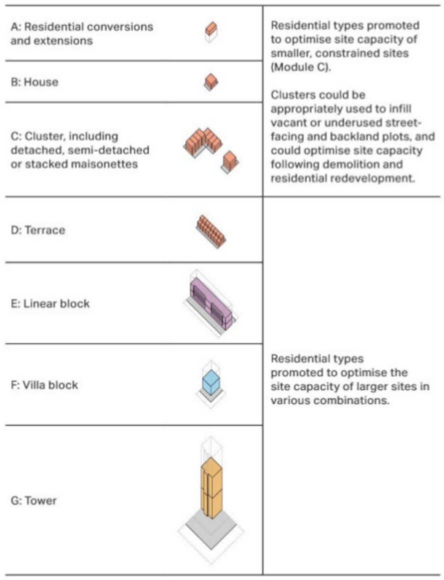

Figure 15: Residential building typologies

(Source: Good Quality Homes for All Londoners SPG)

In determining the typology classification of each application, the following approximations and assumptions were made:

- For developments that include a small proportion of another typology, the majority typology has been used. For example, Ravensbury Estate in Merton has been classified as *terrace* even though it contains a small number of linear blocks as illustrated in Figure 16.

Figure 16: Ravensbury Estate massing

(Source: Design & Assess Statement, LPA ref:17/P1718)

- As per the guidance in *Module A*, courtyard or 'L' shaped blocks have been classified as a variation of a *linear block*, providing they follow the linear block-built form.

- The *tower* typology has been used for standalone tall buildings or multiple tall buildings. For a small number of applications, the *tower* typology has also included applications that include a lower-rise element of the same building. Chesterfield House, illustrated in Figure 17, is one such example.

Figure 17: Chesterfield House massing

(Source: Design and Assess Statement, LPA ref: 15/4550)

- As set out in *Module A*, *tower* and *villa block* typologies can have similar plot coverages but can be differentiated by their height to width ratio. Therefore, for the purpose of this study, typologies over 10 storeys with a height to width ratio of greater than 3:2 have been classified as *towers*.

Type of application

A variety of variables, excluding height, may contribute to differing levels of affordable housing. To identify the variables with the greatest impact, applications have been categorised into the following *types* of development[7]:

- Estate regeneration – These involve the renewal or regeneration of council owned housing estates[8] that may not have needed to factor in land acquisition costs.
- Grant-funded – These are applications that have received grant-funding under the Homes for Londoners: Affordable homes programme 2016-2021 or Affordable Homes Programme 2011-15. Grant funding is allocated following the submission of a successful funding bid and contributes towards affordable housing provision.
- Pocket-living – These are compact living developments, aimed at first-time buyers.
- Mayoral call-in – These are applications that have been called-in by the Mayor under article 7 of the *Mayor of London Order* (2008). Under this article, the Mayor can direct that they become the LPA for an application. Between 1st January 2011 to 4th May 2020, there have been 28 such cases decided at a representation hearing. For these applications, the affordable housing contribution of the final permitted application (as agreed at the representation hearing) has been used. These are included in Appendix A.
- All other types

[7] Where applications fall under multiple types, these have been listed in each.
[8] This also includes estates recently acquired by the private sector

Exhibits and interviews

To support the discussion of the results, four exhibits have been used to emphasize key findings. Two lower-rise and two high-rises with varying levels of affordable housing have been used to demonstrate the key variables impacting the affordable housing contribution. Two informal interviews, listed in Appendix F, were undertaken with leading viability professionals.

Completion Status

Statistics on applications' *completion status* have been compiled using secondary data from the LDD. A collaborative project between the Mayor and London boroughs to monitor planning permissions, this database includes data on the *completion status* for all planning applications across London. Using the LPA reference number for each application, the completion status of each application has been categorised into one of seven groups as defined by the LDD (GLA, 2020d). These are listed below:

- Completed
- Started
- Not started
- Lapsed
- Withdrawn
- Refused
- Awaiting decision

For applications that have been superseded by another or multiple applications, the status of these applications has been determined. Only if all subsequent applications are listed as completed is the initial application deemed to be *complete*. To be categorised as *started*, work must have started on site. However, for developments that comprise multiple buildings, outline applications will not be deemed *complete* until all buildings or parts of the development are complete. *Refused* applications refer to schemes that have been refused, following the Mayors recommendation to approve. This may be due to an unagreed Section 106 (S106) agreement. Uploaded by LPA officers, LDD data has not been fully accuracy checked. A lag in the data entry from boroughs is frequently up to six months and therefore applications recommended for approval after 31st December 2019 have been excluded from this part of the study. Listed in Appendix G, a further 17 applications whose statuses are unknown have been excluded.

Limitations

Data has been collated using several criteria to ensure accurate comparisons can be made between applications. Nevertheless, this has led to several limitations to the dataset as outlined below.

- A residential application has been defined within this study as any application that contains one or more residential unit (use class C3 as defined by the Town and County Planning [Use Classes] 1987 Order. Amended in 2010). For this reason, purpose-built student accommodation, specialist older persons or co-living units are not defined as residential units for the purpose of this study as policy has not always required affordable housing contribution.

- The provision of affordable housing for each application has been measured by units not habitable rooms. While benefits to the collection of habitable room data has been highlighted by Gordon et al. (2016), such as the ability to measure the size of residential units not just the number, the data on habitable rooms for applications before 2016 has been deemed unreliable. For this reason, it has excluded from this study.

- Section 73 applications (including minor amendments or variation of conditions) have been excluded. These 39 applications (listed in Appendix H) have been removed because they entail amendments to an existing application which has previously been assessed at the planning stage. Including these could lead to the potential for double counting of applications as well as difficulty in measuring the level of affordable housing on-site due to whether the overall units or just the uplift in units is accounted for.

- Sizable developments just under the 30-metre height limit with less than 150 homes are not included in this study. This may include many mid-rise blocks that might otherwise be considered tall for their specific location.

- For applications inclusive of a hybrid of outline and detailed permissions, data on the outline permission has been used. The one exception to this is the Canada Water Masterplan (GLA case number: 4373) in which the outline application did not specify the exact number of units.

Ethical considerations

The research undertaken has been conducted using publicly available information which does not disclose any personal information or data. The identity of all interviewees has been kept confidential and their comments have been anonymised. All personal details, data and transcripts were safely and securely stored to ensure confidentiality and integrity. On completion of the dissertation, all personal data will be disposed of as per university guidelines.

5. DISCUSSION AND RESULTS

In examining whether tall buildings are permitted with proportionally less affordable housing as well as being less proficient at delivering this housing than lower-rise developments, the following section provides an insight into applications permitted between January 2011 – May 2020. The heights of these applications are displayed in Figure 18.

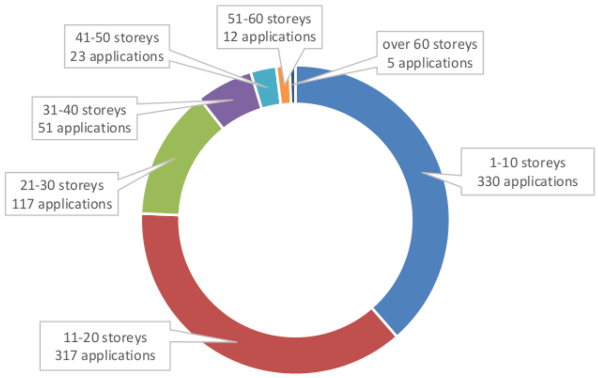

Figure 18: Heights of residential referrals recommended for approval

(Source: Author)

Impact of density and application size on affordable housing

Results from the regression analysis, detailed in Appendix I, indicate that both density and size of application are less deterministic in the provision of affordable housing than height. With a P-value of more than 0.05 (at 0.56) and an R^2 value of 0.03%, the size of applications is not considered significant, nor does it explain the variability in affordable housing provision.

A density P-value of less than 0.05 (at 0.00083) indicates that this variable is a significant determinant of affordable housing. However, this result is less significant than the P-value for height (at 0.000015) which was found to be more significant. In addition, density has both a lower R^2 value (1.3% vs 2.1%) and reduced gradient coefficient (-0.000087 vs -0.00292) than height. Due to the nuances of measuring residential density for mixed-use schemes, two further sets of analysis have been carried out using all applications as well as only those that are residentially-led. The findings, shown in Figure 35 and Figure 36 in Appendix I, display an approximate levelling of affordable housing up to 500 dwellings per hectare (dph) with a decrease thereafter confirming that density by itself is not be the main driver for affordable housing. As schemes of the highest density (over 1000 dph) can, by their very nature, only be delivered through tall buildings on small site areas, these results support the proposition that height is an influencing factor for these high-density schemes.

These results validate that density and the size of applications are not greater determinants of affordable housing than height. Nevertheless, these results emphasise that the relationship between applications and their affordable housing contribution is complex with height alone unable to explain much of the variability in affordable housing provision. The following section sets out to determine some of these variables.

Primary findings of all referable applications

As a starting point, the headline on-site affordable housing contribution has been correlated against the maximum building height for all 855 applications. As illustrated in Figure 19, a negative correlation between the proportion of on-site affordable units and the maximum building height occurs. This trend is similarly illustrated in Figure 20 where applications have been grouped by their height in floors. This analysis reveals that the average on-site affordable housing contribution is highest for developments between 1-10 storeys at 29.1%. A similar level of affordable housing contribution is found in developments between 11-20 and 21-30 storeys with a more noticeable drop in average contributions for developments over 30 storeys. These findings support Knight Frank's (2012) cost 'step change' theory. Applications that did not receive GLA grant funding, as expected, had lower affordable housing contributions.

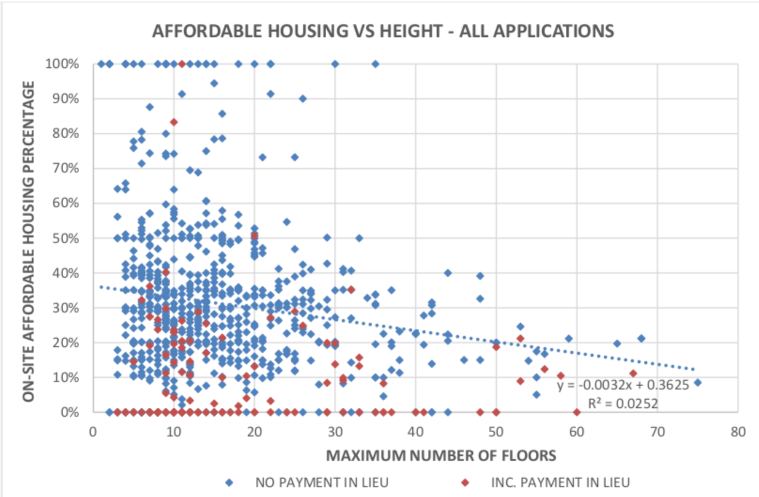

Figure 19: Affordable housing vs highest floor count for all residential applications

(Source: Author)

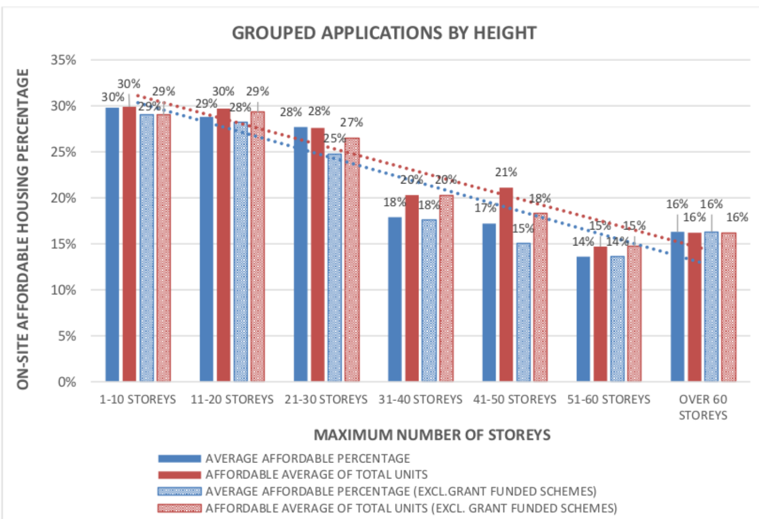

Figure 20: Affordable housing for applications grouped by highest floor count

(Source: Author)

The PIL figures, including average PIL contribution per residential unit, have been outlined in Table 1. These figures indicate that tall building developments (particularly those with the tallest element between 41-60 storeys) offer a greater proportion of off-site rather than on-site affordable housing. Table 1 also demonstrates that while the average affordable percentage for developments up to 30 storeys is similar (as illustrated in Figure 20), the average PIL contribution per unit for 1-10 storey developments is significantly higher than that of 11-20 or 21-30 storeys. If on-site and off-site affordable housing contributions are taken together, the gap between the total affordable housing contribution between the lower-rise (0-10 storey) developments and taller developments (11-20 and 21-30 storey) is greater. This demonstrates again that height is impacting on the affordable housing contribution.

	Average Affordable Percentage	Sum of PIL Financial contributions (in pounds)	Total units	Average PIL contribution per unit
1-10 storeys	29.8%	£364,542,851	79,853	£4,565
11-20 storeys	28.8%	£260,981,294	125,252	£2,084
21-30 storeys	27.7%	£74,306,231	77,975	£953
31-40 storeys	17.9%	£129,840,000	44,984	£2,886
41-50 storeys	17.2%	£108,998,000	18,910	£5,764
51-60 storeys	13.6%	£54,615,157	11,220	£4,868
over 60 storeys	16.3%	£19,250,000	4,007	£4,804
Grand Total	**27.8%**	**£1,012,533,533**	**362,201**	**£2,796**

Table 1: Payment in lieu contributions for applications grouped by highest floor count

(Source: Author)

There are a significant number of lower-rise developments, noticeable in Figure 19, that achieve sub-optimal affordable housing contributions as well as several applications with buildings over 20 storeys that have achieved a high proportion of on-site affordable housing. The overall affordable housing percentage for low-rise applications is however distorted due to numerous Central London applications that involve refurbishment (highlighted in Exhibit 1: 196-222 King's Road, Chelsea). To determine what external variables are impacting on the affordable housing contribution, applications have been categorised by their location, type of application, typology and date of referral.

Affordable housing by location

As sales values of residential units vary considerably across London, the following analysis examines the extent to which affordable housing in tall buildings differ by location. Changes in policy now necessitate 50% thresholds on industrial and public land. However, given that these changes were only brought in during September 2017, an analysis of affordable housing in tall buildings on industrial and public has not been carried out in this study.

Inner vs Outer London

In examining applications with buildings 20 storeys and over, Table 2 reveals that the affordable average of total units is broadly similar in both Inner and Outer London. Given the lower residential sales values in the majority of Outer London (illustrated in Figure 13), these results do not appear to support the notion that affordable housing contributions are lower in lower value areas. Table 2 also illustrates the difference between the Mayoral terms in which applications between 2011-2016, have a 5% lower affordable housing average in Outer London. Whereas, there was no difference between Inner and Outer London for applications between 2016-2020. This suggests a greater weighting and emphasis of affordable housing policy during 2016-2020.

	Inner	**Outer**	**Total**
Boris Johnson (2011 - 2016)	22%	17%	22%
Sadiq Khan (2016 – 2020)	30%	30%	30%
Total	**24%**	**27%**	**25%**

Table 2: 20 storeys and over average affordable housing in Inner and Outer London

(Source: Author)

Affordable housing by value band

Examining the impact of location further, Figure 21 displays the average affordable housing in value bands A to E for applications above 20 storeys. When taken together, a slight decrease in average affordable housing from A to E is shown with the highest average affordable housing contribution in the highest value area (value band A). However, given the low average for application in value band B and the low number of applications with buildings 20+ storeys in value band A (only nine applications), whether tall buildings provide less affordable housing in lower value areas is in-conclusive. These findings differ from previous studies (GLA, 2019b; Three Dragons, 2017) and may indicate that while tall buildings may be unprofitable in some locations where land costs are low, in others, tall buildings in and of themselves may be a sign of economic prosperity to prospective buyers which in turn can lead to increased property values. This trend has been highlighted by Ali & Al-Kodmany (2012). Nevertheless, in an interview (informal interview two) with the co-author of the London Plan Viability Study (Three Dragons, 2017), the interviewee urged caution regarding the assumptions made using value bands data. This is because even in the same postcode, sales values can vary considerably. The interviewee reiterated that value bands were never intended to be used geographically but undoubtably the ability to contribute to obligations relates to value.

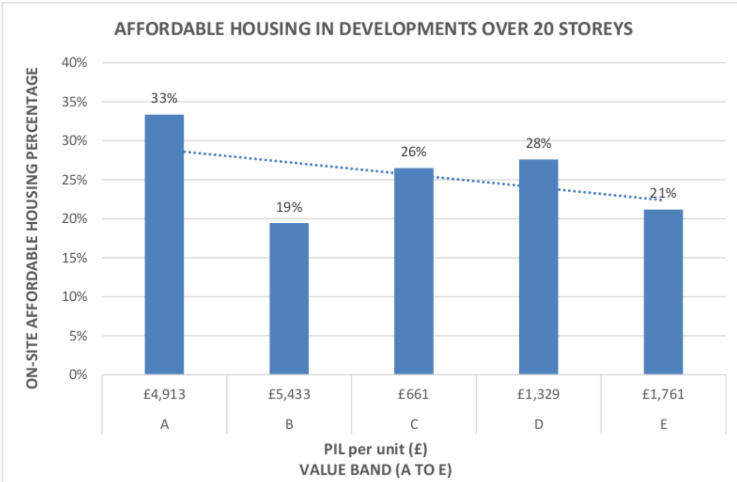

Figure 21: Average on-site affordable housing by value bands

(Source: Author)

Value band	Number of applications	Affordable Units	Total Units	Total payment in lieu	PIL per C3 unit
A	9	678	2,544	£12,500,000	£4,913
B	79	8,409	44,135	£239,768,896	£5,433
C	49	13,369	54,785	£36,220,492	£661
D	76	15,389	53,741	£71,410,000	£1,329
E	24	5,244	19,223	£33,860,000	£1,761

Table 3: Payment in lieu figures by value band

(Source: Author)

EXHIBIT 1: 196-222 King's Road, Chelsea (GLA: 3247a)

Date of stage 2:	**24th November 2015**
Total number of C3 units:	**47 units**
Affordability:	**5 Affordable rent units (11% by unit)**
Maximum height:	**5 storeys**
Site density:	**85 dwellings per hectare**
Value band:	**A**
Typology:	**Villa Block**

Figure 22: 196-222 King's Road, Chelsea

(Source: Cadogan, 2020)

This application is typical of numerous lower-rise Central London applications, with low affordable housing offers, that involve the refurbishment of historic buildings. With 11% affordable housing, the affordable housing contribution is significantly below the 35% threshold required by current planning policy. However, the financial viability assessment attributes much of this to the construction challenges of the retention and refurbishment of the art deco cinema and public house on-site. The constrained site, which is to remain operational throughout led to *abnormally high costs*. While this application does offer £1,653,394 towards the Borough's Community Infrastructure Levy (CIL), it demonstrates the viability implications of restoration projects on the affordable housing contribution.

(Source: 196-222 Kings Road, Financial Viability Assessment (Redact Version), 2014)

Affordable housing over time

Shown in Figure 23, there has been a significant increase in the proportion of affordable housing permitted in tall buildings in recent years (up to 41% in 2019). Reasons for this may include more efficient construction methods and more robust planning policy.

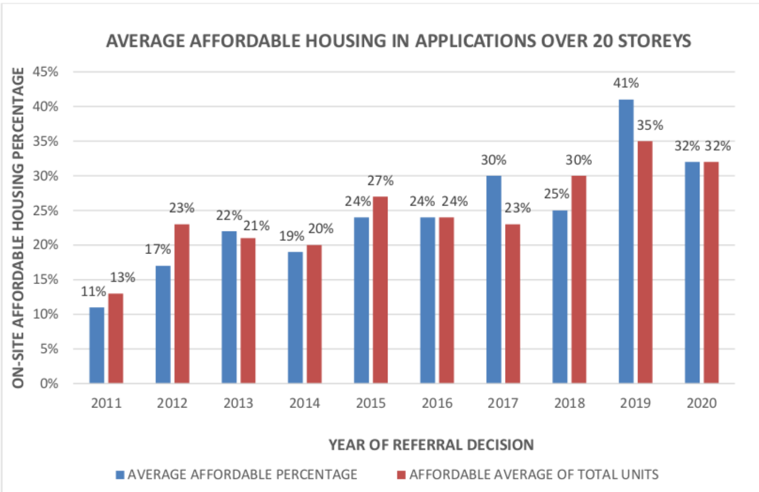

Figure 23: Average affordable housing over time for developments over 20 storeys

(Source: Author)

Additionally, it may also be due to a greater emphasis on affordable housing by decision makers and a change in developer expectation over what is permittable. Figure 24 and Table 2 show an 8% difference between the levels of affordable housing in tall buildings between Mayoral terms. Noticeably, there are also considerably more permissions with no on-site affordable housing during Boris Johnson's Mayoralty. This may reflect changes in planning policy and less emphasis on on-site affordable housing by Boris Johnson. These findings mirror similar increases that are evident across all referable planning applications (GLA, 2019c). Nevertheless, a negative correlation with respect to height exists irrespective of Mayor. Illustrated by Exhibit 2: Ravensbourne Wharf, even applications recommended for approval recently demonstrate underlying viability constraints due to height.

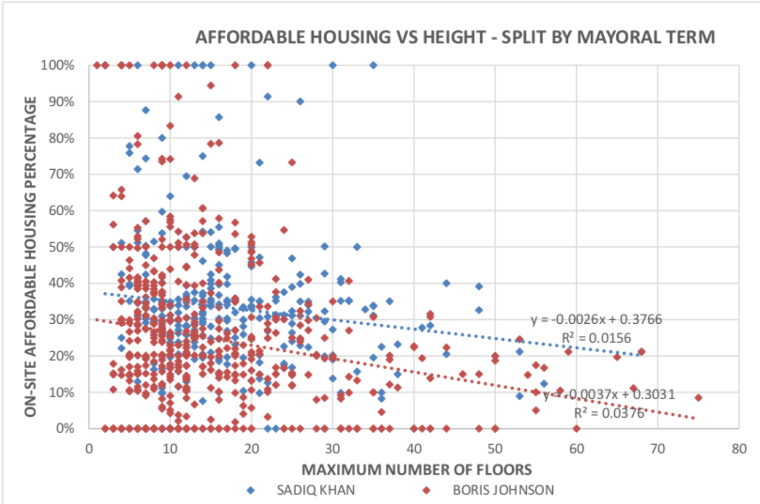

Figure 24: Affordable housing split by Mayoral term

(Source: Author)

EXHIBIT 2: Ravensbourne Wharf, Deptford (GLA: 4634)

Date of stage 2:	**4th May 2020**
Total number of C3 units:	**129 units**
Affordability:	**26 LLR units (20% by unit)**
Maximum height:	**28 storeys**
Site density:	**1084 dwellings per hectare**
Value band:	**C**
Typology:	**Tower**

Figure 25: Ravensbourne Wharf in Deptford

(Source: Craftworks Architects, 2020)

This is an example of a development where the height and design has impacted the viability of the scheme. With 26 intermediate units (all London Living Rent tenure), this 20% affordable housing 28-storey development is considerably short of the 35% target. According to a viability expert interviewed for this study (informal interview one), the height and design of the building led to build costs in excess of £290 per square foot making 20% affordable housing the maximum viable. This compares to a build cost of £260 per square foot for most mid-rise blocks. These viability constraints were highlighted in the decision letter published along with the GLA report stating:

"It is disappointing that the construction costs associated with the design and height of the building, alongside the inefficient building layout, undermine the delivery of affordable housing on this site."

(Source: Ravensbourne Wharf GLA Stage 2 decision letter, 2020c)

Affordable housing by type

Product type

To determine the relationship between different types of applications and their affordable housing contribution, applications have been organised into five 'types' of applications. Illustrated in Figure 26, the category with the highest proportion of affordable housing are pocket-living schemes with between 70-80% of units classed as affordable. With a R^2 value of close to 95%, there is a high level of predictability in the regression line shown. However, this type of application has been subject to numerous criticisms regarding the size of units as the majority of flats are only just above the minimum London Plan space standards of 37 square metres. This is 9 square metres smaller than the average one-bedroom dwelling (Borland, 2018; McKenzie, 2017; Williams, 2018). These homes are also all intermediate units, on the cusp of what is considered an affordable unit within the London Plan, at only 20% discount market value (GLA, 2016b). There is nevertheless, a slight decrease of affordable housing with increased height.

Estate regeneration schemes have the next highest proportion of affordable housing followed by applications that have received grant funding. Notably, the near horizontal trendline (regression line) of grant funded applications, displayed in Figure 26, illustrates that taller developments that receive grant funding do not, on average, decrease in affordable housing as much as other applications with respect to height. With pocket living, estate regeneration, grant funded and Mayoral call-ins taken out, Figure 26 illustrates that the gradient of the trendline for the remaining applications steepens. This demonstrates that when these types of applications are excluded, the average proportion of affordable housing is lower and declines steeper with height.

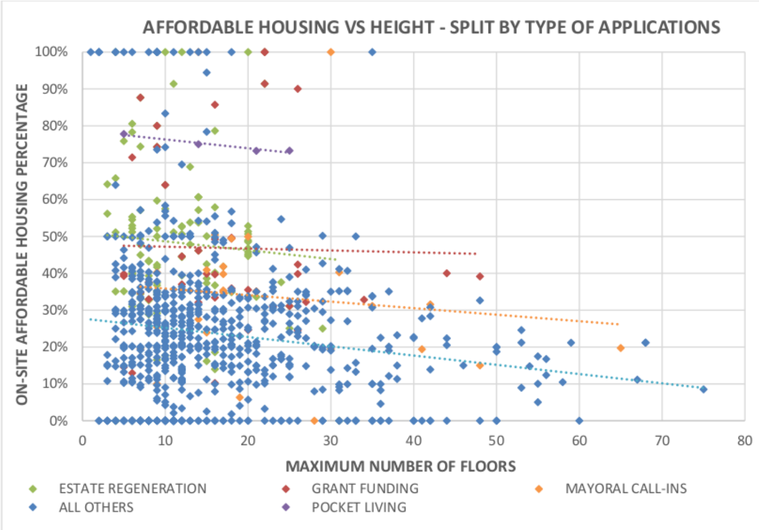

Figure 26: Affordable housing split by type of application

(Source: Author)

<u>Main use class</u>

Noted by Healey et al. (1996), the negotiation of planning obligations is frequently used as a mechanism to make a development proposal acceptable in planning terms. Given this, the following analysis reviews whether the provision of affordable housing varies between residential and non-residential developments. In circumstances where funding structures are driven by other non-residential applications, affordable housing contributions may be used as a form of planning gain which will assist in achieving planning permission.

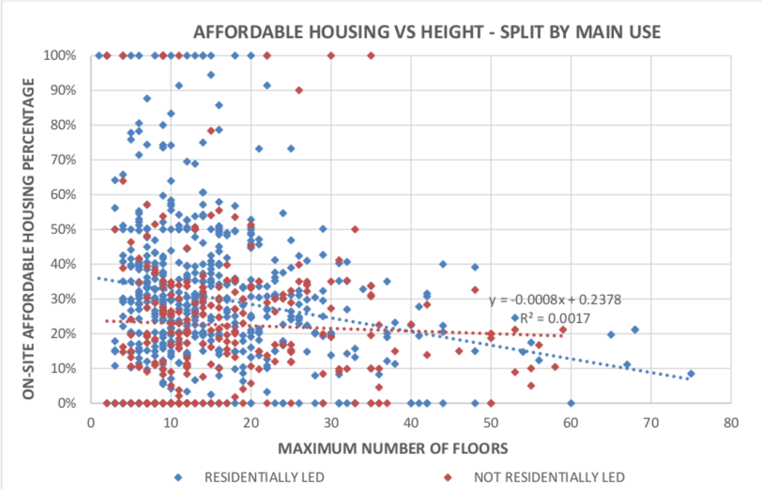

Figure 27: Affordable housing split by main use

(Source: Author)

Figure 27 demonstrates that this may be occurring in the provision of affordable housing in tall buildings. For instance, the affordable housing trendline in applications that are not residentially-led is much shallower than that of residentially-led applications. This may be because profits are generated by a non-residential use such as hotels, offices or student accommodation. Subsequently, these uses may have been used to fund on-site affordable housing within a development. In fact, four out of six of the tallest applications with affordable housing over 90% had a main use class that wasn't residential C3 units (detailed in Appendix J). For instance, Carpetright Site, the tallest application with 100% affordable housing (67 units), also includes 682 Purpose-Built Student Accommodation units (PBSA) of which only 76 were affordable. If taken altogether, these combined units would equate to affordable percentage of only 17.3% by units. Another example has been illustrated by Exhibit 3: Kensington Forum. Furthermore, the remaining four applications all secured grant funding which contributed to their high affordable housing contribution. The stage 2 report for the Station Square West development, for instance, notes that the application is 35% without GLA grant funding and 91% with[9].

[9] Information on individual applications can be found on the GLA planning application search.

EXHIBIT 3: Kensington Forum, Kensington (GLA: 4266)

Date of stage 2:	**5th November 2018 (Mayoral call in 21st June 2019)**
Total number of C3 units:	**62 units**
Affordability:	**62 affordable rented units (100%)**
Maximum height:	**30 storeys**
Site density:	**82 dwellings per hectare**
Value band:	**A**
Typology:	**Tower**

Figure 28: Kensington Forum Hotel, Kensington

(Source: SimpsonHaugh and Partners Architects, 2020)

At 30 storeys, this development is one of the tallest developments offering 100% affordable housing. However, under further investigation there are several factors to consider with respect to this application. This application proposes a 749-bedroom hotel, 340 serviced apartments and 62 affordable rented units. Designated as use class C1, hotels and serviced apartments are not required to provide affordable housing contributions, yet, can be sold at market rates. If the serviced apartments and residential units are considered together, this would equate to an affordable housing percentage of 15.4%. Additionally, 51 of the 62 units are two-bedrooms or smaller. Called-in by the Mayor with 46 units at stage 2 with only 20 affordable units (11 social rent and nine shared ownership) this case also demonstrates the influence of the Mayoral call-in process.

(Source: Kensington Forum Hotel GLA stage 3 report, 2019)

Affordable housing by typology

Using the seven typologies, specified in the *Density and typologies of referable applications* section, the following section summarises the affordable housing contributions by application typology. The results, illustrated in Figure 29, display that the *tower* typology has the lowest level of affordable housing contribution (at 20%). This is followed by the *cluster* typology (at 25%) and *mixed typology with tower* (at 26%) when measuring the affordable average of total units. Notably, these typologies have the highest and lowest residential density averages at 701, 26 and 307 dph respectively, suggesting that developments with very high or very low densities achieve sub-optimal affordable housing contributions. The typology with the highest proportion of affordable housing is the *terrace* typology (at 33% and 38% dependant on how affordable housing is measured) followed by *linear block.* Illustrated in Figure 30*,* the proportion of low-cost units is also the lowest in the *tower* typology. These findings, exemplified by Exhibit 4: 79 Camden Road, indicate that mid-rise developments commit to a proportionally higher level of affordable housing than high-rise.

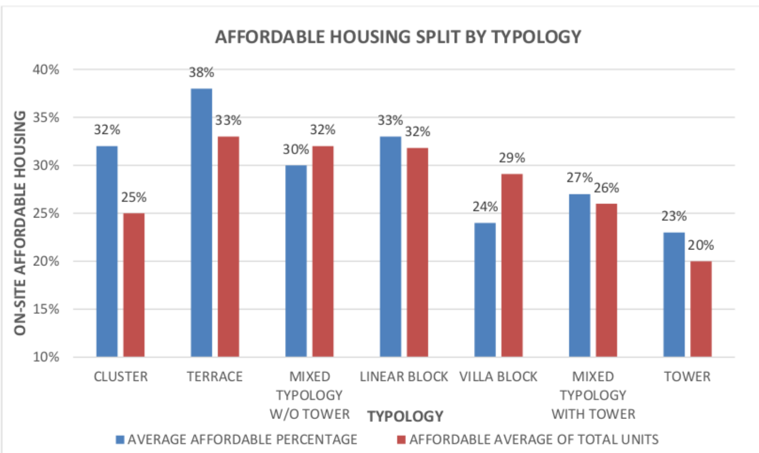

Figure 29: Affordable housing split by typology

(Source: Author)

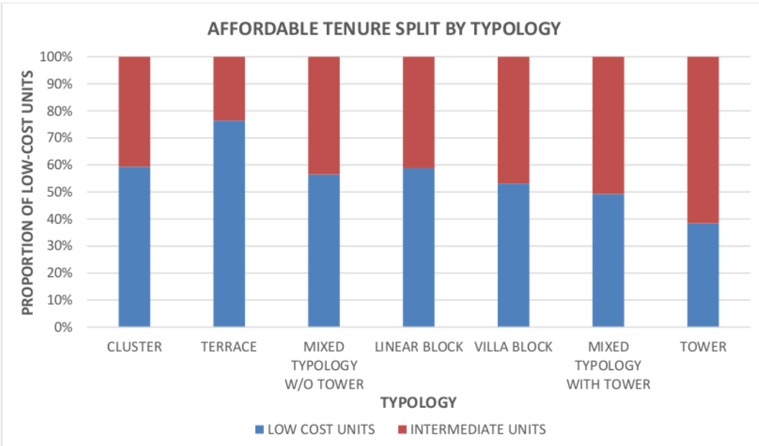

Figure 30: Affordable tenure split by typology

(Source: Author)

Typology	Average residential density (dph)	Total low-cost units	Total intermediate units	Payment in lieu per C3 unit
Cluster	26	410	281	£379
Terrace	54	858	265	£3,846
Mixed typology w/o tower	158	10,881	8,385	£2,681
Linear block	215	6,245	4,381	£699
Villa block	257	2,917	2,573	£16,639
Mixed typology with tower	307	23,816	24,550	£1,259
Tower	701	2,734	4,393	£6,611

Table 4: Affordable housing contributions split by typology

(Source: Author)

A further breakdown of the *tower* typology is illustrated in Figure 31. This graph displays the levels of affordable housing in towers ranging from 10 storeys to over 60 with a noticeable decrease in towers above 30 storeys. These findings appear to support Knight Frank's (2012) notion of a step change in which the cost of construction significantly increases above 30 storeys. In contrast, a small increase in affordable housing contribution in towers over 60 storeys was found. These five applications are listed in Table 15 of Appendix K, revealing that the combined affordable housing contribution was only 709 units.

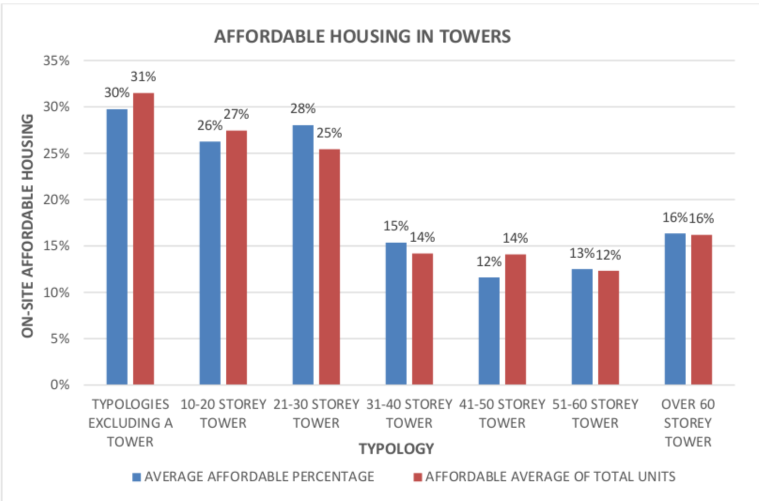

Figure 31: Affordable housing in towers split by tower height

(Source: Author)

EXHIBIT 4: 79 Camden Road, Camden (GLA: 3224)

Date of stage 2:	**9th April 2014**
Total number of C3 units:	**164 units**
Affordability:	**38 shared ownership/44 affordable rent (50%)**
Maximum height:	**7 storeys**
Site density:	**390 dwellings per hectare**
Value band:	**B**
Typology:	**Linear Block**

Figure 32: 79 Camden Road, Camden

(Source: Sheppard Robson Architects, 2020)

Proposing 50% affordable housing at a 54/46 split in favour of low-cost rent, this development is an example of an application that achieves a high level of affordable housing. At seven storeys and 390 dph, it is also an example of a dense mid-rise development. The case study indicates that combining both a mid-rise typology and optimal plot ratio may provide the best conditions to achieve high levels of affordable housing.

(Source: 79 Camden Road GLA Stage 2 report, 2014)

Completion status findings

Using *completion status* data for each application, the following section examines the relationship between height and delivery. The relationship between these two variables is displayed in Figure 33 illustrating that fewer high-rise developments are being completed. While the proportion of completed 1-10 storey applications stands at 39%, the proportion decreases to 17% for 21-30 and 0% for developments over 51 storeys. Conversely, the combined proportion of applications *not started* or *lapsed* increases with height.

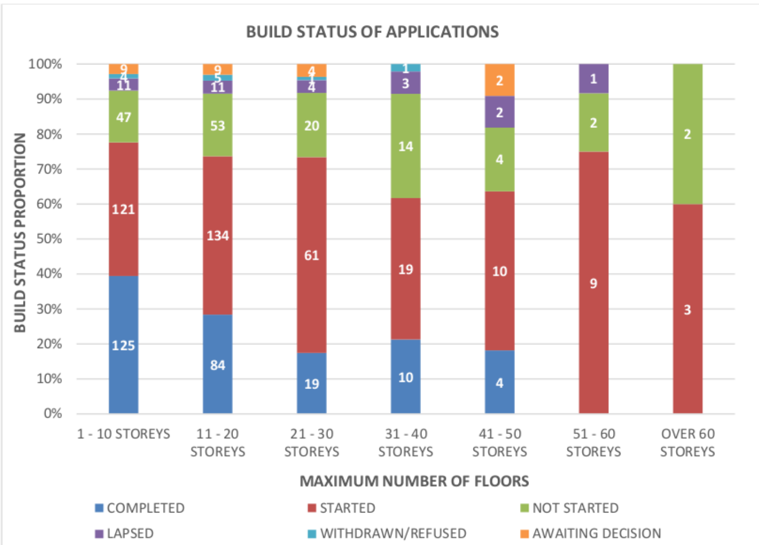

Figure 33: Status of applications grouped by highest floor count

(Source: Author)

These results validate that applications with taller buildings are proportionally less likely to be *completed* and more likely to have *lapsed,* been *withdrawn/refused, not started* or *awaiting a decision*. Nevertheless, the proportion of applications *started* in Figure 33 does not decrease with building height. One reason for this may be due to the multifaceted definition of applications that have *started.* As defined by LDD:

> *"Work is **'started'** when any aspect of the work detailed in the approved planning permission has begun. This may only mean that demolition has occurred or that work has been done on laying out the site. It does not imply that every element of the proposed development has begun or even that there is obvious evidence that the proposed works are underway. Once a planning permission is started, it can no longer lapse even if work on the development is halted."*

Permissions listed as *started* may therefore include applications where demolition has occurred, but commencement of new buildings has not. In addition to the analysis above, the influence of density and application size on the completion status has also been examined. This investigation confirmed that density is not a greater determinant of the completion status than height (see Appendix L) but that the size of application does correlate with completion status. This relationship is understandable given the lengthy build-out rates of large permissions. This highlights the complex relationship where completion status is not only correlated with building height but also application size.

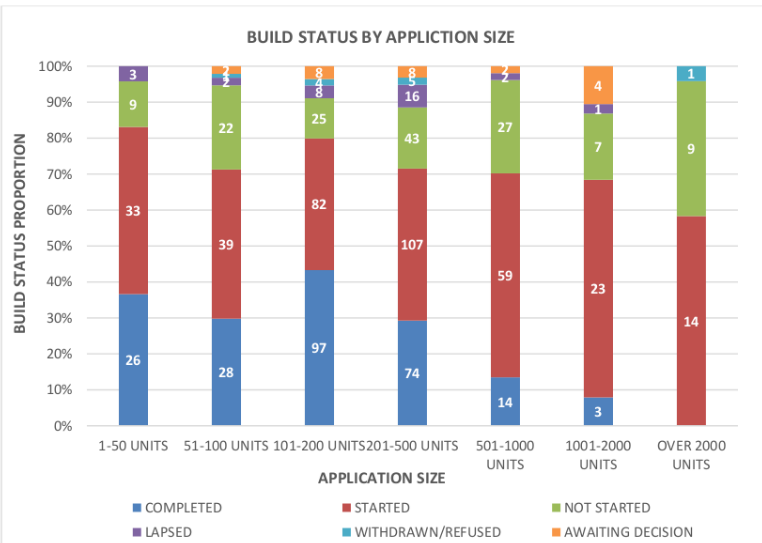

Figure 34: Analysis of build status by application size

(Source: Author)

6. REFLECTION ON SHORT COMINGS TO RESEARCH

Numerous shortcomings have been identified within this study. Firstly, while tall building viability concerns have been expressed in cities such as Birmingham by Bradley and Bloxham (2020), having analysed only London's referable applications to the Mayor, it is not possible to confirm whether the relationship between height and affordable housing is more widespread. The use of 2017 value band data may also have led to inaccurate sales values assumptions. Numerous data sources and literature have also not been available due to the COVID-19 pandemic as well as this affecting the number and scope of interviews.

Additionally, data collected did not include information on developer, landowner or identified business models (except for Pocket-Living). Data collected by The Bureau of Investigative Journalism (Mathiason et al., 2013) found repeated examples of specific housebuilders and property consultancies using economic viability assessments as a way to significantly reduce the number of affordable homes. This study cannot confirm whether a relationship exists in this respect as it was not feasible to collect this data in the given timeframe. Lastly, this analysis only considered applications that progressed to a Mayoral recommendation. This is a subset of all applications of which many did not reach the Mayoral decision stage for one reason or another.

7. CONCLUSION

This study set out to determine the relationship between the height and proportion of affordable housing and whether tall buildings in London are less proficient at providing affordable housing than lower-rise alternatives. Key findings from this study confirm there is a negative correlation between building height and on-site affordable housing for London's referable applications between January 2011 – May 2020. While the average affordable percentage is 30% in applications of 10 storeys and less, less than 18% is provided in applications over 30 storeys. Noticeable reductions in affordable housing contributions were also found in applications of a tower typology.

Several factors found to impact affordable housing were the main land-use of applications and decision date. Most notably, the proportion of on-site affordable housing has increased with respect to time (from 11% in 2011 to 32% for the first 3 months in 2020). These findings indicate that strengthened affordable housing and viability planning policy since 2017 as well a greater emphasis on affordable housing by the current Mayor has impacted on the levels of affordable housing in tall buildings. Mayoral call-ins and grant funded applications have also permitted higher levels of affordable housing in tall buildings, demonstrating their influence. The main land-use of applications was found to reduce the correlation between affordable housing and height. Little correlation was found between the affordable housing contribution and location. However, inaccurate or out of date sales values data may be a causal factor in this result. On the contrary, lower-rise applications were found to have a higher proportion of affordable housing provision. This was particularly evident in *terraced* and *linear block* developments.

With a negative correlation found between building height and the delivery (completion) status, the findings from this study demonstrate that tall buildings are much less likely to be completed. Applications with a maximum height of 10 storeys or less were found to be *completed* more often while tall building applications were more likely to have *lapsed,* been *withdrawn/refused, not started* or *awaiting decision*. Results examining the correlation between application size and built status do however confirm the potential influence of this variable. This indicates a more complex relationship where the size of application has a significant impact on the completion status as well.

Recommendations and implications

Based on these findings, this study sets out several recommendations and implications.

- Recommendation 1: Planning policy when applied firmly results in a greater proportion of affordable housing being permitted in tall buildings. This study reaffirms the importance of strong affordable housing policy and recommends consistent application of these policies.

- Recommendation 2: Planning policy in London should recognise the influence of height and typology in the provision of affordable housing. As indicated by this study's findings, prioritising low to medium-rise developments may increase both the proportional contribution and completion of affordable housing in London, while designing in a contextual approach. This understanding could be used at the plan-making stage and in the capacity and allocation of sites.

- Recommendation 3: Given the implications of height on affordable housing, further guidance on delivering low to medium-rise developments should be published promoting this type of development. While guidance could be provided on tall buildings, given the underlying viability constraints, this may result in lower affordable contributions and rates of delivery than developing lower-rise alternatives.

- Recommendation 4: Further work should be carried out to examine this relationship between height and affordable housing provision including its influential factors. This could include investigating the relationship in other UK cities. An in-depth study into the impact of benchmark land values and sales values would also be beneficial.

This study exposes the implications of building tall on affordable housing contribution. At a time when the need for affordable housing is increasingly evident, it is critical that policy makers recognise the impact of building height on affordable housing so more equitable decisions can be made. With this understanding, London stands a greater chance of delivering the affordable homes it needs.

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9. APPENDICES

APPENDIX A. MAYORAL REPRESENTATION HEARING APPLICATIONS

Below is a list of the applications that have been decided at a Mayoral representational hearing between May 2016 – May 2020

Site name	LPA	LPA decision date	GLA case number	Total number of units at representation hearing	Height (floors)	Reason for refusal relating to height	Representation hearing date
Former Biscuit Factory and Bermondsey Campus	Southwark	06-Feb-19	3776a	1548	35	Refused on grounds other than height	21-Feb-20
100 West Cromwell Road	Kensington and Chelsea	30-May-19	4810	462	29	Building 2, due to its excessive height, scale and poor visual relationship when seen in the background of views of the Grade I listed St Cuthbert's Church and from the Grade II* listed Brompton Cemetery arcade, of Grade I Registered Brompton Cemetery, would harm the setting of these heritage assets.	03-Feb-20
Kidbrooke Station Square	Greenwich	16-Jul-19	3757a	619	20	The proposed development, by reason of its excessive height, scale and bulk, would form a visually dominant element that would be visible over the largely intact skyline of the Blackheath Conservation Area.	31-Oct-19
9, 11 & 19 Osiers Road, Wandsworth Riverside	Wandsworth	25-Apr-19	4558	168	14	The proposed development by reason of its scale, siting, massing, and layout would be an inappropriate and unneighbourly development, resulting in an unduly dominant proposal.	18-Oct-19
Pentavia Retail Park, Mill Hill	Barnet	25-Oct-18	3756a	844	16	The proposed development, by virtue of its excessive height and scale would represent an over development of the site resulting in a discordant and visually obtrusive form of development.	25-Jul-19
Holiday Inn, Kensington Forum Hotel	Kensington & Chelsea	27-Sep-18	4266	62	30	The height and massing of the proposed development, including an additional tower, would cause less than substantial harm to the character and appearance of nearby heritage assets, especially in nearby views.	21-Jun-19

VIP Trading Estate and VIP Industrial Estate, Charlton	Greenwich	09-Jul-18	3800	771	10	Due to the excessive height of the buildings, together with their massing and design, the proposed development would result in the overdevelopment of the site and would fail to adhere to the vision for the redevelopment of the area set out in the Charlton Riverside SPD 2017.	29/01/2019 (Refused)
1A & 1C Eynsham Drive, Abbey Wood	Greenwich	09-Jul-18	4295	272	17	The proposed development represents overdevelopment of the site by reason of its density, height, scale and massing, and would fail to complement the character and appearance of the street scene.	07-Dec-18
Beam Park, Dagenham and Rainham	Havering	05-Apr-18	2933a	3000	16	The proposed development, by reason of its overall height would result in a development which would be out of character with the area.	28-Sep-18
Newcombe House	Kensington and Chelsea	31-Jan-18	3109a	55	17	The height of the tall building would be significantly taller than the existing building and the surrounding townscape at a very high land point in the borough. The architecture of the proposed tall building would be of insufficient high design quality and would not have a wholly positive impact on the townscape.	18-Sep-18
Citroen Site, Capital Interchange Way, Brentford	Hounslow	16-Feb-18	4279	441	18	The proposed buildings, by virtue of their location, scale and design, would not enhance the quality of the built environment and would cause serious harm to the significance of a range of designated heritage assets including listed buildings and conservation areas, as they would appear as overly tall bulky elements.	20-Jul-18
Homebase, Swandon Way, Wandsworth	Wandsworth	26-Apr-17	3537a	385	17	The proposal, by reason of the height, scale and massing of the Station Building, would result in an inappropriate form of development for the site which would fail to respond to or integrate with the surrounding townscape.	17-Oct-17
National Institute for Medical Research (NIMR),	Barnet	22-Feb-17	3967	460	9	Refused on grounds other than height	06-Oct-17
Palmerston Road	Harrow	16-Nov-16	3825	186	17	The proposal would be an overdevelopment, with excessive and overbearing height, bulk, mass, scale and intensity, to the detriment of local character and amenity.	10-Mar-17

Hale Wharf, Tottenham Hale	Haringey	1-Nov-2016	1239a	505	21	The proposed development by virtue of its overall height, design and visual impact would fail to respond positively to the surrounding context, resulting in an overly large and discordant mass, detracting from the openness and character of the adjacent Lee Valley Regional Park, Green Belt, and the area generally.	10-Mar-17

Table 5: Mayoral call-ins between May 2016 – May 2020

(Source: Author)

Below is a list of the applications that have been decided at a Mayoral representational hearing between January 2011 – April 2016

Site name	LPA	GLA case number	Total number of units at representation hearing	Height (floors)	Representation hearing date
Wimbledon Greyhound Stadium	Merton	3130b	602	9	19/08/2016
Alpha Square	Tower Hamlets	3473a	634	65	27/04/2016
Westferry Printworks	Tower Hamlets	3363	722	30	27/04/2016
Blossom Street	Tower Hamlets	2656b	40	14	18/01/2016
Trocoll House	Barking and Dagenham	2624a	198	28	11/12/2015
56-70 Putney High Street	Wandsworth	3512	97	7	27/10/2015

Land north west of the Royal Mail Sorting Office	Islington/Camden	3032a/b	681	15	03/10/2014
City Forum, 250 City Road	Islington	2234a	995	42	01/04/2014
Convoys Wharf	Lewisham	0051c	3500	48	31/03/2014
Southwark Free School, 399 Rotherhithe New Road	Southwark	3060	158	19	19/12/2013
Eileen House, Newington Causeway	Southwark	1100a	335	41	19/11/2013
Holy Trinity Primary School	Hackney	3067	101	10	18/11/2013
Saatchi Block	Camden	2646	55	9	19/09/2011

Table 6: Mayoral call-ins between January 2011 – April 2016

(Source: Author)

APPENDIX B. RAW DATA COLLECTED

<table>
<tr><th>GLA Case Number</th><th>Value band</th><th>Main use class (Residentially-led, not residentially-led)</th><th>Typology</th></tr>
<tr><td>1679b</td><td rowspan="39">A</td><td rowspan="34">Not residentially-led</td><td rowspan="24">Villa block</td></tr>
<tr><td>4035</td></tr>
<tr><td>3981</td></tr>
<tr><td>4001</td></tr>
<tr><td>3619a</td></tr>
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<tr><td>3247a</td></tr>
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<tr><td>3373</td></tr>
<tr><td>1594c</td></tr>
<tr><td>3280</td></tr>
<tr><td>2655a</td></tr>
<tr><td>1548b</td></tr>
<tr><td>1561a</td></tr>
<tr><td>2393a</td></tr>
<tr><td>2750a</td></tr>
<tr><td>2655</td></tr>
<tr><td>4266</td><td rowspan="3">Tower</td></tr>
<tr><td>3440</td></tr>
<tr><td>2849</td></tr>
<tr><td>3102</td><td rowspan="3">Mixed typology with tower</td></tr>
<tr><td>2713</td></tr>
<tr><td>1717</td></tr>
<tr><td>3354</td><td rowspan="4">Mixed Typology without a tower</td></tr>
<tr><td>2278a</td></tr>
<tr><td>2277a</td></tr>
<tr><td>2499</td></tr>
<tr><td>3243</td><td rowspan="7">Residentially-led</td><td>Terrace</td></tr>
<tr><td>1317g</td><td>Linear block</td></tr>
<tr><td>3935</td><td rowspan="5">Villa block</td></tr>
<tr><td>4071</td></tr>
<tr><td>3146a</td></tr>
<tr><td>3188d</td><td rowspan="2">A</td></tr>
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<tr><td>3162</td></tr>
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<tr><td>0824a</td></tr>
<tr><td>2501a</td></tr>
<tr><td>2742</td></tr>
<tr><td>3444</td><td rowspan="4">Tower</td></tr>
<tr><td>2819</td></tr>
<tr><td>1317j</td></tr>
<tr><td>1317h</td></tr>
<tr><td>4810</td><td rowspan="10">Mixed typology with tower</td></tr>
<tr><td>3716</td></tr>
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<tr><td>3032a</td></tr>
<tr><td>1640b</td></tr>
<tr><td>2747</td></tr>
<tr><td>1011c</td><td rowspan="8">B</td><td rowspan="8">Not residentially-led</td><td rowspan="4">Linear block</td></tr>
<tr><td>4161a</td></tr>
<tr><td>3417</td></tr>
<tr><td>1419b</td></tr>
<tr><td>4115</td><td rowspan="4">Villa block</td></tr>
<tr><td>4350</td></tr>
<tr><td>4158</td></tr>
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4240	B	Not residentially-led	Villa block
2723			
3073			
2646			
1288c			Tower
4623			
4395			
1024a			
3802			
2211b			
3857			
3993			
2106a			
3813			
0386c			
2000b			
2014a			
3346			
3120			
2193a			
2894			
2130a			
2270			
3974b			Mixed typology with tower
4580			
3654			
4428			
4219			
1167d			
3537a			
3880			
3711			
2858	B		
3131b			
3307			
3066			
2826a			
3231			
3131			
2885			
2818			
3004			
0935b			
2540b			
1772a			
2817			

<table>
<tr><td>2826</td><td rowspan="46">B</td><td rowspan="17">Not residentially-led</td><td rowspan="7">Mixed typology with tower</td></tr>
<tr><td>2388a</td></tr>
<tr><td>2504a</td></tr>
<tr><td>2739</td></tr>
<tr><td>2472</td></tr>
<tr><td>1964a</td></tr>
<tr><td>0043d</td></tr>
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<tr><td>3395</td></tr>
<tr><td>2656b</td></tr>
<tr><td>1759a</td></tr>
<tr><td>3087</td></tr>
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<tr><td>2733</td></tr>
<tr><td>2764</td></tr>
<tr><td>1445b</td></tr>
<tr><td>4425</td><td rowspan="29">Residentially-led</td><td rowspan="23">Linear block</td></tr>
<tr><td>4221a</td></tr>
<tr><td>4152</td></tr>
<tr><td>2253b</td></tr>
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<tr><td>1476c</td></tr>
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<tr><td>2688</td></tr>
<tr><td>0066a</td></tr>
<tr><td>1476b</td></tr>
<tr><td>1366c</td></tr>
<tr><td>2690</td></tr>
<tr><td>0447b</td></tr>
<tr><td>5097</td><td rowspan="6">Villa block</td></tr>
<tr><td>3608a</td></tr>
<tr><td>2306d</td></tr>
<tr><td>4558</td></tr>
<tr><td>4110</td></tr>
<tr><td>3904</td></tr>
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3997	B	Residentially-led	Villa block
3608			
3666			
3658			
3186b			
3437			
3512			
3454			
3419			
3213			
2214b			
2267c			
3883			Tower
4271			
4370			
3066c			
3369a			
3819			
3752			
3570			
3764			
2404b			
3504			
3500			
3384			
3369			
3300			
3329			
3334			
3072			
3139			
0039a			
1721b			
2930			
2874			
0957f			
1100a			
2510b			
4534			Mixed typology with tower
2779b			
3456a			
4803			
3782b			
3596b			
3109a			
3456			

3770	B	Residentially-led	Mixed typology with tower
3672			
0198b			
3291			
3099b			
3246b			
3596			
2456b			
3550			
3145			
3377			
1772b			
3328			
3286			
3246			
3063			
3250			
2975			
2234a			
3209			
2942			
2675a			
1439b			
1519a			
2935			
2854			
2694			
2782			
2588			
0447b			
2510			
2406			
4251			Mixed Typology without a tower
3832			
3609			
3493			
3433			
3127			
1011a			
3094a			
2997			
2253			
2695			
0833a			
3617	C	Not residentially-led	Linear block
4094a			

3197a			
3849			
2489b			
3126a			
3126			
3241			
4094			
4131			
3945			Villa block
3738			
2924b			
3778a			
1046g			Tower
3696			
4067			
3848			
3400			
3673			
3487			
1668b			
2232b			
0519q			
3535			
2208e			Mixed typology with tower
0704d			
2833a			
0797b			
3111a			
1728			
2469a			
2795			
2676			
0612c			
3477			
3657			
3130b			
2917			
3293			
3266			Mixed Typology without a tower
2752			
2887			
2658	C		
2773			
2619a			
3206a			Terrace
3852d			Linear block

2973a	C	Residentially-led	Linear block
4169			
3907			
4078			
3852a			
3683			
3536			
2060c			
3548a			
3172			
0783d			
3506c			
3095			
3265			
3197			
3170			
3041			
1496c			
2149a			
3082			
2920			
2650a			
2200a			
0783a			
3867			Villa block
3814a			
4488			
4105			
4126			
3969			
3244a			
3364			
3427			
2792a			
3067			
2832			
2803			
4634			Tower
4599			
4248			
4453			
2910a			
3551			
3778			
4279			
3775			

3926			
3681			
2350a			
3473a			
3191			
3345			Tower
0018c			
0612e			
0519o			
3230			
2110a		Residentially-led	
2187b	C		
2079a			
1340a			
2765			
2318			
3506a			
4183a			
4407			
4021			
4646			
4173a			
3707			
2166a			
3780			
4147			
3799			
3873			
3612a			
3562			
3533			
1289c			
3431			Mixed typology with tower
3363			
1403b			
3548			
2605a	C		
0306a			
0306b			
3497			
1370g			
3267			
3248			
3225			
2075h			
2075g			

0051c	C	Residentially-led	Mixed typology with tower
2864			
0519l			
1376b			
2807			
2149			
0519j			
2880			
0519i			
2232			
2740			
2665			
1097c			
2515			
4734			Mixed Typology without a tower
3626			
4301			
3875			
3583			
3618			
3660			
2553b			
3177			
0258f			
2757c			
2075j			
3122			
3219			
3219a			
3020			
2188b			
2075c			
2075e			
2075d			
2829			
2770			
2469b			
2666			
2648			
2831	D	Not residentially-led	Cluster
3855a			Terrace
3525			
4065			Linear block
3847			
3058			
1223a			

<table>
<tr><td>2721</td><td rowspan="34">D</td><td rowspan="47">Not residentially-led</td><td rowspan="4"></td></tr>
<tr><td>0939c</td></tr>
<tr><td>2159</td></tr>
<tr><td>2822</td></tr>
<tr><td>4645</td><td rowspan="8">Villa block</td></tr>
<tr><td>4335</td></tr>
<tr><td>4106</td></tr>
<tr><td>4104</td></tr>
<tr><td>3048</td></tr>
<tr><td>2068b</td></tr>
<tr><td>3128</td></tr>
<tr><td>1943b</td></tr>
<tr><td>3480</td><td rowspan="9">Tower</td></tr>
<tr><td>2993a</td></tr>
<tr><td>2584a</td></tr>
<tr><td>3729</td></tr>
<tr><td>1585c</td></tr>
<tr><td>3029a</td></tr>
<tr><td>2229</td></tr>
<tr><td>2580</td></tr>
<tr><td>0768b</td></tr>
<tr><td>3776a</td><td rowspan="26">Mixed typology with tower</td></tr>
<tr><td>4209</td></tr>
<tr><td>1762b</td></tr>
<tr><td>4263</td></tr>
<tr><td>4415</td></tr>
<tr><td>4306</td></tr>
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<tr><td>4336</td></tr>
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<tr><td>3771a</td></tr>
<tr><td>1239a</td><td rowspan="13">D</td></tr>
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<tr><td>3685</td></tr>
<tr><td>3495</td></tr>
<tr><td>3176a</td></tr>
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<tr><td>3362</td></tr>
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<tr><td>2810a</td></tr>
<tr><td>3003b</td></tr>
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</table>

2884	D	Not residentially-led	Mixed typology with tower
0056c			
2843			
2705			
2615			
2637			
2614			
1638a			
0498b			
0988c			Mixed Typology without a tower
2279d			
3560			
0498f			
2830b			
3656			
1598a			
2810b			
3187a			
3288			
2888			
3076			
2993			
0859b			
2777a			
0960c			
1502d			
1035a			
2830			
2292c			
1502b			
2489			
4426		Residentially-led	Cluster
3941			
1472b			
3001			
2957			
2099b			
2954b			Terrace
3821			Linear block
4364a			
4424			
3921			
4563			
2268c			
3932			
4322			

4210	D	Residentially-led	Linear block
3721			
3386			
3962			
3516			
3559			
3554			
2489d			
2489c			
3435			
3381			
3140			
3234			
3338			
1265c			
3084			
2915			
0492d			
3157			
2845			
2980b			
0319a			
2332a			
1573b			
2871a			
2861			
2788			
1999a			
3084c			Villa block
4323a			
4557			
4545			
4608			
4354			
4223			
4375			
4293			
3946			
4189			
4089			
3058a			
3843			
4052			
0522f			
3757a			Tower
5037			

4764			
4635			
4840			
4903			
4730			
4346			
4442			
4651			
4450			
4413			
0613d			
1638c			
4300			Tower
3831a			
4180			
1585d			
2229b			
3894			
3245a			
4063	D	Residentially-led	
3826			
3789			
3597			
3794			
3643			
3420a			
3258			
3322			
0768c			
2063a			
2558			
3521			
4607			
4373			
4283			
4727			
4841			
4201a			
4542			Mixed typology with tower
4056			
3756a			
3850			
3344a			
4295			
3029b			
4385			

4419	D	Residentially-led	Mixed typology with tower
3942			
3925a			
3640			
4081			
3084b			
3838			
4116			
3797			
3783			
3532			
3705			
3628			
3565			
3584			
3671			
3831			
3561			
3663			
3394			
3492			
3549			
3297			
2530			
3223			
2245f			
0526c			
2281b			
3240			
3262b			
3245			
2710a			
1368b			
3132			
3158			
0843d			
3060			
2000c			
2999			
2904			
2670			
2245a			
1336			
2586			
1999b			
2415c			

1447b	D	Residentially-led	
0543h			Mixed Typology without a tower
3730			
4111			
3786			
3686			
3967			
4033			
4153			
3717			
2030c			
3084a			
3397			
3106a			
3795			
3302			
2871d			
3251			
1459a			
3387			
3335			
3262			
3262a			
3143			
3045a			
2786a			
0939f			
2777b			
0489b			
2000			
2384a			
1617			
2871			
0789a			
2875			
2104a			
2245b			
2351			
2126			
2642a			
804			
2108d	E	Not residentially-led	Cluster
2896a			
1537a			
3269			Terrace
1973a			Linear block

<table>
<tr><td>4601</td><td rowspan="46">E</td><td rowspan="26">Not residentially-led</td><td>Villa block</td></tr>
<tr><td>3961</td><td rowspan="3">Tower</td></tr>
<tr><td>4463a</td></tr>
<tr><td>3879</td></tr>
<tr><td>3449a</td><td rowspan="13">Mixed typology with tower</td></tr>
<tr><td>3260</td></tr>
<tr><td>0130d</td></tr>
<tr><td>3659</td></tr>
<tr><td>3966</td></tr>
<tr><td>3365</td></tr>
<tr><td>3825</td></tr>
<tr><td>3674</td></tr>
<tr><td>3059c</td></tr>
<tr><td>3147</td></tr>
<tr><td>3000</td></tr>
<tr><td>1633j</td></tr>
<tr><td>2732</td></tr>
<tr><td>1236b</td><td rowspan="9">Mixed Typology without a tower</td></tr>
<tr><td>3459</td></tr>
<tr><td>2396</td></tr>
<tr><td>2751</td></tr>
<tr><td>3077</td></tr>
<tr><td>3097</td></tr>
<tr><td>2039a</td></tr>
<tr><td>2054a</td></tr>
<tr><td>2828</td></tr>
<tr><td>3604</td><td rowspan="20">Residentially-led</td><td rowspan="8">Cluster</td></tr>
<tr><td>2034a</td></tr>
<tr><td>3261</td></tr>
<tr><td>3138</td></tr>
<tr><td>3314</td></tr>
<tr><td>3040</td></tr>
<tr><td>1359b</td></tr>
<tr><td>1181a</td></tr>
<tr><td>3852c</td><td rowspan="8">Terrace</td></tr>
<tr><td>0766a</td></tr>
<tr><td>3262c</td></tr>
<tr><td>3046</td></tr>
<tr><td>3104</td></tr>
<tr><td>3062</td></tr>
<tr><td>2616</td></tr>
<tr><td>1248b</td></tr>
<tr><td>4493</td><td rowspan="4">Linear block</td></tr>
<tr><td>4675</td></tr>
<tr><td>3852e</td></tr>
<tr><td>4286</td></tr>
</table>

3097b	E	Residentially-led	Linear block
4026			
3817			
3401a			
2968b			
3192			
2968a			
2972			
2693a			
1292a			
0287i			
130			
4706a			Villa block
4559			
4109			
3845a			
3098a			
4324			
3201b			
2223a			
2595a			
0995e			
4559a			Tower
4664			
2410c			
3851			
2090b			
4072			
4349			
3682			
2090a			
2624a			
3118			
1670a			
1970b			
5183			Mixed typology with tower
4700			
4798			
4138			
3239b			
4013			
3457a			
3694			
3616			
2416b			
3399			

3481	E	Residentially-led	Mixed typology with tower
3481a			
2758b			
1217b			
2728			
2664			
2410a			
2210a			
4305			Mixed Typology without a tower
2933a			
3960			
2734a			
3610			
3347			
2878b			
2414e			
3178			
3239			
3201			
0456a			
0456b			
3016			
2903a			
2414d			
2878			
2878a			
1236a			
2053			
2824			
2825			
2527			
0287f			

Table 7: Raw data collected

(Source: Author)

APPENDIX C. APPLICATIONS REMOVED FROM ANALYSIS

GLA Case Number	Site name	LPA	Date of stage 2 (DD/MM/ YYYY)	Reason for excluding from study
5067	1 Olympic Way	Brent	20/04/2020	This application involves a roof and side extension to an existing building.
3989	Town Hall Annexe	Newham	26/06/2018	This application involves the refurbishment of the Town Hall Annexe and the erection of a two-storey roof extension as well as a change of use class from B1(a) Offices to C3 residential use.
4236	Maydew House	Southwark	05/06/2018	This application involves the refurbishment of the existing 144 residential units 5-storey roof extension
3939	Finsbury Tower, Clerkenwell	Islington	08/05/2017	This application involves the erection of a 12-storey extension to the existing 16 storey building and a 3 to 6 storey extension to the existing podium block up to 7 storeys
3264	Empress State Building	Hammersmi th and Fulham	16/05/2014	This application involves the change of use from Class 81 (Business) to Class C3 (340 Residential units)
2658b	Abbey Co-op housing sites at Casterbridge Snowman	Camden	03/12/2013	This application includes the retention of two existing residential towers

Table 8: Applications removed from analysis

(Source: Author)

APPENDIX D. VALUE BANDS BY POSTCODE

The following value bands have been assigned to the postcodes listed below:

Postcode district	Value band
SW1E	A
SW1Y	
WC2R	
EC3R	
SW1W	
W1B	
W8	
WC2B	
SW1P	
EC4A	
W1U	
WC1X	
W14	
W1F	
WC2N	
W1W	
SW1A	
W2	
E1	B
N6	
NW1	
NW11	
SW11	
SW14	
W11	
W6	
NW3	
SW6	
W4	
W9	
WC1N	
EC1V	
NW5	
SE1	
SW15	
SW4	
W12	
W1D	
EC2A	

SW18	B
W1T	
SW8	
TW10	
N1	
E8	C
EC1Y	
KT1	
N4	
NW6	
SE10	
SE11	
SE23	
SE24	
TW1	
TW8	
E14	
E2	
E5	
N7	
N8	
SE13	
SE15	
SW12	
SW9	
W13	
E9	
NW2	
SW17	
TW11	
W5	
N16	
N20	
NW4	
SE17	
SE26	
SW16	
N19	
W10	
SE8	
SW19	
TW9	
SW2	
BR1	

BR6	D
E10	
E18	
EN1	
EN4	
HA0	
HA2	
HA6	
HA8	
N12	
N13	
SE14	
SE19	
SM3	
SW20	
TW12	
TW3	
BR2	
DA6	
E4	
EN2	
EN5	
HA1	
HA4	
KT2	
N11	
N17	
N3	
NW10	
SE18	
SE27	
BR3	
E17	
KT3	
N14	
NW7	
RM14	
SE21	
SE3	
SE4	
TN16	
UB3	
BR4	
BR7	

E16	D
HA5	
HA7	
HA9	
KT6	
N21	
SE16	
SE2	
W3	
E3	
NW9	
SE5	
SE6	
CR0	
TW7	
UB1	
CR2	E
CR4	
DA14	
DA16	
DA8	
E13	
IG1	
IG6	
RM11	
RM8	
UB2	
UB7	
UB10	
CR5	
DA17	
E11	
IG2	
IG7	
KT5	
RM12	
RM3	
SE20	
SM1	
SM6	
TW5	
UB4	
TW13	
BR5	

CR8	E
DA7	
E15	
EN3	
HA3	
IG11	
RM7	
UB5	
UB9	
N22	
N18	
SE25	
SM4	
W7	
SE7	
SM5	
UB6	
N15	

Table 9: Assigned value band by postcode

(Source: Author)

Additional postcodes that have not been assigned value bands were categorised using the following assumed value bands:

Postcode district	Assigned value band
EC1N	A
EC3N	
SW1H	
SW1V	
SW1X	
SW3	
SW7	
W1	
W15	
W1J	
W1K	
W1S	
WC1A	
WC1R	
WC1V	
WC2	
WC2A	
WC2E	

WC2H	
E98	B
EC1	
EC2M	
N2	
NW8	
SW10	
EC2	
EC1A	C
SE12	
CR9	D
E6	
N10	
SE28	
TW2	
TW4	
E20	E
IG8	
N9	
RM10	
RM13	
RM5	
RM9	

Table 10: Unassigned value band by postcode

(Source: Author)

APPENDIX E. RESIDENTIAL BUILDING TYPOLOGIES

Typology	Example cited	GLA case number	Architect/designer
Cluster	Cane Hill Park, Croydon	2108d	HTA Architects
Terrace	Goresbrook Village, Barking and Dagenham	3062	Stetch Architects
Linear block	Kilburn Quarter, Brent	2650a	Alison Brooks Architects
Villa block	The Courthouse, Westminster	2501a	Grid Architects
Mixed typology without tower	Upton Village, Newham	3016	PCKO Architects
Tower	The Corniche, 20 Embankment Tower, Lambeth	1721b	Foster and Partners Architects
Mixed typology with tower	Blackfriars Circus, Southwark	3145	Maccreanor Lavington

Table 11: Residential building typologies

(Source: Author)

APPENDIX F. INFORMAL INTERVIEWS

Two informal interviews were carried out as part of this study. The identity of the interviewee has been kept confidential. These meetings took place on the following dates and location.

Informal interview one

Date: 23 April 2020 Location: virtual over Microsoft Teams

Informal interview two

Date: 15 May 2020 Location: virtual over Microsoft Teams

APPENDIX G. APPLICATIONS EXCLUDED FROM LDD MATCHING

GLA Case Number	Site name	LPA	Date of stage 2/3 (DD/MM/YYYY)	LDD status as of July 2020
3757a	Kidbrooke Station Square	Greenwich	31/10/2019	Status' unknown
4534	Centre House, Wood Lane	Hammersmith and Fulham	02/12/2019	
4488	96-104 Broadway	Ealing	11/11/2019	
3604	Bury Lodge Depot	Enfield	04/11/2019	
4109	Park View Place	Ealing	21/10/2019	
4646	Poplar Gasworks	Tower Hamlets	21/10/2019	
3449a	Middlesex Business Centre	Ealing	14/10/2019	
4323a	Former Educational Campus for the Ealing, Hammersmith and West London College	Ealing	14/10/2019	
2410c	Metro Tower, 226-244 High Road, Ilford	Redbridge	27/08/2019	
4545	90 Monier Road	London Legacy DC	13/08/2019	
4608	5-9 Surrey Street	Croydon	29/07/2019	
4283	Colindale Telephone Exchange	Barnet	15/07/2019	
4727	30-38 Addiscombe Road	Croydon	24/06/2019	
4105	Former London Chest Hospital	Tower Hamlets	18/03/2019	
3365	Purley Baptist Church	Croydon	14/03/2017	
2972	Smith's Farm	Ealing	12/09/2013	
2777b	St Bernards Hospital	Ealing	29/05/2013	

Table 12: Applications excluded from LDD matching

(Source: Author)

APPENDIX H. SECTION 73 APPLICATIONS

GLA Case Number	Site name	LPA	Date of stage 2 (DD/MM/YYYY)
3344b	20-22 Gillender Street	Tower Hamlets	20/04/2020
4675a	Morrisons Supermarket	Hillingdon	16/03/2020
3492b	Hounslow High Street Quarter	Hounslow	02/03/2020
3649d	Whiteleys Shopping Centre	Westminster	16/12/2019
2933c	Beam Park, Dagenham and Rainham	Barking and Dagenham/Havering	16/12/2019
3729a	Portal West	Old Oak and Park Royal DC (OPDC)	10/12/2019
3967a	National Institute for Medical Research	Barnet	02/12/2019
3966a	GSK	Ealing	18/11/2019
3239c	Gascoigne Estate East	Barking and Dagenham	04/11/2019
4349a	Esso Petrol Filling Station	Ealing	03/06/2019
3457c	Malgavita Site	Ealing	03/06/2019
2694b	Nine Elms Parkside (South London Mail Centre)	Wandsworth	18/03/2019
3058b	Ferry Lane Industrial Estate	Waltham Forest	25/02/2019
0306c/0306d	Aylesbury Estate, Walworth	Southwark	10/12/2018
3291b	White City Living, Wood Lane	Hammersmith and Fulham	14/05/2018
2156i	Former Homebase site, 195 Warwick Road	Kensington and Chelsea	16/10/2017
2245r	Village Centre (Phase 3)	Greenwich	29/08/2017
0599d	Cringle Dock	Wandsworth	24/04/2017
2406b	Stone House and Staple Hall, Bishopsgate	City of London	19/12/2016
2694a	South London Mail Centre, Nine Elms	Wandsworth	07/11/2016
0150c	Barking Riverside Area, Renwick Road	Barking and Dagenham	05/09/2016
2950f	Battersea Power Station	Wandsworth	03/05/2016
1723b	Catford Stadium Site	Lewisham	11/02/2016
2310b	Southall Gas Works site	Ealing	04/02/2016
1663h	142-170 Streatham Hill And Wentworth House	Lambeth	06/11/2015
2515b	Enderby Wharf	Greenwich	25/08/2015
3066a	Keybridge House	Lambeth	22/07/2015

3534	Former Thames Water Land	Hounslow	08/04/2015
0855b	Fresh Wharf Estate	Barking and Dagenham	31/03/2015
0855c	Fresh Wharf Estate	Barking and Dagenham	31/03/2015
3158a	Galaxy House	Croydon	18/12/2014
2950c	Battersea Power Station	Wandsworth	29/10/2014
2309b	Former Job Centre Plus, 307 Burdett Road	Tower Hamlets	02/06/2014
2130c	Market Towers, 1 Nine Elms Road	Wandsworth	20/05/2014
2558a	Tidal Basin Pumping Station	Newham	20/05/2014
2950b	Battersea Power Station	Wandsworth	24/04/2014
0684c	St Andrews Hospital	Tower Hamlets	03/04/2014
2950a	Battersea Power Station	Wandsworth	09/10/2013
0827b	former Government Offices, Honeypot Lane	Harrow	15/02/2012

Table 13: Section 73 applications

(Source: Author)

APPENDIX I. REGRESSION ANALYSIS

TOTAL SIZE SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.019681
R Square	0.000387
Adjusted R Square	-0.00079
Standard Error	0.224512
Observations	849

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.016544	0.016544	0.328213	0.566865
Residual	847	42.69343	0.050405		
Total	848	42.70998			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.280745	0.008814	31.8523	5.4E-147	0.263446	0.298045	0.263446	0.298045
Total Units	-5.8E-06	1.01E-05	-0.5729	0.566865	-2.6E-05	1.4E-05	-2.6E-05	1.4E-05

DENSITY SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.114507
R Square	0.013112
Adjusted R Square	0.011947
Standard Error	0.223078
Observations	849

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.560009	0.560009	11.25333	0.00083
Residual	847	42.14997	0.049764		
Total	848	42.70998			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.305567	0.011168	27.36189	1.3E-118	0.283648	0.327487	0.283648	0.327487
Density	-8.7E-05	2.6E-05	-3.3546	0.00083	-0.00014	-3.6E-05	-0.00014	-3.6E-05

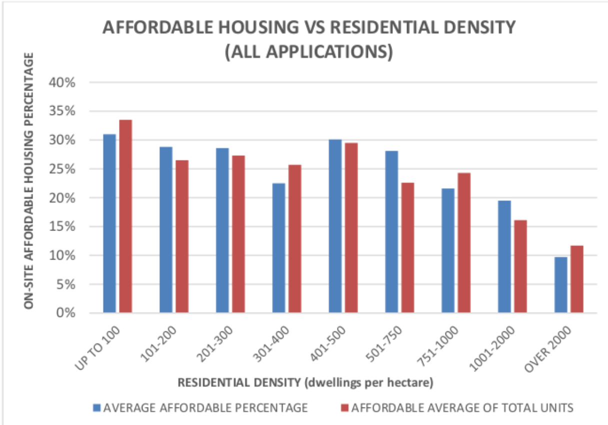

Figure 35: Affordable housing split by density for all applications

(Source: Author)

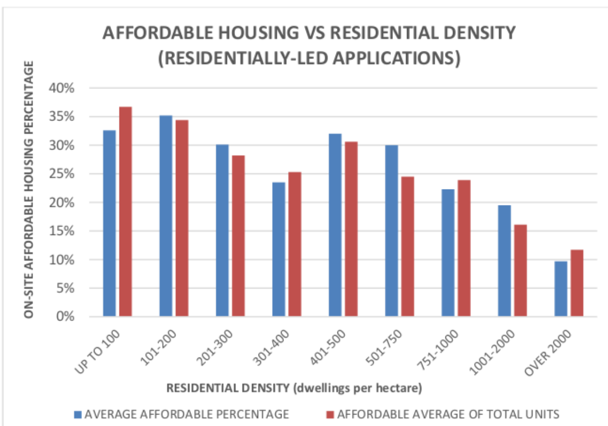

Figure 36: Affordable housing split by density for residentially-led applications

(Source: Author)

HEIGHT SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.147739
R Square	0.021827
Adjusted R Square	0.020672
Standard Error	0.222091
Observations	849

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.932219	0.932219	18.89976	1.55E-05
Residual	847	41.77776	0.049324		
Total	848	42.70998			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.325248	0.013219	24.60387	2.8E-101	0.299302	0.351195	0.299302	0.351195
Tallest Building of the Development (in floors)	-0.00292	0.000671	-4.34738	1.55E-05	-0.00423	-0.0016	-0.00423	-0.0016

APPENDIX J. TALL DEVELOPMENTS WITH HIGH AFFORDABLITY

GLA Case Number	Site name	LPA	Council Estate Regeneration? (y/n)	Main use	Date of stage 2	Intermediate	Low cost	Affordable units	Affordable unit %	Units	Tallest Building of the Development (in floors)	Num. of Students Accommodation units	PIL Financial contributions	School? (y/n)	GLA Grant Funded?	Notes
3778a	Carpetright site, Lewisham town centre	Lewisham	n	Student accommodation led	07/10/2019	27	40	67	100%	67	35	758 (76 affordable)	n	n	n	
4266	Kensington Forum	Kensington and Chelsea	n	Hotel	21/06/2019	0	62	62	100%	62	30			n		
2584a	Minavil House	Brent	n	Mixed use	17/07/2017	194	32	226	90%	251	26		£0		y	
4063	Station Square West	Haringey	y	Residential	02/05/2017	117	0	117	91%	128	22		£0		y	35% without GLA grant money, 91% with grant money
2835a	Dudley House	Westminster	y	Residential led	07/04/2016	197	0	197	100%	197	22			y	y	
2967	Cannon Rubber Site	Haringey	n	Mixed Use	06/02/2013	100	122	222	100%	222	22			y	y	

Table 14: Tall developments with high affordability

(Source: Author)

APPENDIX K. TALL DEVELOPMENTS WITH LOW AFFORDABLITY

GLA Case Number	Site name	LPA	Affordable Units	Affordable unit (%)	Total Units	Maximum height (in floors)	Off-site Affordable Housing (in units)
2229b	One Lansdowne Road	Croydon	170	21%	802	68	
2350a	Hertsmere House	Tower Hamlets	96	11%	861	67	60
3473a	Alpha Square	Tower Hamlets	125	20%	634	65	
3191	South Quay Plaza	Tower Hamlets	188	21%	888	68	
2187b	City Pride, 15 Westferry Road	Tower Hamlets	70	9%	822	75	

Table 15: Tall developments with low affordability

(Source: Author)

APPENDIX L. BUILD STATUS ANALYSIS

Density

The analysis below demonstrates the relationship between density, measured by dwellings per hectare, and the build status. Figure 37 demonstrates that the completion rate fluctuates with residential density with no noticeable trend.

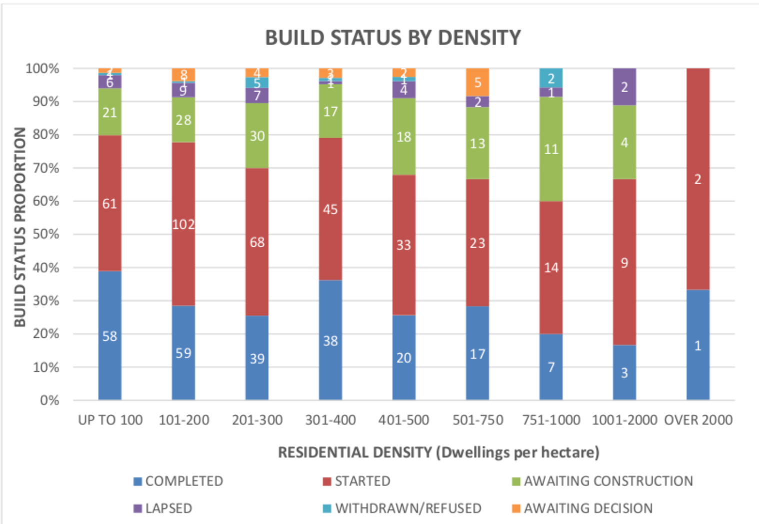

Figure 37: Analysis of build status by density

(Source: Author)

APPENDIX M. RISK ASSESSMENT FORM

RISK ASSESSMENT FORM
FIELD / LOCATION WORK

The Approved Code of Practice - Management of Fieldwork should be referred to when completing this form
http://www.ucl.ac.uk/estates/safetynet/guidance/fieldwork/acop.pdf

DEPARTMENT/SECTION **PLANNING**
LOCATION(S) **UCL/HOME**
PERSONS COVERED BY THE RISK ASSESSMENT **Alan Smithies**

BRIEF DESCRIPTION OF FIELDWORK

The fieldwork for this dissertation is predominately desk based, using data from the GLA and Local Authority websites. A number of case studies will able to be examined, which will also use data available online. A number of interviews will also be carried out.

Consider, in turn, each hazard (white on black). If **NO** hazard exists select **NO** and move to next hazard section.
If a hazard does exist select **YES** and assess the risks that could arise from that hazard in the risk assessment box.
Where risks are identified that are not adequately controlled they must be brought to the attention of your Departmental Management who should put temporary control measures in place or stop the work. Detail such risks in the final section.

ENVIRONMENT	**The environment always represents a safety hazard. Use space below to identify and assess any risks associated with this hazard**
e.g. location, climate, terrain, neighbourhood, in outside organizations, pollution, animals.	Examples of risk: adverse weather, illness, hypothermia, assault, getting lost. Is the risk high / medium / low ? **NO**
CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**

	work abroad incorporates Foreign Office advice
	participants have been trained and given all necessary information
	only accredited centres are used for rural field work
	participants will wear appropriate clothing and footwear for the specified environment
	trained leaders accompany the trip
	refuge is available
	work in outside organisations is subject to their having satisfactory H&S procedures in place
	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

EMERGENCIES	**Where emergencies may arise use space below to identify and assess any risks**
e.g. fire, accidents	Examples of risk: loss of property, loss of life

Fire at home address: low risk

CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**
	participants have registered with LOCATE at http://www.fco.gov.uk/en/travel-and-living-abroad/
	fire fighting equipment is carried on the trip and participants know how to use it
x	contact numbers for emergency services are known to all participants
	participants have means of contacting emergency services
	participants have been trained and given all necessary information
x	a plan for rescue has been formulated, all parties understand the procedure
	the plan for rescue /emergency has a reciprocal element
	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

FIELDWORK 1 May 2010

EQUIPMENT	**Is equipment used?**	**YES**	**If 'No' move to next hazard** **If 'Yes' use space below to identify and assess any risks**
e.g. clothing, outboard motors.	Examples of risk: inappropriate, failure, insufficient training to use or repair, injury. Is the risk high / medium / low ?		

Use of computer: low risk

CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**
	the departmental written Arrangement for equipment is followed
x	participants have been provided with any necessary equipment appropriate for the work
x	all equipment has been inspected, before issue, by a competent person
x	all users have been advised of correct use
x	special equipment is only issued to persons trained in its use by a competent person
x	OTHER CONTROL MEASURES: please specify any other control measures you have implemented: Large computer screen has been purchased for home working.

LONE WORKING	**Is lone working a possibility?**	**NO**	**If 'No' move to next hazard** **If 'Yes' use space below to identify and assess any risks**
e.g. alone or in isolation lone interviews.	Examples of risk: difficult to summon help. Is the risk high / medium / low?		

CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**

	the departmental written Arrangement for lone/out of hours working for field work is followed
	lone or isolated working is not allowed
	location, route and expected time of return of lone workers is logged daily before work commences
	all workers have the means of raising an alarm in the event of an emergency, e.g. phone, flare, whistle
	all workers are fully familiar with emergency procedures
	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

FIELDWORK **2** May 2010

ILL HEALTH	The possibility of ill health always represents a safety hazard. Use space below to identify and assess any risks associated with this Hazard.
e.g. accident, illness, personal attack, special personal considerations or vulnerabilities.	Examples of risk: injury, asthma, allergies. Is the risk high / medium / low? Back problems/pains from home working. – low risk
CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**

	an appropriate number of trained first-aiders and first aid kits are present on the field trip
	all participants have had the necessary inoculations/ carry appropriate prophylactics
	participants have been advised of the physical demands of the trip and are deemed to be physically suited
	participants have been adequate advice on harmful plants, animals and substances they may encounter
	participants who require medication have advised the leader of this and carry sufficient medication for their needs
x	OTHER CONTROL MEASURES: please specify any other control measures you have implemented: Suitable chair to work from.

TRANSPORT	Will transport be required	NO	NO	Move to next hazard
		YES		Use space below to identify and assess any risks
e.g. hired vehicles	Examples of risk: accidents arising from lack of maintenance, suitability or training Is the risk high / medium / low?			
CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**			

	only public transport will be used
	the vehicle will be hired from a reputable supplier
	transport must be properly maintained in compliance with relevant national regulations
	drivers comply with UCL Policy on Drivers http://www.ucl.ac.uk/hr/docs/college_drivers.php
	drivers have been trained and hold the appropriate licence
	there will be more than one driver to prevent driver/operator fatigue, and there will be adequate rest periods
	sufficient spare parts carried to meet foreseeable emergencies
	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

DEALING WITH THE PUBLIC	Will people be dealing with public	NO	If 'No' move to next hazard If 'Yes' use space below to identify and assess any risks
e.g. interviews, observing	Examples of risk: personal attack, causing offence, being misinterpreted. Is the risk high / medium / low?		
CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**		

	all participants are trained in interviewing techniques
	interviews are contracted out to a third party
	advice and support from local groups has been sought
	participants do not wear clothes that might cause offence or attract unwanted attention
	interviews are conducted at neutral locations or where neither party could be at risk
	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

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WORKING ON OR NEAR WATER	Will people work on or near water?	NO	If 'No' move to next hazard If 'Yes' use space below to identify and assess any risks
e.g. rivers, marshland, sea.	Examples of risk: drowning, malaria, hepatitis A, parasites. Is the risk high / medium / low?		
CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**		

	lone working on or near water will not be allowed
	coastguard information is understood; all work takes place outside those times when tides could prove a threat
	all participants are competent swimmers
	participants always wear adequate protective equipment, e.g. buoyancy aids, wellingtons
	boat is operated by a competent person
	all boats are equipped with an alternative means of propulsion e.g. oars
	participants have received any appropriate inoculations
	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

MANUAL HANDLING (MH)	**Do MH activities take place?**	**NO**	**If 'No' move to next hazard** **If 'Yes' use space below to identify and assess any risks**
e.g. lifting, carrying, moving large or heavy equipment, physical unsuitability for the task.	Examples of risk: strain, cuts, broken bones. Is the risk high / medium / low?		
CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**		

- [ ] the departmental written Arrangement for MH is followed
- [ ] the supervisor has attended a MH risk assessment course
- [ ] all tasks are within reasonable limits, persons physically unsuited to the MH task are prohibited from such activities
- [ ] all persons performing MH tasks are adequately trained
- [ ] equipment components will be assembled on site
- [ ] any MH task outside the competence of staff will be done by contractors
- [ ] OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

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SUBSTANCES	**Will participants work with substances**	**NO**	**If 'No' move to next hazard** **If 'Yes' use space below to identify and assess any risks**
e.g. plants, chemical, biohazard, waste	Examples of risk: ill health - poisoning, infection, illness, burns, cuts. Is the risk high / medium / low?		
CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**		

- [ ] the departmental written Arrangements for dealing with hazardous substances and waste are followed
- [ ] all participants are given information, training and protective equipment for hazardous substances they may encounter
- [ ] participants who have allergies have advised the leader of this and carry sufficient medication for their needs
- [ ] waste is disposed of in a responsible manner
- [ ] suitable containers are provided for hazardous waste
- [ ] OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

OTHER HAZARDS	**Have you identified any other hazards?**	**NO**	**If 'No' move to next section** **If 'Yes' use space below to identify and assess any risks**
i.e. any other hazards must be noted and assessed here.	Hazard: Risk: is the risk		
CONTROL MEASURES	**Give details of control measures in place to control the identified risks**		

Have you identified any risks that are not adequately controlled?	**NO**	**NO**	**Move to Declaration**
	YES		**Use space below to identify the risk and what action was taken**

Is this project subject to the UCL requirements on the ethics of Non-NHS Human Research? NO

If yes, please state your Project ID Number

For more information, please refer to: http://ethics.grad.ucl.ac.uk/

DECLARATION	The work will be reassessed whenever there is a significant change and at least annually. Those participating in the work have read the assessment.

Select the appropriate statement:

X	I the undersigned have assessed the activity and associated risks and declare that there is no significant residual risk
	I the undersigned have assessed the activity and associated risks and declare that the risk will be controlled by the method(s) listed above

Alan Smithies

NAME OF SUPERVISOR: Richard Simmons

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