Driving energy efficiency through the London Plan

Summary report

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author	**Jon Gregg**
date	**25/08/2017**
approved	**Duncan Price**
signature	
date	**25/08/2017**

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1 Executive Summary

1.1 Introduction

The scope of this study is to establish options for an energy efficiency (Lean) target, presented as an improvement beyond Part L, to be included in the London Plan. The GLA is seeking to develop appropriate targets for residential and non-residential developments along with an understanding of the technical and cost implications.

1.2 Methodology

Analysis has been undertaken on three key data sets:

- GLA dataset - cases submitted to the GLA for planning permission from 2014, 2015 and 2016
- BuroHappold dataset - BuroHappold London Projects tested under 2013 Building Regulations Part L
- Technology cost curves from Currie & Brown

Technical and cost implications of potential policy scenarios have then been evaluated.

1.3 Key findings

From the GLA data set, the median Lean reduction currently being achieved is 3.47% for residential, 11.6% for non-residential and 6.28% for mixed-use. Through analysis of all three datasets, it is deemed that a 'Medium level' 5% Lean reduction target for Residential and 10% target for non-residential would be technically feasible with a wide range of fabric and services specification. This would impact and improve the performance of 63% of residential and 42% non-residential applications.

A 'High level' 10% Lean reduction target for Residential would give added focus to locking in long-term carbon reductions through improved building fabric rather than shorter-life heat generation plant. This would raise the performance of 87% of the new applications coming forward. It would additionally be fill the gap left by reduction in the performance of Clean savings in the short term with an update the grid carbon factors. It would expect to reduce occupant bills £33/unit/year compared to a 0% policy target. Meeting the target will pose a technical stretch and buildability for many projects, and the industry may take a few years to raise performance to this level.

A 'High level' 15% target for Non-residential would be technically achieve with good passive design and would align with BREEAM 'Outstanding' levels. This is considered a high target because it raised the majority of developments and it aligns with BREEAM ‘Outstanding’, which is considered the aspiration within the industry, with the GLA adopting a leadership role pushing towards BREEAM Outstanding energy performance. It would expect to reduce occupant bills by between £0.5/m2 - £1.4/m2 per year compared to a 0% policy target.

Cost uplift over Part L notional for these targets has been provided and financial viability, across five London Development Zones, will be tested by the London plan viability consultants.

Table 1—1 Range of residential cost uplifts over notional (£/unit) for varying Lean % carbon reduction targets

LEAN % reduction Target	Notional	0%-4.9% (current London Median in this region 3.7%)	5%-9.9%	10%-14.9%	15%-19.9%
Upper Quartile	£0	£6,300	£8,010	£7,920	£8,560
Median		£5,000	£5,710	£6500	£7,870
Lower Quartile		£4,350	£4,130	£5,550	£7,330

Table 1—2 Range of non-residential cost uplifts over notional (£/m²) for varying Lean % carbon reduction targets

LEAN % reduction Target	Notional	0%-9.9%	10%-19.9% (current London Median in this region, 15.1%)	20%-29.9%	30%-39.9%
Upper Quartile	£0	£64	£59	£47	£57
Median		£35	£55	£37	£36
Lower Quartile		£20	£37	£32	£34

1.3.1 What is the appropriate metric for setting an energy efficiency policy?

Building Regulations Part L Carbon reduction has been chosen as an appropriate metric for an energy efficiency policy for the following reasons:

- it provides consistency with the rest of the GLA Energy hierarchy and Zero Carbon performance (35% on site carbon reduction and 100% with offsetting);
- Government Building Regulations require reporting of energy and carbon using these standards and metrics, reducing compliance risk of strategies implemented in demonstration of planning performance;
- It is based upon a relative target, creating a notional building of the same from and system types to be improved upon, which theoretically does not limit any development types in meeting a policy target;
  - An absolute energy or carbon target may preclude certain building types from achieving said target; and
- UK industry recognised and well established metric and standard.

Other metrics and their correlation with reduction beyond Part L 2013 have also been reviewing in this study, including Part L Fabric Energy Efficiency, Passivhaus and BREEAM (BRE Environmental Assessment Method) Energy Performance Ratio (EPR). However there is a general push for in the industry and by other policy makers to set absolute performance targets based upon kWh/m² per building. With more focus on Post occupancy performance monitoring and operational targets, see the Policy Review in Appendix 5 of the Data Analysis Report.

1.4 Next steps and recommendations

- The models required to generate cost uplift for this study are considered as a wide range of indicative ways to achieve the targets, however do not represent all permutations and is not exhaustive. A further study will be required on common building types to evidence fully how a target could be achieved across the building stock.

- Analysis suggests that increasing G-value (closer to 1.0) will improve % lean reduction, however will increase overheating risk. A detailed study should be undertaken on the impact of G-value in typical dwellings on % lean reaction and Overheating risk in line with latest CIBSE and GLA guidance.

2 Introduction

2.1 Background

The Greater London Authority (GLA) London Plan is current under review and a new version is being written. The New London Plan will look to maintain the current target of a 35% reduction in onsite carbon dioxide emissions for residential and non-residential major developments. Zero Carbon will also be enforced for all development types, with the use of Local Authority offset payments, for emissions not abated through on-site measures. Research, including a study recently produced by BuroHappold[1], suggests that as a result of the changing carbon intensity of the grid and heat network carbon factors, the 35% onsite CO_2 reductions target will require a transition away from gas engine CHP to other lower carbon heat sources and greater levels of energy efficiency.

2.2 Aims

The scope of this study is to establish options for an energy efficiency (Lean) target, presented as an improvement beyond Part L, to be included in the London Plan. The GLA is seeking to develop appropriate targets for residential and non-residential developments along with an understanding of the technical and cost implications

3 Methodology

3.1 Overview

Analysis has been undertaken by BuroHappold and Currie & Brown on three key data sets:

- GLA dataset - cases submitted to the GLA for planning permission from 2014, 2015 and 2016 tested under 2013 Building Regulations Part L
- BuroHappold dataset - BuroHappold London Projects tested under 2013 Building Regulations Part L
- Technology cost curves from Currie and Brown

The GLA dataset has been used to understand the current performance of various development types across London and to provide a macro picture of building performance submitted for planning under The London Plan 2016.

The BuroHappold dataset has been used to understand the technical implications of meeting varying performance levels. It consists of energy models developed for BuroHappold projects within London. 100 unique blocks/buildings have been tested and 351 models generated from these with varying specifications. Incremental fabric and systems improvements have been made to many of the projects to provide a range of models across glazing ratios. The carbon reduction and capital costs of these models has been correlated to generate cost uplifts over each Notional within regions of performance.

The models required to generate these cost uplift are considered as a wide range of indicative ways to achieve the targets, however do not represent all permutations and is not exhaustive. A further study will be required on common building types to evidence fully how a target could be achieved across the building stock.

[1] The future role of the London Plan in the delivery of area-wide district heating (BuroHappold) 29/06/17

The Currie & Brown data has been used to generate estimates of the cost uplift to achieve different levels of performance on a £/m2 basis for Non-Residential and on a £ per unit basis for Residential. Both Notional and Actual buildings have been costed and the 'Cost Uplift' quoted is the difference between the two for each model/development.

Technical and cost implications of potential policy scenarios have then been evaluated, with cost ranges provided to the GLA's viability consultant. Third party peer review on this study has been provided by AECOM.

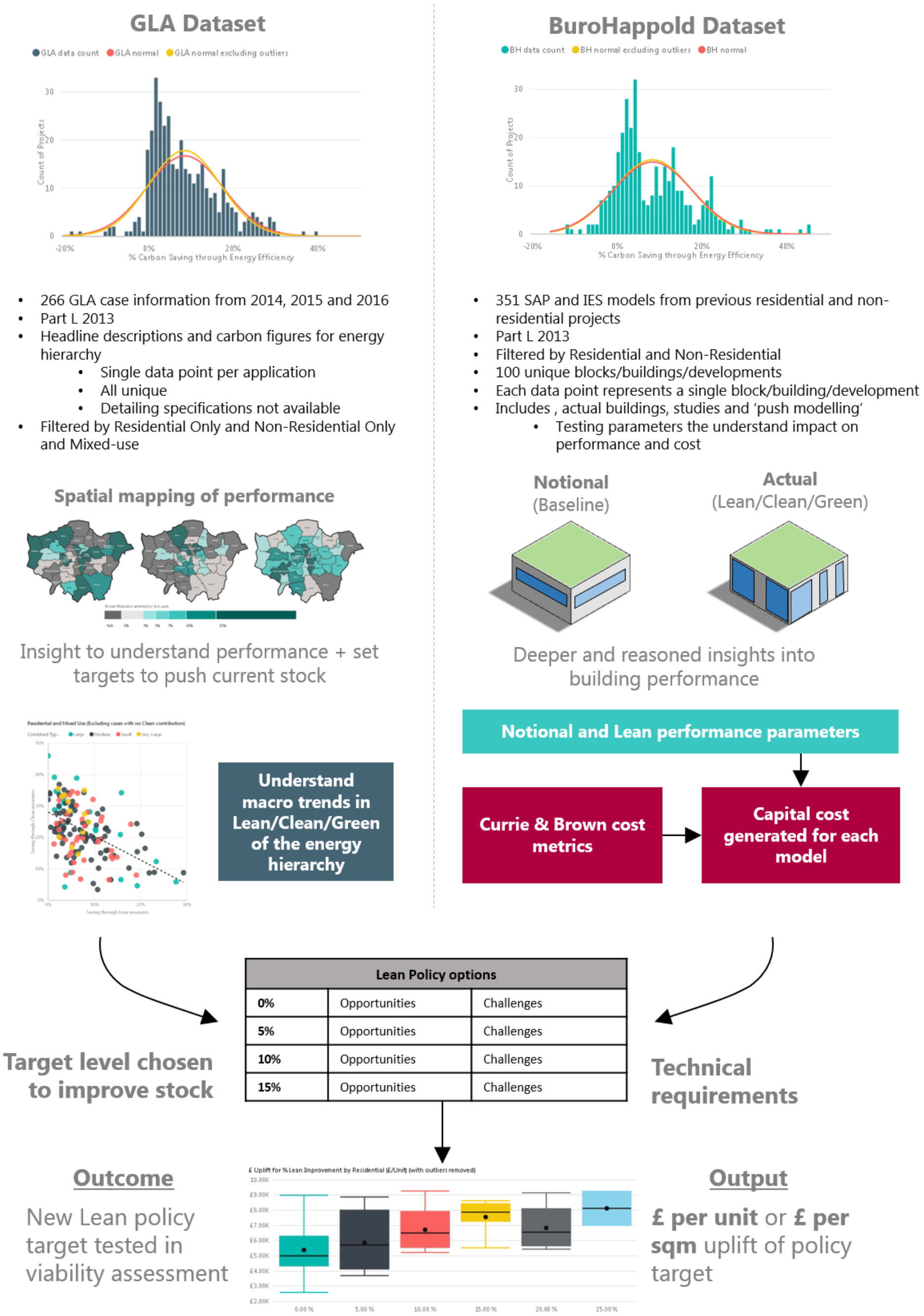


Figure 3—1 Overview of the analysis carried out

4 Analysis

4.1 What is the current Lean performance across London?

From the GLA data set, the median Lean reduction is 3.7% for residential, 15.1% for non-residential and 5.8% for mixed-use. The average (mean) Lean reduction is 4.7% for residential, 2% for non-residential and 7.26% for mixed-use. Statistical analysis suggests that median is generally the most appropriate measure for this study.

The Median Lean performance of those residential developments that did not connect to a co8.17nal/district heating systems is 7.5% reduction compared to a 3.4% reduction if Clean savings are identified. Additionally Non-residential developments achieve 8.17% with Clean savings and 17.83% without Clean savings.

Of current GLA residential projects, 37% are already meeting a 5% energy efficiency reduction. A residential target set here would be expected to result in an energy efficiency performance uplift in 63% of residential developments, so making a significant impact on the majority of the residential new builds. This is balanced with the demonstration that this a consistently achievable target as over a third of projects already meet it.

The non-residential data shows that 58% of projects would already meet a 10% Lean reduction target. A target at this level would impact 42% of non-residential developments. This would again have a strong effect on many developments but is also clearly achievable in the majority of cases.

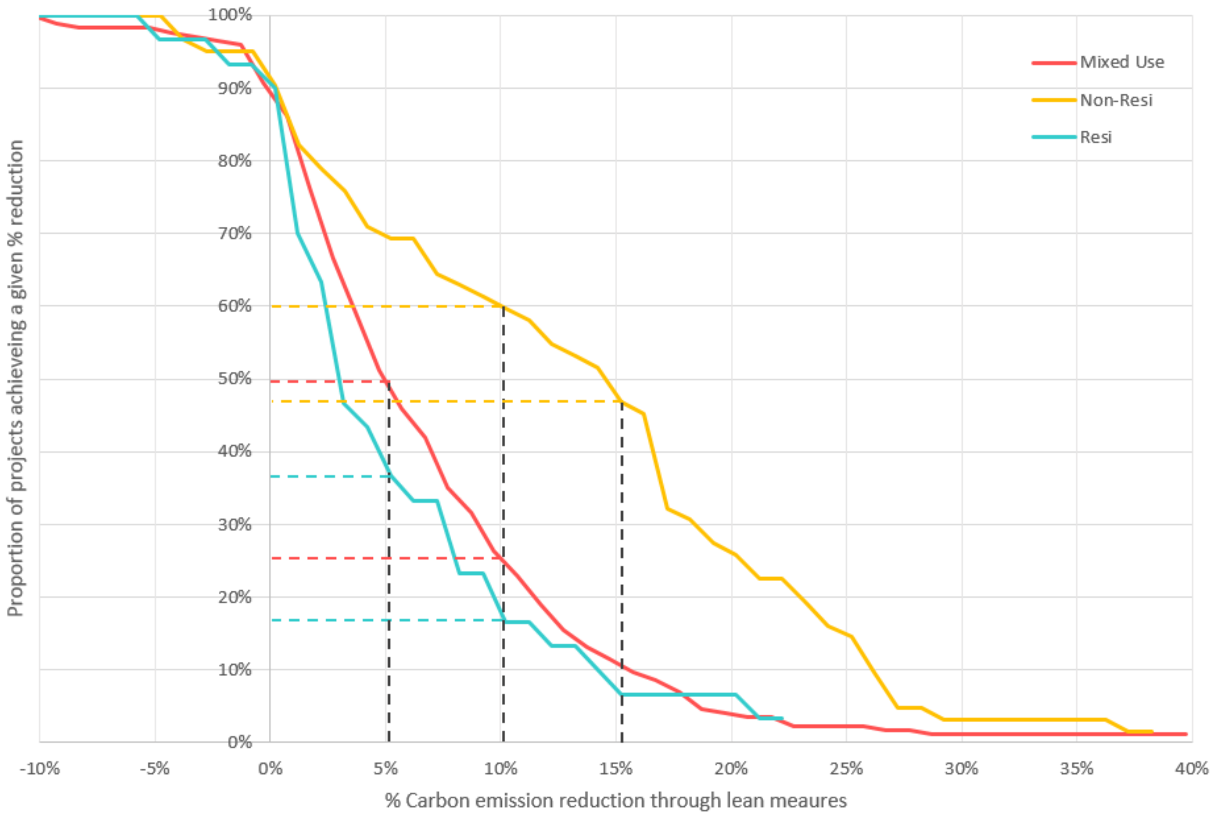


Figure 4—1 Distribution of % carbon reduction achieved by mixed use, non-resi and resi projects

Mixed use schemes sit between non-residential and residential in terms of performance with 49% meeting a 5% reduction and 25% meeting a 10% target. It is assumed that the majority of the floor area in a mixed use scheme is typically residential, as the pattern of performance follows closer to the Residential only. This suggests that the true proportion of residential schemes already meeting a 5% target is higher than the 37% shown so increasing the evidence to support the feasibility of achieving this level of reduction.

The data suggests that 11% of projects (across all space uses) are not meeting regulations through Lean measures alone. This adds weight to the suggestion that there is a significant energy efficiency requirement in London associated with meeting Building Regulations.

4.2 Performance by borough

4.2.1 Lean

Figure 4—2 shows the % Lean reductions for planning applications received by the GLA under Part L 2103 from 2014, 2015 and 2016, considering both borough and development zone. Each map shows Non-residential, Residential and Mixed Use developments.

The far left maps show that the majority of Non-Residential applications' median % Lean reduction is higher than 15%. This is present in 12 of 23 boroughs, with 10 Boroughs not receiving any solely Non-Residential applications. There does not seems to be a specific pattern or trend to the locations and % reductions, with both central and outer boroughs achieving above a 15% threshold. The central map of Residential-only applications shows that high performance was achieved in Barnet, Hackney and Camden (+15%). Particularly low performance was achieved in Croydon, Bromley and Southwark, all less than 1% reduction.

Mixed-use application make up the majority of applications submitted, 174 of 266. This map show a general trend that Central and South Westerly Boroughs perform best. Outer Borough, such as Croydon, Harrow, Enfield and Redbridge all perform low (<3%) compared to the other mixed use schemes. This may be due on high Residential to Non-residential proportions or other unknowns within these boroughs.

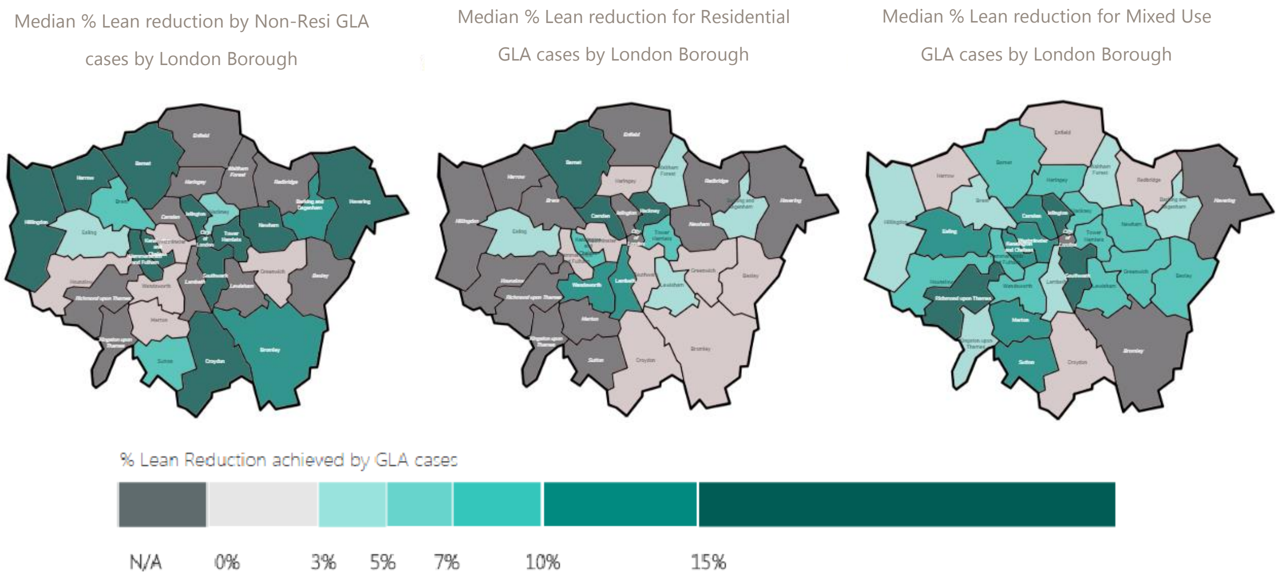


Figure 4—2 Median % Lean reduction of GLA cases by London Borough for non-resi, resi and mixed use developments

4.2.2 BREEAM

The majority of London Boroughs already have a BREEAM target embedded in their local planning policy. The most common requirement is for developments to achieve an "Excellent" rating, with more areas moving towards "Outstanding" in future policy. Both "Excellent" and "Outstanding" ratings have an associated minimum requirement for energy performance. In the EPR calculation methodology energy efficiency has a significant impact on the score awarded (CO2 reduction and primary energy are also incorporated). This suggests that energy efficiency targets are already to some extent embedded in local planning policy.

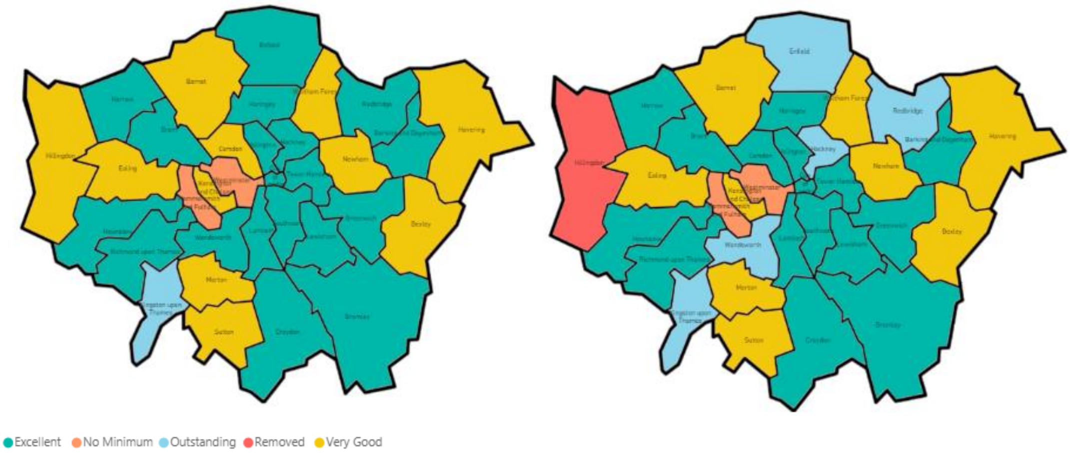


Figure 4—3 Current (on the left) and future (on the right) BREEAM requirement by London Borough from Local Authority Planning Policy

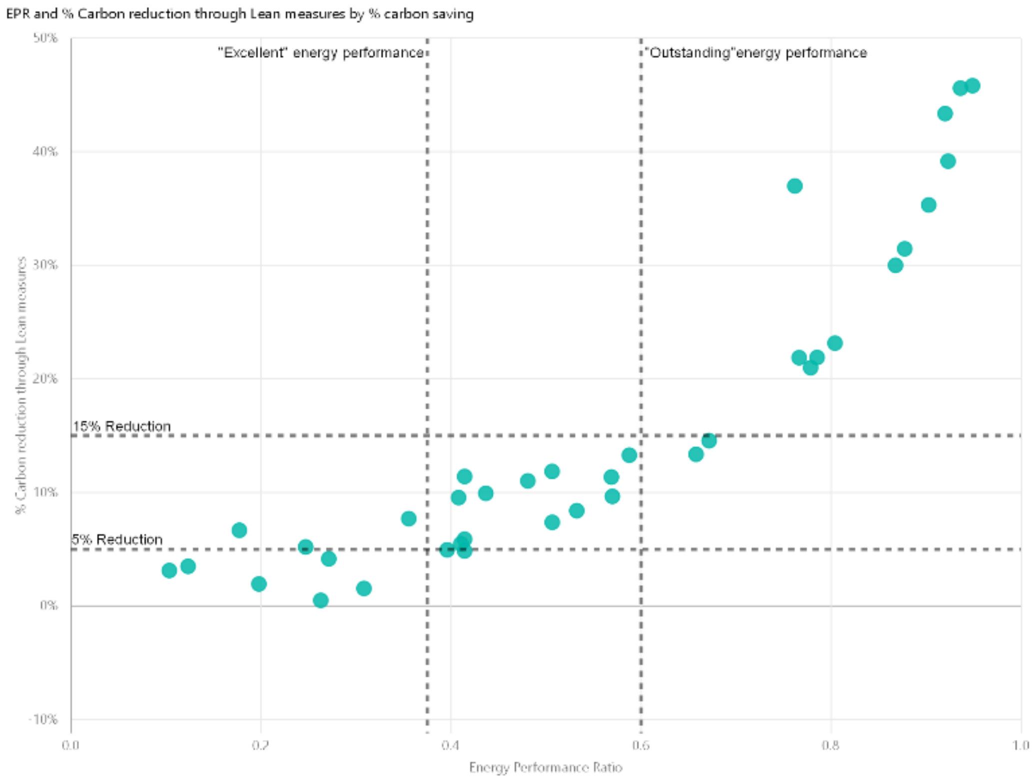


Figure 4—4 Correlation between % carbon reduction (y-axis) and Energy Performance Ratio (x-axis)

There is a very clear correlation between the EPR of a project and % carbon reduction. Projects achieving a BREEAM Excellent rating are meeting at least a 5% carbon reduction target through energy efficiency, and a BREEAM Outstanding rating correlates to a 15% carbon reduction through Lean measures. This suggests that energy efficiency targets in the range of 5-15% fit well with current and future BREEAM requirements around London.

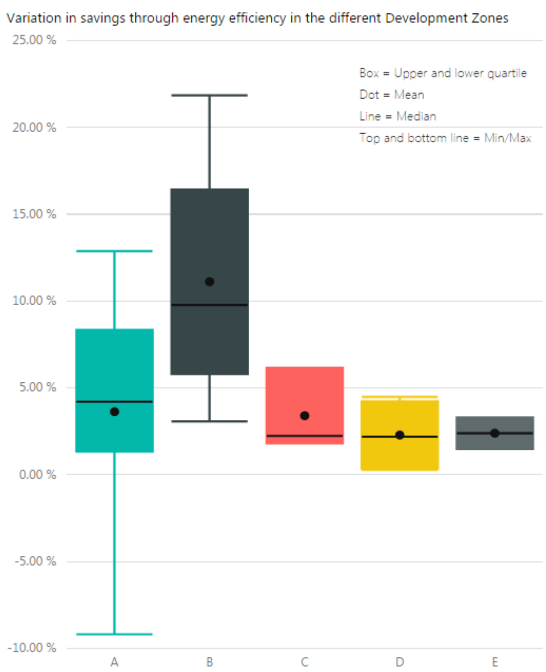
4.2.3 Performance by Development zone

4.2.4 Residential

The average and median performance across all the Development Zones (except B) is less than a 5% reduction. In all zones there is an approximately 20% saving being achieved through Clean measures. The reasons for the better performance in zone B are not fully understood although it may be linked to the typical architecture and typologies being built in these Boroughs. However, analysis in section 14 of the full Data Analysis report shows that for residential developments in GLA case residential cases, achieve higher Lean % reductions. Of those developments that did not connect to a communal/district heating systems achieve a median 7.5% reduction compared to a 3.4% reduction if Clean savings are identified.

A wide range in performance is observed in zones A and B whilst the other zones are more tightly grouped. This may be a function of the smaller sample size in zones C, D and E or could be associated with a more consistent style of development in the latter zones leading to more similar energy savings being achieved. There is a general trend for the outer Development Zones to perform more poorly than those closer to central London.

Despite this, the actual variation (again excluding zone B) is minimal (between 4.3% in zone C and 2.4% in zone E). This suggests that there will not be a particularly negative impact of an energy efficiency target on any one Development Zone.



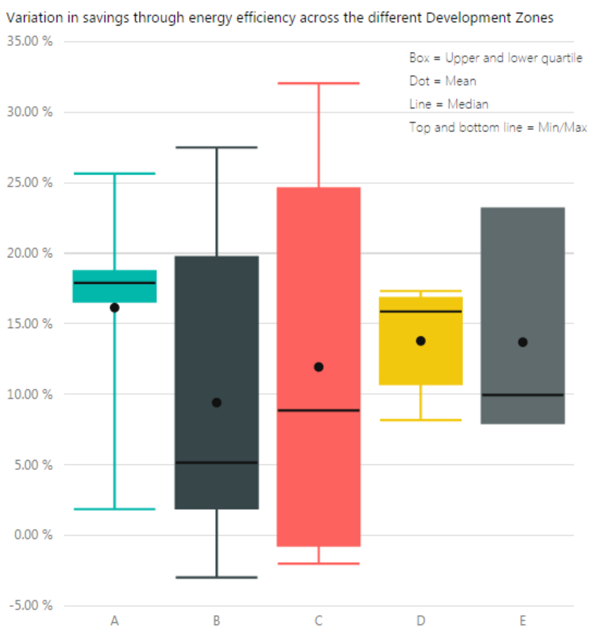


Figure 4—5 Carbon savings achieved by development zone for residential (on the left) and non-residential (on the right) developments

4.2.5 Non-residential

There is a general trend for both the median and average performance to increase as the Development Zone moves further towards the edge of London. This could be linked to typical non-residential typologies in the outer boroughs compared with the inner Boroughs For example the tendency towards retail spaces rather than office spaces in outer boroughs may have an impact as offices would tend to have greater space heating/cooling loads whereas retail area emissions are often lead by lighting requirements. The exception to this is Zone A, which is very central and performs better than all the other zones.

Analysis in section 14 of the full Data Analysis report shows that median Clean savings, in GLA case non-residential cases, are not as significant as Clean savings in residential, 13% compared to 23%. Additionally the majority of Non-residential developments show no savings from communal/district heating systems. In these instances median Lean savings are as high as 17%. This suggests that energy efficiency is being targeted as an effective way to meet the GLA 35% reductions target. This is corroborated by the high average savings observed - only zone B does not have a mean over 10%.

Although there is significant variation in the average and median savings across the zones, the worst performing zones (B and C) show a wide spread in the data indicating that increased savings are potential feasible in these areas. This suggests that no one zone would be particularly harshly impacted by and energy efficiency target.

4.3 Cost implications

Figure 4—6 below shows how % Lean carbon reduction affects cost uplift (compared to the notional building).

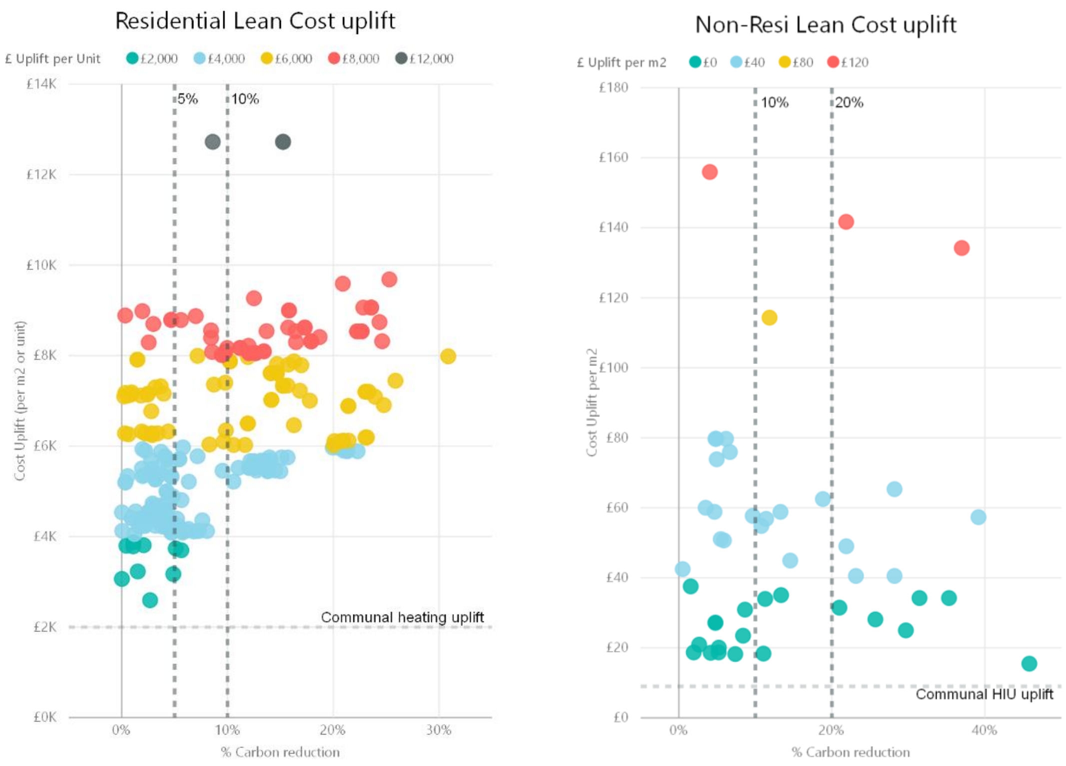


Figure 4—6 Correlation between carbon reduction and cost uplift in resi and non-resi projects

Residential analysis shows to achieve a carbon reduction greater than 5% it is expected that the cost uplift per unit would be £4000. For a 10% reduction a cost uplift greater than £5500 will be required to improve elemental systems performance to the levels identified.

Not every permutation of ways to achieve 10% reductions have been tested. many factors influence the performance of buildings, more cost effective ways of achieving performance reduction may be present however have not been identified. A further study should be undertaken by the GLA to identify a range of fabric and service options to meet targets set within specific building types.

The BuroHappold Lean residential models all include communal heating within the cost analysis. The cost uplift associated with dwelling distribution, HIU, communal pipework distribution and central plant over the notional individual boiler is on average £2,000. The nominal uplift of all units is shown to be no less than £2,500 per unit and the communal heating system could be assumed to make up the majority of this. A jump in minimum cost uplift is observed at 5% and 10% reduction. At 5% the minimum specification cost uplift of £4,100 is observed and this again to jumps to £5,200 at 10% reduction and above.

The BuroHappold non-residential modelling, however, shows no correlation between carbon reduction and cost uplift. This suggests that carbon savings in non-residential buildings are driven by a combination of services specification as well as space type and architectural design. The non-residential modelling assumes a communal heating system in both notional and actual building however, the addition of a HIU in each unit has been considered to allow for connection to a site wide heat network. This contributes on average a £9 per m^2 uplift in cost.

As shown in Figure 4—7, the biggest contributors to cost uplift in the analysed residential developments (compared to notional) are boilers, ventilation and windows. In fact, higher efficiency boilers are specified in most units (compared to notional) and most units are provided with MVHR systems. All buildings will have either the same or higher glazing ratios compared to notional, as the notional dwelling will match actual up to 25% of floor area. The increased glazing ratio also determines the negative wall cost uplift; however, due to the improved U-values, this results in a net positive facade cost uplift.

Regarding non-residential developments, the analysis shows that the main driver of cost uplift compared to notional are boiler, lighting and windows costs. The cost of lighting takes into account the improvement on lighting efficacy compared to the notional building and the provision of lighting controls.

Figure 4—7 Cost uplift drivers in resi (top) and non-resi (bottom) projects

4.3.1 What is the typical specification to meet varying performance levels?

Varying specifications have been taken from the BuroHappold models to indicate the expected typical requirements to meet varying Lean % reduction levels. They indicate that the residential specification can utilise double glazing in many instances to achieve 5% reduction. However to achieve 10%, the specification may likely required to become more stringent, with many models showing Triple glazing and an air tightness of 3m3/m² @ 50pa required. This specification could impact buildability and construction time compared to current London Plan policies and will require more consideration at planning on buildability by design teams. It may also take a few years for the design teams to work through the new policy and understand the technical implications of meet the target.

This is due to the air tightness testing which will likely be required across all dwellings in a development to achieve 3 m^3/m^2 @ 50pa. If all units are tested actual testing results can be used, if only a sample of units are tested a +2 m^3/m^2 is added to the result. Therefore all units will need to be tested for an input of 3 m^3/m^2 @ 50pa, otherwise 1 m^3/m^2 @ 50pa will need to be achieved which may not be technically feasible. The cost implications of this addition have not been considered within the cost uplift calculations in this study.

For non-residential, little or no trend in strictness of specification can be observed as the % reduction increases.

4.3.2 Cost uplifts to developers

The cost uplifts have been outlined compared to the Building Regulations Part L Notional building, however this may not be considered typical or appropriate as a London Counterfactual case. Current London median shows is shown on the cost uplift tables. This indicates which performance region the median Resi or Non-Resi development sits within. This is the point where 50% of the current applications currently meet. A hard or soft policy of this region would expect to influence the majority (over 50%) of developments in the future. London median Resi 0%-4.9% region and 10%-19.9% region Non-resi. This is without an energy efficiency policy, under the current London Plan.

Therefore the viability consultant should choose whether to use the full cost uplift or difference between this figure and the cost of a chosen policy. Ranges have been provided based on upper, lower quartile of data sets as well as median cost, this outlines spread of datasets and a cost figures that can be chosen by the viability consultant. Analysis suggests, a cost uplift is always present over notional for residential, min. £2,594, and a lower quartile of £15 per sqm for non-residential. This is due to mechanical ventilation and communal heating systems. The notional dwelling is based on a 'typical' UK home with individual boiler and is naturally ventilated.

Table 4—1 Range of residential cost uplifts over notional (£/unit) for varying Lean % carbon reduction targets

LEAN % reduction Target	Notional	0%-4.9% (current London Median in this region 3.7%)	5%-9.9%	10%-14.9%	15%-19.9%
Upper Quartile	£0	£6,300	£8,010	£7,920	£8,560
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Table 4—2 Range of non-residential cost uplifts over notional (£/m^2) for varying Lean % carbon reduction targets

LEAN % reduction Target	Notional	0%-9.9%	10%-19.9% (current London Median in this region, 15.1%)	20%-29.9%	30%-39.9%
Upper Quartile	£0	£64	£59	£47	£57
Median		£35	£55	£37	£36
Lower Quartile		£20	£37	£32	£34

Figure 4—8 Cost uplift by % carbon reduction for resi (top) and non-resi (bottom)

4.3.3 Cost to occupant - residential

BuroHappold modelling show that residential heating bills reduce as energy efficiency increases, however electricity bills for fixed services will increase. Overall occupants would expect to save £40 to £73/year for a 5% reduction and £50 to £81/year for a 10% reduction compared to the notional equivalent, depending upon heating system. It also shows that occupants could save between £15 to £25/year for a 5% reduction and £24 to £33/year for a 10% reduction compared to the equivalent 0% lean reduction, considered current policy, depending upon heating system.

4.3.4 Cost to occupant – non-residential

BuroHappold modelling shows that Non-residential do not vary significantly; and that the driver for energy bills for fixed services is electricity over heat in these cases. Overall occupants would expect to save between, little before 20% reduction are observed. Beyond that occupants could save £1.23/sqm at 30% reduction and £2.20 /sqm at 40% reduction compared to the notional equivalent. It also shows that occupants could save between £0.5/m2 for a 10% reduction and £1.4/m for a 20% reduction compared to the equivalent 0% lean reduction, considered current policy, depending upon heating system.

4.4 How might the change in grid carbon factors affect the % reduction and the hierarchy overall?

By using Carbon intensity of heat factors, investigated from the previous BuroHappold DHN study, future emissions have been projected for the Hierarchy. The analysis based upon the demand figures from the BuroHappold Part L 2013 models, shows that % Lean reduction can be passed on to Clean reduction in if carbon factors are updated in line with the 2016 SAP consultation. It is expected that a 10% Residential Lean target would balance out the shortfall in Clean performance that occur because of future SAP carbon factors and increased communal distribution losses.

Analysis suggests the average Clean performance, with 0% Lean reduction, shows 24% improvement over 2013 Part L baseline. If a Business As Usual London Plan is enacted, this clean reduction may drop on average to 14%. With a 5% or 10% Lean reduction Policy in place a Clean reduction of 18% to 23% could be observed. A 5% Lean reduction will have a 4.8% positive impact on Clean and a 10% Lean target will have a 9% positive impact on Clean.

5 Evaluation of policy options

Three levels of Lean reduction have been assessed depending upon the varying level chosen and the challenges and opportunities of each have been outlined.

5.1 RESIDENTIAL

5.1.1 LOW – 0%

The base 'do nothing' position would be to maintain the GLA's current position as articulated in developer guidance but cement this through placing it more clearly in London Plan policy. The target is to meet Building Regulations Part L 2013 through energy efficiency alone. The expectation would be that, despite there being no increase in the Lean target, retention of the overall 35% carbon reduction target will continue to drive investment in a mix of Lean, Clean, Green measures and that the forthcoming higher carbon factors for gas engine CHP may provide pressure for greater Lean reductions, even without a specific Lean target. Furthermore, the absence of a specific Lean target may increase developers' focus on the transition away from gas engine CHP to lower carbon heat sources. The challenge is that the current Lean target is typically being exceeded, so the target is no longer providing a stretch to developments.

5.1.2 MEDIUM – 5%

A 5% Lean reduction target is considered achievable and technical feasible with a range of specifications, as it can be achieved without the need for triple glazing or other strict requirements on performance of fabric and systems. 36.7% of GLA cases currently achieve this level so setting this target would raise the performance of two-thirds of projects and signal the need to focus on mitigating the impact of changing carbon factors. The challenge is the time and effort to enforce a relatively modest sub-target within the overall 35% carbon reduction.

This target would not fill the gap left by the expected drop in Clean savings under 2016 SAP consultation grid carbon factors. Additionally this target level is under the Median performance of developments that do not connect to heat networks. This would suggest that a higher target would be required to actually improve performance going forward or even relax the performance of any projects already at this level.

5.1.3 HIGH – 10%

A residential target of 10% would represent a strong or stretch target. 13% of current cases achieve this therefore this would raise the performance of 87% of the new applications coming forward. A strong wording of the policy would look to rapidly improve the industry and a soft wording may look to drive the industry in the right direct, levels of energy efficiency closer to Passivhaus requirements. This target would give added focus to locking in long-term carbon reductions through improved building fabric rather than shorter-life heat generation plant. A 10% reduction would be Fill the gap left by reduction in the performance of Clean savings in the short term with an update the grid carbon factors. Savings will also be provided day one of a development occupation, unlike Clean savings that may only be provided when a low carbon asset is installed or a District heat network is connected. Finally reductions in demand to this significant level would provide real long term carbon reductions as grid decarbonisation or Low carbon heating systems are relied upon.

Meeting the target will pose a technical stretch and buildability for many projects, and the industry may take a few years to raise performance to this level. I could also increase the likelihood of detailed examination /discussion of applications on a case-by-case basis to agree the level that projects can reasonably attain. The lower heat demand could reduce the overall viability of low carbon heat networks and/or increase fixed standing charge costs to consumers.

5.2 NON-RESIDENTIAL

5.2.1 LOW – 0%

The base 'do nothing' position would be to maintain the GLA's current position as articulated in developer guidance but cement this through placing it more clearly in London Plan policy. The target is to meet Building Regulations Part L 2013 through energy efficiency alone. This acknowledges the variability of non-domestic stock and maintains the use of local borough BREEAM targets as the way to drive the market. The challenge of this approach is the absence of strong GLA policy to drive non-residential buildings since heat loads are often low and therefore not especially supported by low carbon heat networks.

5.2.2 MEDIUM – 10%

A 10% Lean reduction is considered achievable for most non-residential specifications. BREEAM Energy credit pre-requisites are driving to and beyond a 10% Lean reduction through the EPR ratings and the majority of Boroughs require BREEAM 'Excellent'. 58% of GLA applications are current achieving this target so it would raise the energy performance of 42% of projects including BREEAM 'Very Good' and some 'Excellent' buildings. The challenge is that this slightly reduces the flexibility of how to achieve BREEAM targets set by local authorities.

5.2.3 HIGH – 15%

A 15% reduction is being achieved in 46.8% of cases so a target at this level would raise the performance of 54% of projects. There is good evidence base that achievable in many cases however certain developments may find this a challenge due to a number of project-specific constraints. This is considered a high target because it raised the majority of developments and it aligns with BREEAM 'Outstanding', which is considered the aspiration within the industry. The high variability of non-domestic buildings means there will always be particular projects that will find it hard to meet the target. Nevertheless this would be a strong aspirational target to encourage investment and drive a section of the market less supported by low carbon heat networks. GLA would be adopting a leadership role alongside boroughs pushing towards BREEAM Outstanding energy performance.

Table 5—1 Policy options for residential and non-residential projects

Residential					
Level	**Lean reduction**	**Technical comparator**	**Cost comparator**	**Opportunities**	**Challenges**
Low	0%	• Part L 2013 GLA baseline	London Counterfactual	• Retention of overall 35% carbon reduction target will continue drive investment in mix of Lean, Clean, Green and offset • Higher carbon factors for Gas CHP may provide pressure for greater Lean reductions, even without target • Absence of specific Lean target may increase focus on transition to lower carbon heat sources	• Current Lean target is typically being exceeded current target no longer providing a stretch
Medium	5%	• 37% current cases achieving • Lower than median without clean	Median of '5% - 9.9%' cost range	• Raises performance of two-thirds of projects • Generally achievable without significant technical change • Increases focus on the need to mitigate impact of changing carbon factors	• Time and effort to enforce relatively modest sub-target within the energy hierarchy • Does not fill the gap left by reduced future clean savings • Many projects, not connecting to DHN, already surpass this level
High	10%	• 13% current cases achieving • Close to Passivhaus levels; • Higher than median without clean	Median of '10% - 14.9%' cost range	• Stronger aspirational target to encourage innovation • Focuses on locking in long-term carbon reductions • Fills gap left by future reduced clean savings	• Technical stretch expected for many developments • Increases likelihood of detailed examination / discussion on case-by-case basis • May reduce viability of low carbon heat networks • Heading towards diminishing returns on investment

Non-Residential					
Level	**Lean reduction**	**Technical comparator**	**Cost comparator**	**Opportunities**	**Challenges**
Low	0%	• Part L 2013 GLA base case	London Counterfactual	• Acknowledges variability of non-domestic stock • Maintain local authority BREEAM targets as the way to drive the market	• Absence of strong GLA policy to drive non-residential buildings since heat loads are often low, hence Clean reductions often low
Medium	10%	• 58% current cases achieving; • Mid BREEAM Excellent	Median of '10% - 19.9%' cost range	• Raises the performance of 42% of projects • Generally achievable without significant technical change • Potential implementation mechanism through BREEAM • Raises the energy performance of BREEAM Very Good and some Excellent buildings	• Reduces flexibility of how to achieve BREEAM targets set by local authorities
High	15%	• 46% current cases achieving; • Just below median without clean; • Min for BREEAM Outstanding	Median of '10% - 19.9%' cost range	• Raises the performance of 54% of projects • Good evidence base that achievable in many cases • Strong aspirational target to encourage investment • Drives section of the market less supported by low carbon heat networks • Leadership role alongside boroughs pushing for BREEAM Outstanding	• High variability of non-domestic buildings means there will always be particular projects that will find it hard to meet the target

Jon Gregg
Buro Happold Limited
17 Newman Street
London
W1T 1PD
UK

T: +44 (0)207 927 9700
F: +44 (0)870 787 4145
Email: jon.gregg@burohappold.com