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# **The Growth of the Green Office Market in the United Kingdom**

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## **Abstract**

**Purpose** - This paper examines the experience of the UK office market in embracing green buildings. The empirical analysis considers the spatial pattern and growth of green buildings in cities since 1990. It examines the perceived industry wisdom that the establishment of a green premium for occupation is the key to greening the office stock

**Design/methodology/approach** - The paper begins by looking at the concept of a green office and then examines the evolving attitudes towards these offices and the issues for local market dynamics. The empirical analysis examines the current spatial pattern of green office buildings in the UK and then their impact on city office markets where there is a major concentration. The latter part of the paper examines the growth of green offices since 1990. It begins with national trends and then examines the evolution of green development in individual cities.

**Findings** - The initial adoption of green offices was slow. There has been a dramatic rise in green offices at the peak of the last decade's development boom and in the immediate years that follow. Market acceptance of the importance of greenness appears still to be in the melting pot with limited market transactions since 2008. Green offices represent only 2.7% of office buildings and 12% of total space in the market. Most green offices are in the principal cities with the largest concentration in London. London represents the only potential locality where a green market could have been established so far.

**Practical implications** - The paper provides an empirical assessment of the growth of green offices in the UK.

**Originality/value** - This is the first paper to consider the development and scale of green offices in the context of local markets. It challenges the perceived wisdom that a green premium is central to the green transformation to date.

## 1. Introduction

There are global concerns about the carbon foot print of cities and buildings and the energy consumption of offices as principal workplaces represents a central element of this problem. It is part of a wider sustainability perspective that relates not just to the need for green buildings but also to how far and how the workers in these offices commute (Sayce et al, 2007). A sustainable policy agenda has become almost universally accepted by governments and addressed by land use planning and policies promoting green buildings. The latter has been seen in energy usage certification for buildings and higher green standards for new buildings in some countries. These measures have ramifications for the property market in terms of development, conversion of existing stock, investment and pricing. The impact is complex and there are question marks about the efficacy of these policies in terms of the pace of uptake of green offices and the conversion of the existing stock. This paper examines the experience of the UK office market in embracing green buildings to date.

The initial adoption of this green agenda by the real estate sector was slow. A major constraint was an apparent unwillingness to move from the longstanding status quo prime office specification with air conditioning and the perceived lack of market interest in green buildings (Guy, 1998). While the process has accelerated in the last decade (Chegut et al 2014; Dixon et al, 2009; Jones, 2013) detailed information is not available. Green offices are relatively new in the history of city development but the recent rapid pace of green office development in the UK offers the prospect that they might ultimately assume a dominant position as prime office stock. On the other hand there is a distinction between new green building and gaining market acceptability, and this process of radical change is likely to be slower (Jones, 2009, 2013). This paper sheds some light on these issues by examining the spatial development of green offices and their impact on local markets across cities in the UK.

It begins by looking at the concept of a green office and then examines the benefits and evolving attitudes towards these offices. This section also sets out the established perception of the expected process toward greening the office stock that is based on a local green premium stimulating development/refurbishment. The next section of this study

describes the data used for this study. This is followed by an analysis of the spatial pattern of green buildings in the UK and then their impact on city office markets where there is a major concentration. The latter part of the paper examines the growth of green offices since 1990. It begins with national trends and then examines the evolution of green development in individual cities. The summary of findings and conclusions challenge the role of the green rent premium as a mechanism for the adoption of new green offices.

## **2. A green office**

There are different definitions and classifications of green buildings around the world (Reed et al, 2009). BREEAM (British Research Establishment Environmental Assessment Method) was the first green building accreditation scheme, beginning in the UK in 1990. Other schemes followed with BREEAM adapted in other parts of Europe, China and South America. In North America LEED (Leadership in Environmental and Energy Design) is the primary scheme set up in 1994. Other notable examples are Green Star in Australia, HQE in France and GBTool in South Africa.

Buildings in these schemes receive credits for green features ranging over energy, health and wellbeing, water, waste, materials, transport, land use and ecology, and management. Sustainable transport scores are not based on travel usage but based on nearness to public transport, car parking spaces, bicycle friendliness, etc. Similarly energy consumption and environmental scores are estimated based on computer models and the building design. Criteria vary by national scheme and have changed over time reflecting developments in the state of the art of green technology (van de Wetering and Wyatt, 2010). This in turn has led to a range of questions about the interpretation and meaning of these classifications (Haapio and Viitaniemi, 2008; Olayonwa et al, 2012). BREEAM is arguably the scheme with the highest standards (Reed et al, 2009), and it has six benchmarks within its classification - 'outstanding', 'excellent', 'very good', 'good' and down to 'pass' and 'unclassified'.

Like all these schemes BREEAM is a voluntary badge but Energy Performance Certificates (EPCs) were introduced in the Europe Union for offices by the Energy Performance of Buildings Directive in 2008. An EPC demonstrates the current energy

efficiency capability of an office and is legally required on completion, on sale or on letting or every ten years. EPCs are actually an estimate based on a building's characteristics and give a rating from A down to the lowest G. Looking to the future the Energy Act 2011 in the UK requires the government to introduce legislation which could make it unlawful to let commercial properties after April 2018 in the lowest two bands (Francis et al, 2013). In addition large public offices have to display "Display Energy Certificates" (DECs) in Europe that give the actual energy consumption of the building. In 2008 it was announced that all new public buildings in the UK will be required to be 'zero carbon' by 2018 and private offices in the following year. There are parallel government initiatives in many developed countries and the real estate sector is being gradually 'encouraged' to go 'green'. Another way of looking at this is that these policies are needed to speed up the adoption of green buildings, not least by providing labels for identification in the market.

### **3. Dynamics of going green**

Although the BREEAM scheme was introduced in 1990 initial take up by the real estate sector was minimal (Francis et al, 2013). Despite growing interest in sustainability especially by the planning system it was in effect ignored by occupiers, agents, landlords or developers. A decade after the introduction of BREEAM the Sustainable Construction Task Group (2000) reported that while property market stakeholders generally concurred with the need for green buildings there was a feeling of powerlessness. This was characterised by Cadman's '(vicious) circle of blame' in which occupiers, developers, architects and investors all see the benefits of green buildings but attribute the lack of green buildings to the other real estate stakeholders' reluctance (RICS, 2008).

A more likely explanation is a combination of a reluctance to change and market ignorance. These barriers are illustrated by an analysis by Holmes and Hudson (2000) of the letting of a new office block marketed in the late 1990s in Newcastle, a provincial city of the UK. The office had been rated as having the highest BREEAM certification yet the letting agents did not incorporate this information in the marketing material and the ultimate tenants of the office block did not factor it into their decision choices. This example probably exemplifies the state of market attitudes at the turn of the millennium. It illustrates a barrier to green offices is that the additional construction cost of the

specification of green buildings is not mirrored by a market willingness to recognise their benefits by paying a rent premium.

Green labels are an essential prerequisite to establishing a market premium to justify new development but so is recognition of their importance. An EPC or a BREEAM rating signals to potential tenants the likely energy consumption. The problem is illustrated by the initial impact of EPCs. The 2010 annual occupiers' satisfaction survey by GVA Grimley (2010) found that 80% of respondents who had agreed a new lease within the last 12 months had not been told their EPC rating by their landlord. This is only limited evidence but it is indicative that at least until recently there has been only a very modest impact of green labelling on the UK office market. Why should tenants look for a green label?

There are a range of arguments for why occupiers would be prepared to seek out (and pay a higher rent for) a green office, often referred to as a 'green premium'. Potential motivations can be summarised as:

- Energy cost savings (as well as reduced waste and water usage)
- Improved working environment enhances productivity (Miller et al, 2009)
- Green corporate image is enhanced by firms/government (agencies) demonstrating their commitment to corporate social responsibility (CSR) or who see use of green buildings as offsetting an otherwise negative image (Eichholtz et al, 2009).

The difficulty is that these benefits are either subject to conjecture or perception or difficult to quantify (Jones, 2013). Nevertheless it is market perceptions on these issues that will drive change and the green agenda.

As noted earlier the last decade has seen an accelerated growth of green offices as documented in Dixon et al (2009) but the implications for the office market are yet to be fully chronicled. There is a clear difference between the existence of green offices and a market for green offices. It is the latter that will ultimately drive the expansion of green offices on a large scale by creating the viability of new development. The perceived industry wisdom is that the first stage of the office market going green would be the establishment of a local green submarket whereby such offices have a premium for occupation. This in

turn means that the increased value will make the construction of such buildings with their additional costs viable (Chegut et al, 2014; Fuerst and McAllister, 2011). The implication is that this process will be gradual through the successful demonstration of the financial viability of development and an increased share of the local market for green buildings. The long drawn out process is reinforced with the role of green refurbishment (possibly after sale) occurring as leases are ended. Thinking further ahead the greening of the office stock will only be complete when this submarket ultimately assumes a dominant position in the locality as prime office stock. The prospect involves not only extensive new development but also the slow emergence of obsolescence in the current non-green stock and re-development/ refurbishment. We refer to this process as the green premium development model.

These short and long term dynamics centre on relative and absolute rent/capital values within an individual office centre, and so must be viewed within a framework of local markets rather than a national perspective. A key necessary condition for the creation or establishment of a (sub)market for green offices in an urban centre is sufficient scale in terms of number of transactions for both leases and purchases (Jones, 2009). The issue is reinforced by the difficulty of factoring in greenness into rental/capital values following RICS guidance the cornerstone of which is comparable evidence on transactions (Crosby, 2000). These questions provide the backdrop to this study that assesses the extent of (emerging) greenness within UK urban areas as a basis for testing the green premium development model.

#### **4. Data and research method**

The focus of the analysis is the spatial incidence of BREEAM offices. While BREEAM certification is tiered, ranging from pass to outstanding, it is assumed that offices in the least BREEAM rating are better in terms of sustainability than conventional buildings. The study undertakes a historic trend analysis of the development of these individual buildings focused on the UK cities or towns with a 'significant' presence of BREEAM certified office buildings. In this study, the terms "green" shall be used to describe any office that has achieved a level of BREEAM rating.



A major barrier to the analysis is the availability and accessibility to accurate, complete and reliable data on green offices. Fuerst, et al (2011) addresses data issues in relation to measurement of green building financial performance. The study investigates the potential sources of data that are relevant for commercial property researches in the UK. Four cardinal data elements of physical characteristics, financial performance, energy consumption and environmental performance are considered. It is found that while public organisations have the potential to provide large samples, it is difficult and cost ineffective to obtain and link these different databases. The study acknowledges that BREEAM dataset is not publicly available in the UK unlike the situation for green buildings in the US and similar developed property markets. Currently in the UK comprehensive information is not available on the actual number, type, design, age, year of certification and location of BREEAM certified office buildings (Fuerst et al, 2011).

There are two potential data sources on individual offices for this study, BREEAM and CoStar. BREEAM GreenBookLive contains information on some certified buildings both in the UK and internationally. However, its usefulness is marred by a number of limitations. In the first instance, it covers only properties certified since 2008. Adopting 2008 as the base year for the data analysis is insufficient to undertake meaningful time series analysis. Another limitation of this dataset is that it excludes properties covered under data protection and client confidentiality. This means that the percentage of certified buildings in a locality cannot be identified with certainty from this source. Third, the information obtainable, which only includes building name and location, postcode, rating category and score, is not comprehensive enough for robust empirical analysis as it does not include property specific attributes. Given these limitations the BREEAM dataset of certified office buildings is not appropriate for this study. In fact there are wider issues concerning the BREEAM database. Given its status as the UK sustainability standard the confidentiality of BREEAM individual certifications undermines its purpose as a green label in the market place, and the promotion of a sustainable built environment.

The CoStar database has a wide remit offering market information on a subscription basis. It provides intelligence on all commercial properties in the UK covering a wide range of sectors such as offices, industrial, retail, land, mixed-use and hospitality. The CoStar database gives access to what can be described as the UK most comprehensive record of

commercial real estate market activities compiled and independently verified by the largest property research team (CoStar Review, 2013). CoStar's proprietary data is sourced directly from property agents, investors and other relevant stakeholders. The precise coverage of the data is unclear but is almost certainly biased toward larger properties and markets. The data on individual properties is not always complete with in some instances missing variables. It will also not include purpose built public and private sector owner occupied offices. For our purposes these gaps do not pose any substantial threat to the validity of the analysis of green development and markets. Crucially the CoStar database enables the identification of properties based on city of location, submarket, postcode, rentable floor area, BREEAM or star rating among others.

From comparison of these two databases it is discovered that CoStar even reports higher number of certified buildings than the BREEAM data in some locations presumably due to the confidentiality clause mentioned above. CoStar also reports the year of construction and refurbishment of buildings and this is not readily available with BREEAM. The study has chosen to be based solely on CoStar data as it enables from one source the analysis of green office growth within local markets incorporating the scale of rentable floor area for both the BREEAM certified and the uncertified office buildings.

A close examination of the 433 BREEAM certified offices in the CoStar database in March 2015 reveals that most of the properties are newly built and these are primarily properties constructed after 1998. For the certified properties that were developed before 1998, most of these have undergone refurbishment which may be adduced as the quest to upgrade them to required sustainability standards. Therefore, in determining the year that a building becomes green, the year of construction is adopted for those buildings that were built after 1998 and have not been refurbished while the year of refurbishment is adopted for the refurbished. Through this, the annual rentable building area is determined and used to generate cumulative figures which have been used to measure the growth of green office space.

## **5. Spatial incidence of green offices**

Following a very slow start from 1998 to the end of 2007 more than 1,000 offices were assessed by the BREEAM scheme, most of these were new properties and assessed in the top two categories. Nevertheless these figures are equivalent to only a minimal proportion of new offices. Dixon et al (2009) for example estimate that in 2006 the 128 BREEAM assessments of 'excellent', 'very good' and 'good' represented approximately 7% of new offices. The CoStar database identifies 433 green office properties in March 2014 which is substantially less than the aggregate total noted above but it is almost certainly explained by the focus on offices for let in the market. The corollary is that BREEAM statistics overstate the significance of green buildings to the office market as more than half were either in the public sector or bespoke.

The UK office market, defined by the CoStar database, comprises a total of 16,053 office buildings in March 2015 out of which green buildings account for 2.7 per cent. However, based on rentable space the green fraction rises to 12.1 per cent presumably reflecting the relative size of new city centre green developments (Table 1). The spatial distribution of these green offices across the UK is very uneven with only 79 locations identified in the CoStar database as having a BREEAM building; so many towns outside city-regions have none. These 79 locations comprise all the cities (incorporating dispersed locations within a city-region) and a range of types of towns. The frequency distribution shown in the Appendix reinforces the spatial concentration of green buildings as 35 of the 47 market areas covering the UK defined by CoStar have 9 or less green buildings, and many of these have only one or two buildings. The 12 market areas with more than 10 green buildings are the main provincial cities (and surrounds) of the UK, excluding Sheffield and Nottingham, plus London and Cheshire. Outside the major cities the sparsity of green buildings means that there is no possibility of even an embryonic local market.

The significant presence of green buildings only in the city-regions is reinforced by Table 2 that demonstrates that only eleven office markets each have 1% or more of the green buildings in the UK. This number is arguably an exaggeration as it includes defining South Wales and Berkshire as city-regions. While there are more than ten green office buildings in the Cheshire market area they do not amount to 1% of the UK stock. London has by far and away the highest number of green office buildings with 120 green offices. It is trailed by Newcastle, Manchester and Glasgow city-regions which only have their green office building

stock in the twenties/thirties. However, using the percentage of UK green office rentable area, the league table is slightly different, though London still maintains its position as top of the pyramid. London alone accounts for half of the entire UK green rentable space even though its contribution is only 27% in terms of actual building unit. Based on space Manchester is second to London, followed by Birmingham and Newcastle, with Glasgow a distant fifth. Overall London and the major provincial city-regions (not including Sheffield) equate to 84% of the green office stock. If Reading, Maidenhead, Milton Keynes, Cardiff and Swansea the figure rises to almost 90%.

### *5.1 Share of green offices in local markets*

A key prerequisite within the green premium development model is the position of green offices within their local markets in offering first a demonstration and then a measurement of adoption/transition to a new general norm. The green shares in relation to the overall office stock within the central business districts of British cities are presented in Table 3. The number of green offices in each central business district of provincial cities is on average in the low teens with an upper bound of 20 in Manchester. With the exception of London green buildings represent less than one in ten offices in city centres. However, the picture in terms of green office space is more significant. As much of the green space is new and in large office blocks it accounts for a greater share of the market than suggested by building numbers. In fact green office space is more than a fifth of the market in London, Manchester and Leeds, and almost a fifth in Bristol and Edinburgh (Table 3). Reading is not included in the table but green office buildings in this locality amount to 783, 235 square feet, more than in Glasgow, Liverpool and Newcastle, and equivalent to 34.2% of total space in the city.

## **6. Growth of green office market**

Earlier it was noted that there had been little interest shown in the building of green office buildings before the millennium. The growth of the UK green office market space is now examined over a 16-year period using annual data since 1999 with the national results presented in Table 4 and Figure 1. There continues to be only modest completions of green office space in the first half of the last decade and it is only toward the end of that decade's

property boom that numbers begin to substantially rise. In the period 2000-2005 only 23 green offices are completed (including refurbishments) although the amount of green space more than doubled, albeit from a low base. There then follows a dramatic upward step change in the number green of completions through the end of the boom and on through the recession. The peak year is 2009 when 105 green offices are completed adding over 8m square feet of space and increasing the green office stock by 54%. By the end of 2014 green office space has grown almost sixteen fold since 1999, and 90% of this expansion has occurred since 2005, with the overall impact shown in Table 5.

Not all of this new green space had been generated from new build. As Figure 2 shows there is a sudden popularity of refurbishment from 2008 and 2009 with more than 1.5m square feet of offices generated in this way in both of those years. After a blip in the following two years newly refurbished green space rises to over 1m square feet in each of the three years 2012-2014. In fact 44% of all new green space is accounted for by refurbishment in 2012 followed by 47% in 2013. In the post-recession office market refurbishment therefore has been the major source of green space.

These statistics on green office space development suggest that the recent economic/property cycle appears to be an important influence on going green, although they clearly do not conform to a simple boom/bust model. Detailed comparison with the timing of office development completions as a whole is demonstrated in Table 5. The total amount of office space coming on the market in the 2000s shows the expected upward trend linked to the economic growth of the economy rising to a crescendo in 2008 and 2009 before quickly falling away with aftermath of the recession. Green office development over this period experiences only a limited uplift from the cycle. There is a modest upward trend but then a sudden upward sea change in 2008 when new green space represents 32% of all office development completed in that year. The proportion of new office space accounted for by green buildings in subsequent years then rises dramatically to an average of over 70% over the period 2011 to 2014. In a very short period there has arguably been a revolution in the production of new green offices, an argument reinforced when the green output statistics include refurbished space. The potential reasons are considered later, together with an appraisal of the green premium development model, but first the analysis looks at a disaggregated city-region perspective.

## 6.1 *Green office growth in London and provincial city-regions*

Given the role of local markets in the underpinning of the green development premium model it is important to spatially decompose the national picture of the dramatic green office growth since 2005. It is useful to begin with London as the foregoing analysis identifies not only the city as distinctive from the other cities in terms of its early adoption of green space but it also represents a significant difference in scale. Green office growth in London is shown in Figure 3 and exhibits a similar trend as that of the entire UK. London holds a significant share of the UK green office stock and so to a degree whatever happens there will have significant impact on the national figures. Nevertheless the dramatic national peak of 2009 is missing in London. Instead 2008 is a minor peak and although there is a subsequent falling away the annual production of green space quickly recovers and 2014 represents a record level of output. In 2014 virtually all (98%) completed green building occurred in London.

In the provincial city-regions typically first green developments were completed in the early 2000s, although a small number of green buildings date from the 1990s in Newcastle and Edinburgh. The first green office was not completed in Bristol until 2006. In general the first half of the 2000s saw annual building completion rates of none, one or two in provincial cities. Green office completions in these city-regions normally began in earnest 2007-2008. Birmingham was earlier where the peak year of green development was 2006 when four buildings were completed representing just over .75 m square feet (25% of total space at the end of 2014). In Manchester 2.29m square feet was completed in 2008-09 representing 62% of green space in the city-region in 2014. Similarly in Edinburgh six developments were completed in 2009 totalling 0.55m square feet, equivalent to more than half the current green space in city region. In the other provincial city-regions listed in Table 6 the scale of green office completion activity amounted to around a third of the cumulative space to date. In general green development, with the possible exception of Edinburgh, has subsequently fallen away in provincial city-regions but it has been a period of minimal development outside London (CBRE, 2015).

An overview of the rapid expansion of green office space in individual city-regions through the last decade is given by Table 6. The cumulative growth in green space in

London has been much greater in proportional terms than the provincial city-regions since 2009. In 2014 London had an estimated total green space of over 20m square feet as compared to almost 9m square feet in 2009, 2.8 million square feet in 2005 and only 0.6m square feet in 1999. But it is also clear that the pace of growth in provincial cities has slowed although it continues.

## **7. Development trends and the green premium development model**

From almost nowhere new green office space has moved from the margins of the market to the majority of new developments in the space of less than five years, at least in provincial cities. There has been a substantial rise not only in new development but also refurbishment. This surge coincides with the peak of development completions stimulated by the property boom of the last decade but also at that point when the market as it is suffering a downturn following the global financial crisis and capital values are plummeting with record levels of vacant space.

There are a range of alternative potential explanations. First, is that the rapid success can be explained by the acceleration of the dynamics of the green premium development model, and the sustainability message has convinced the market that green offices have not only become acceptable but there is an accepted rent/yield premium to developers/owners. Second that (anticipated) green legislation has convinced investors that new properties need to meet more vigorous standards to avoid accelerated obsolescence in the medium term. Third, the technologies incorporated in the new generation of offices mean that green is now mainstream or that these offices can easily be adapted to become green. A final alternative explanation is that in a severe market downturn 'green' becomes a significant marketing edge. Each of these is evaluated in turn.

The green development model explanation requires the wide acceptance of evidence of a green yield premium stimulating an extremely rapid development response. This is unlikely simply because of the pace and scale of change, the fact that the number of new green developments in any year in a provincial city is very small, together with the time necessary for new development to be completed in response to any signals. Prior to 2006 there was a maximum of one green development a year in every provincial city, and in many

cases none. Even in the two year period 2006 and 2007 there were only 20 green office building completions across the six provincial city-regions in Table 6, the cities where most such development occurred. These numbers are unlikely to have enabled sufficient comparable valuation evidence, following RICS guidance, to establish any widely accepted yield premium. London with its greater scale could be the exception but here too only eleven green developments were completed between 2000 and 2007 inclusively.

In addition the next step of the green development model requires the building of offices in the response to the market acceptance of a premium. The surge in green office completions in 2008-9 must have been instigated before the first wave of such offices in 2006-07. Indeed given the supply constraints in London some suggest even a twenty year property cycle. While there are academic hedonic regression models indicating green premiums these studies often suffer from missing variables and the coefficients are based on equilibrium assumptions (Jones, 2013). The technique is unsuitable for analysing property markets during the volatility/ turmoil of a boom and bust. Furthermore with green offices representing a high proportion of new offices there is an evident practical issue of distinguishing between a new and a green office premium.

Green legislation per se is also unlikely to explain the surge in green office completions in 2008. EPCs were introduced by the EU Energy Performance of Buildings Directive in 2008 but as noted earlier at first received scant attention by the market (GVA Grimley, 2010). The government commitment that new private offices will be required to be 'zero carbon' by 2019 was also introduced in 2008. UK legislation on minimum green standards for all offices to be let from 2018 did not materialise until the Energy Act 2011. While legislation may not explain the initial wave of green offices, together these two phenomena may be reinforcing influences on subsequent investment. In addition the direction of travel of government policy on greening the environment had been clear for some time and so investors may have decided that new green development reduced the risk of obsolescence in the relatively near future as more strict environmental standards were expected on the horizon.

Improvements in building technology are pushing the frontiers of energy conservation. Indeed greening the environment is an imperative to drive such technological change



particularly in terms of energy efficient insulation and equipment. This will ultimately drive down the cost differential of green building over standard buildings but this has yet to occur and certainly had not occurred in 2008 when the significant boost to green offices began (Abdul et al, 2014). But despite this the figures suggest that green has become the norm for new buildings since 2010. It is probable that from the investor's point of view green technologies were changing so fast so why not try to capture the latest advances in new development otherwise again there is a fear of later obsolescence.

The year 2008 is a textbook example of the aftermath of a property boom. Large numbers of properties conceived in the heady heights of the boom arrive on the market just as the economy turns down. It is a year of 'record' low take up as firms come to terms with the global financial crisis creating a huge overhang of supply. It seems that to counter this market collapse green credentials offered not so much a rent premium but an opportunity to demarcate your office from the pack at a small financial cost. This may also explain the rise of green refurbishment at this time. In other words the adversity created by market crisis represented a catalyst that led to a substantial stimulus in green offices. On balance this is the most likely explanation of the rapid expansion of green space at the very end of the last decade. The greater chance of being let is then an avenue to increased value. In a sense this is a speculative 'green premium' based on rental income from occupation increasing capital value rather than through higher rents achieved.

This last explanation centres on the role of the boom and bust explaining the rise of green office development/refurbishment. Company failures brought many properties on the letting market competing with newly built offices. Greening offered a possible solution. It also highlights a missing element in the green premium development model, namely the property cycle. The cycle of the last decade was very much a national/global phenomenon and both the boom and the bust were of historic significance. The melee of the peak and its immediate aftermath, together with the emergence of new green technologies, seems to have been the catalyst for fast fundamental change, even a sea change in attitudes.

The green offices developed during our sixteen year period are now predominantly part of the mainstream investment universe. CoStar ownership data is incomplete with approximately 10% of office ownership not known. Excluding these unknowns 57% of the

green offices are owned by financial institutions (including listed property companies/REIT and investment funds). Institutional ownership rises to 70% in terms of space. The vast majority of the remainder are owned by (regional) private property companies. Only a few were built as part of urban regeneration schemes by public-private companies or government (agencies). The high percentage of institutional ownership reinforces the investor fear of obsolescence motivation outlined above.

## **8. Summary and conclusions**

There has been a dramatic rise in the green office 'market' but the BREEAM stock still represents only about 2.7% of buildings although just over 12% of the UK total office space. While there are individual properties spread around the UK most green offices are in the principal cities. London and ten major provincial city-regions account for 84% of the green office stock. The largest concentration by some way is in London with 120 green office buildings and over half the UK green space. Other large city regions have typically 20 to 30 buildings and 10 to 20 within city business districts. In terms of city centres green office space is almost 30% in London, just over a fifth of the market in Manchester and Leeds, and approaching a fifth in Bristol and Edinburgh. In Reading it is equivalent to 34.2% of total space in the city.

The green transformation occurred suddenly after only minimal expansion in the first half of the last decade. Green building explodes at the peak of that decade's development boom and in the immediate years that follow as the office market collapses. Indeed in 2009 over 8m square feet of green space is completed expanding the BREEAM market office stock by 54%. A similar pattern of green development occurred in the USA (Kok and Holtermans, 2014). New green space emanated not just from new building but there was a significant contribution from refurbishment.

London led the way in terms of not only the timing of this green building boom but also its scale of growth. In general green development in the provincial city-regions was minimal until it took off in 2007-2008 and peaked in 2009. Most of the green office space in these cities was completed in this short three year period, and with the possible exception of Edinburgh, output subsequently declined as office development in general was put on hold.

However, London continues to exhibit a rising trend and in 2014 green completions reached a record level in the city.

These findings are inconsistent with the green premium development model outlined at the outset in which increased value generates green offices in a gradual cumulative process that establishes a green submarket. The driving forces instead appear to be the fear of obsolescence by investors in the upside of the boom and latterly the desire by landlords to offer a competitive edge in a market with high vacancies. In the maelstrom of change created by the credit crunch and the collapse of the decade's property boom green offices appear to have become the new norm. Whereas in the first half of the 2000s green completions represented much less than 10% of new building more than half of all new offices completed since 2009 have been green and since 2011 the figure has risen to seven out of ten.

The long term implications are uncertain, clouded by the cyclical nature of the property market. The supply overhang from the property boom has meant that vacancy rates have been high for six years although beginning to fall through 2014, giving rise to the first recovery shoots of speculative development (JLL, 2014). The green premium development model may not explain the process to date but its end state is still relevant to an assessment of the future, especially for the refurbishment of the existing stock. Going green still involves substantial investment for these properties. A key long term question is to what extent distinctive local (sub)markets for green labelled offices have been established?

The answer inevitably varies by location. As noted earlier a necessary condition is sufficient scale in terms of the number of green transactions for both leases and purchases to provide comparable valuation evidence and confidence to occupiers and investors. This has definitely not occurred outside the major cities where green buildings have been 'one-offs'. In the largest provincial city centres there has been a substantial amount of new green offices built, approaching 20% of the overall stock albeit primarily derived from a small number of large blocks. However, the long and shallow recovery since 2008 has meant very limited market transactions in these cities and this in turn has almost certainly diluted and stagnated the dynamics of green market transformation.

In comparison the London office market did not suffer to the same degree from the recession and green development is at record levels in 2014 with green penetration almost 30%. London represents the only potential locality where a green market could have been established so far. More generally the fundamental unresolved issues are can the leap in green office building that occurred as a result of the property boom be translated from a cyclical phenomenon to creating significant structural change in the office market, and if so how long will it take?

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**Table 1 Share of Green Offices in the UK Office Market**

<b>Basis of measurement</b>	<b>Description</b>	<b>Value</b>
Actual building unit	UK green office sector	433
	UK office market	16,053
	% Green of UK office market	2.73
Rentable building area (ft <sup>2</sup> )	UK green rentable building area	41,022,397
	UK rentable building area	340,188,446
	% Green of UK rentable building area	12.06

Source: CoStar Database, March 2015



**Table 2 Green Space in City-Regions with Significant Numbers of Green Offices\***

Location	Number of green offices	% of UK green offices	Green lettable space (ft <sup>2</sup> )	% of UK Green lettable space
London	120	27.71	20651081	50.34
Manchester	27	6.24	3676954	8.96
Birmingham	19	4.39	2730659	6.66
Newcastle upon Tyne	33	7.62	2364302	5.76
Glasgow	26	6.00	1735740	4.23
Berkshire <sup>1</sup>	23	5.31	1655140	4.03
Leeds	17	3.93	1332873	3.25
Bristol	19	4.39	1042415	2.54
Edinburgh	19	4.39	1009204	2.46
Liverpool	14	3.23	1008369	2.46
South Wales <sup>2</sup>	16	3.70	513416	1.25
Total	433		41022397	

Source: CoStar Database, March 2015

\*To qualify each area accounts for more than 1% of the UK stock

<sup>1</sup> Includes Maidenhead and Reading, <sup>2</sup> Includes Cardiff and Swansea

**Table 3 Share of Green Offices in Central Business Locations of British Cities**

Location	Number of green offices	Total office build-ings	Green % of total offices	Ranking	Green office space (ft <sup>2</sup> )	Total office space (ft <sup>2</sup> )	Green % total space	Ranking
London <sup>1</sup>	42	366	11.48	<b>1</b>	8414650	28865877	29.15	<b>1</b>
Manchester	20	335	5.97	<b>7</b>	3420360	15803534	21.64	<b>2</b>
Leeds	13	162	8.02	<b>3</b>	1198627	5753344	20.83	<b>3</b>
Edinburgh	14	188	7.45	<b>4</b>	925772	4744688	19.51	<b>4</b>
Bristol	8	99	8.08	<b>2</b>	821327	4271723	19.23	<b>5</b>
Birmingham	10	261	3.83	<b>8</b>	1993363	11305201	17.48	<b>6</b>
Newcastle upon Tyne	9	136	6.62	<b>5</b>	614129	3670455	16.73	<b>7</b>
Liverpool	8	130	6.15	<b>6</b>	808758	6370425	12.70	<b>8</b>
Glasgow	7	236	2.97	<b>9</b>	637168	9617634	6.62	<b>9</b>

Source: CoStar Database, March 2015

<sup>1</sup>It comprises the four CoStar submarkets of City Core (North, East and West) and City Fringe. For other cities the areas are defined by CoStar central submarkets.

**Table 4 Development of Green Space in the UK Office Market**

<b>Year</b>	<b>Annual green building unit</b>	<b>Annual green office space (ft<sup>2</sup>)</b>	<b>Cumulative green building unit</b>	<b>Cumulative green office space (ft<sup>2</sup>)</b>
1999	0	0	28 <sup>1</sup>	2,560,517
2000	3	180,996	31	2,741,513
2001	1	54,295	32	2,795,808
2002	5	408,509	37	3,204,317
2003	7	1,709,245	44	4,913,562
2004	3	146,569	47	5,060,131
2005	4	460,180	51	5,520,311
2006	19	2,276,170	70	7,796,481
2007	28	1,810,251	98	9,606,732
2008	54	5,283,093	152	14,889,825
2009	105	8,082,085	257	22,971,910
2010	32	3,172,273	289	26,144,183
2011	24	2,357,945	313	28,502,128
2012	30	3,586,429	343	32,088,557
2013	38	2,660,755	381	34,749,312
2014	38	5,549,342	419 <sup>2</sup>	40,298,654

Source: CoStar Database, March 2015

<sup>1</sup>The 1999 cumulative figures are aggregates of green offices (both actual building unit and rentable building area) up to and including 1999 annual data.

<sup>2</sup>Out of the total of 433 green office buildings, five are excluded from the analysis due to lack of information on year of construction and nine were completed since 2014.

**Table 5 Comparison of New Green and Total UK Annual Office Completions 1990-2014\***

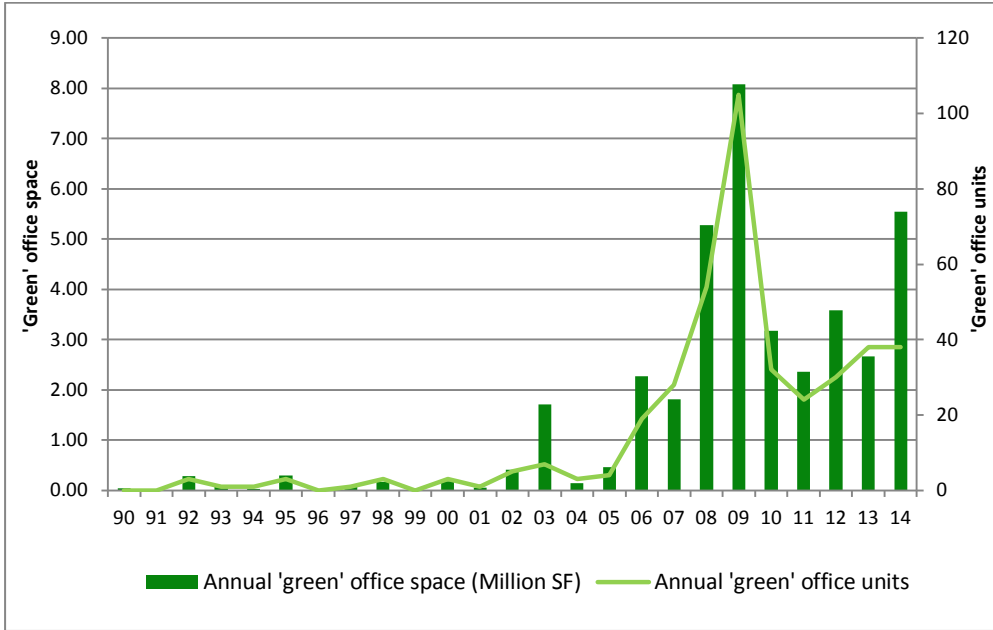
Year	All Offices		Green Offices		Green	Green
	Number	Space (ft <sup>2</sup> )	Number	Space (ft <sup>2</sup> )	Number %	Space %
1990	374	7,656,381	2	38,069	0.5	0.5
1991	236	7,393,329	0	0	0.0	0.0
1992	267	7,695,449	3	279,805	1.1	3.6
1993	191	3,628,323	1	91,815	0.5	2.5
1994	179	3,368,104	1	35,433	0.6	1.1
1995	212	4,300,144	2	265,714	0.9	6.2
1996	156	3,782,738	0	0	0.0	0.0
1997	188	4,119,955	0	0	0.0	0.0
1998	197	4,008,908	3	169,546	1.5	4.2
1999	218	4,725,573	0	0	0.0	0.0
2000	380	9,425,843	3	180,996	0.8	1.9
2001	175	6,416,135	1	54,295	0.6	0.8
2002	227	5,887,681	4	203,509	1.8	3.5
2003	170	7,844,631	7	1,709,245	4.1	21.8
2004	246	5,799,268	2	101,868	0.8	1.8
2005	253	4,477,905	4	460,180	1.6	10.3
2006	241	5,596,009	16	1,532,411	6.6	27.4
2007	315	7,134,514	26	1,418,162	8.3	19.9
2008	520	11,484,203	43	3,709,149	8.3	32.3
2009	363	11,386,045	90	6,501,673	24.8	57.1
2010	140	4,676,832	26	2,583,514	18.6	55.2
2011	74	2,343,013	19	1,756,857	25.7	75.0
2012	73	3,059,395	19	1,973,515	26.0	64.5
2013	71	1,874,067	21	1,402,419	29.6	74.8
2014	82	5,706,727	24	4,506,123	29.3	79.0

\*excluding green space generated by refurbishment

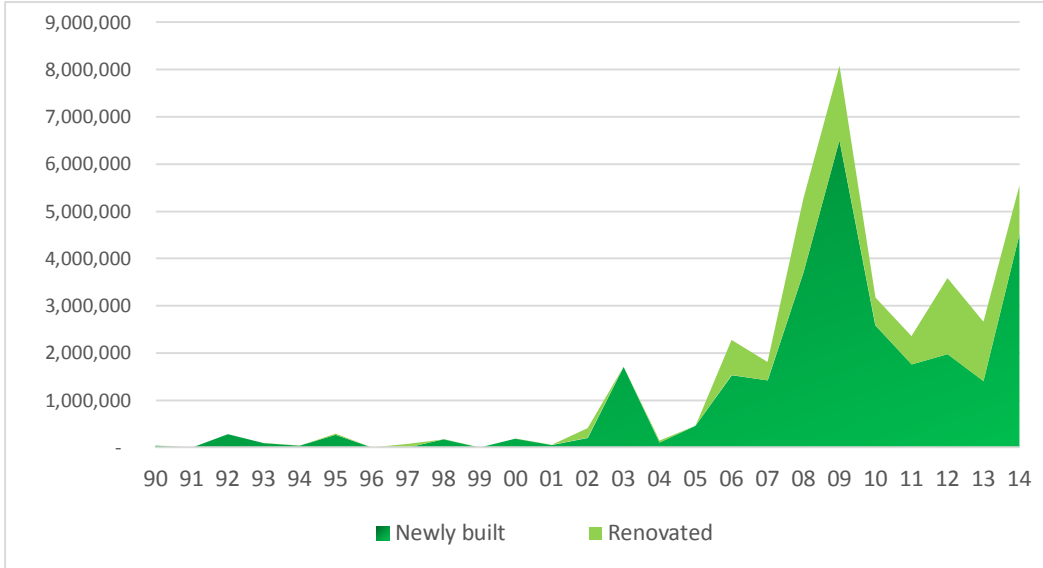
**Table 6 Profiles of the Cumulative Growth of Green Office Space in Selected City-Regions\***

<b>Year</b>	<b>London</b>	<b>Manchester</b>	<b>Birmingham</b>	<b>Edinburgh</b>	<b>Leeds</b>	<b>Bristol</b>	<b>Newcastle</b>
<b>1999</b>	605,452	0	0	30,858	180,864	0	645,331
<b>2005</b>	2,805,765	54,295	61,118	54,937	210,864	0	1,027,247
<b>2009</b>	8,929,360	2,643,018	2,171,603	716,288	913,614	549,091	1,769,272
<b>2014</b>	20,228,843	3,676,954	2,730,659	1,009,204	1,332,873	943,892	2,336,950

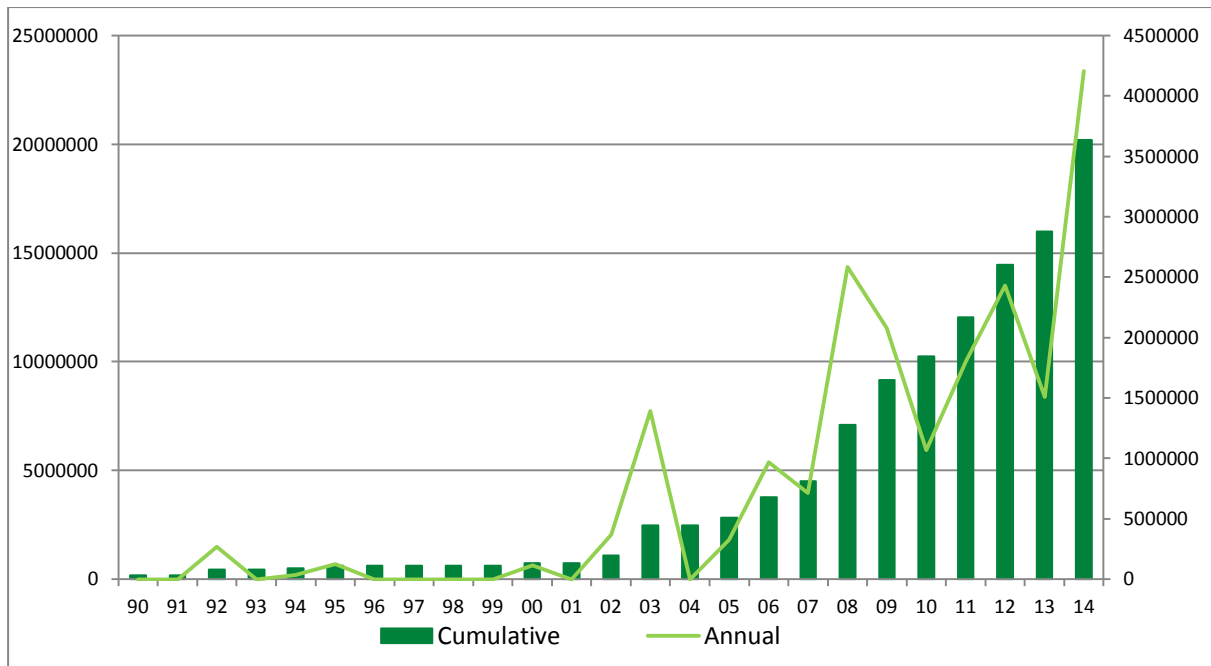
\*Figures vary marginally from other tables above as analysis only includes buildings where date of completion is known.



**Figure 1: Annual Green Office Development**



**Figure 2 The Breakdown of New Green Space created by New Build and Refurbishment 1990-2014**



**Figure 3 Growth of Green Office Space in London (ft<sup>2</sup>)**

## Appendix CoStar Market Areas with less than Ten Green Office Buildings

Market	No. of BREEAM Buildings
Aberdeen	2
Buckinghamshire	2
Cambridge & Peterborough	3
Central Scotland	2
Coventry	3
Cumbria	0
Derby	3
Devon & Cornwall	3
Dorset & Somerset	0
Essex	3
Hampshire	4
Herefordshire & Worcestershire	0
Hertfordshire	2
Highlands & Islands	1
Humberside	0
Kent	4
Lancashire	4
Leicester	3
Lincolnshire	1
Luton & Bedfordshire	2
Milton Keynes	9
Norfolk & Suffolk	2
North Wales	3
Northampton	1
Northern Ireland	0
Nottingham	6
Oxford	1
Sheffield	4
Shropshire & Staffordshire	5
South Scotland	1
Surrey	6
Sussex	2
Swindon & Gloucester	1
Tees Valley & Durham	2
York	1