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# University of Glasgow

**'EXAMINING THE LEVEL OF INFLUENCE THAT BREEAM CERTIFICATION  
HAS ON TENANTS' DECISION TO OCCUPY COMMERCIAL REAL ESTATE:  
A CASE STUDY OF BREEAM CERTIFIED OFFICE BUILDINGS IN  
GLASGOW'S CITY CORE'**

by

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# CONTENTS

|   |    |
|---|----|
| List of Figures and Tables .....  | 4  |
| Abstract .....  | 5  |
| Acknowledgements .....  | 6  |
| 1. Introduction .....   | 7  |
| 1.1 Background .....  | 7  |
| 1.2 Statement of the Problem.....                                       | 9  |
| 1.3 Research Questions.....   | 10 |
| 1.4 Methodology.....  | 11 |
| 1.5 Research Instrument.....  | 11 |
| 1.6 Research Aims .....   | 11 |
| 2. Literature Review .....  | 12 |
| 2.1 Introduction .....  | 12 |
| 2.2 Sustainability and the Built Environment .....                      | 13 |
| 2.3 Benefits of Sustainable Commercial Properties to the Occupier ..... | 15 |
| 2.4 Valuation of Commercial Real Estate.....                            | 18 |
| 3. Methodology.....   | 19 |
| 3.1 Rationale for the Research Design .....                             | 20 |
| 3.2 Methodology Framework.....  | 20 |
| 3.3 Data Collection.....  | 21 |
| 3.4 CoStar Data Analysis .....  | 21 |
| 3.5 Sampling Procedures .....   | 22 |
| 3.6 Study Interview Questions.....                                      | 23 |
| 3.7 Research Limitations.....   | 24 |
| 4. Results and Analysis .....   | 24 |
| 4.1 Property Case Study .....   | 25 |
| 4.1.1 St Vincent Plaza.....   | 26 |
| 4.1.2 141 Bothwell St.....  | 26 |
| 4.1.3 CONNECT110NS .....  | 27 |
| 4.2 CoStar Data Analysis .....  | 27 |
| 4.3 Market Analysis.....  | 30 |
| 4.3.1 United Kingdom .....  | 32 |
| 4.3.2 Glasgow City Core.....  | 33 |

|       |                                      |    |
|-------|--------------------------------------|----|
| 4.4   | Interview Results and Findings ..... | 35 |
| 4.4.1 | St Vincent Plaza.....                | 35 |
| 4.4.2 | 141 Bothwell St.....                 | 37 |
| 4.4.3 | CONNECT110NS .....                   | 39 |
| 4.5   | Interview Outcomes.....              | 41 |
| 4.6   | Summary .....                        | 44 |
| 5.    | Conclusions .....                    | 45 |
| 5.1   | Glasgow City Core Evaluation.....    | 46 |
| 5.2   | Summary of Results and Analysis..... | 47 |
| 5.3   | BREEAM Certification .....           | 48 |
| 5.4   | Final Conclusion.....                | 48 |
|       | References .....                     | 50 |
|       | Appendices.....                      | 58 |

## LIST OF FIGURES AND TABLES

| <b>List of Figures</b>   | <b>Page</b> |
|--|-------------|
| Figure 1. Regional Capital Investments in United Kingdom Office Space  | 8           |
| Figure 2. Energy Efficiency Methodology Framework  | 21          |
| Figure 3. Vacancy rates for BREEAM certified office buildings and non-BREEAM high quality (4/5 Star) office buildings in Glasgow City Core | 33          |
| Figure 4. Rental rates for Glasgow City Core office buildings  | 34          |

| <b>List of Tables</b>  | <b>Page</b> |
|--|-------------|
| Table 1. BREEAM Commercial Case Study Interview Questions            | 23          |
| Table 2. Names and Locations of the Selected Case Study Buildings    | 25          |
| Table 3. Available Square Footage Commercial Office Space            | 28          |
| Table 4. Net Absorption Square Footage of Commercial Space           | 29          |
| Table 5. Comparison BREEAM Ratings                                   | 31          |
| Table 6. Interviews Data St Vincent Plaza, Bothwell St & CONECT110NS | 42          |
| Table 7. Quantified Data for Interview Questions                     | 43          |

## **ABSTRACT**

Apart from primary positive effect of the green building great energy performance, companies opt for office buildings with green design due to evidence based findings in regard to negative effects of office building construction and maintenance on the environment. Visions of potential improvements to corporate performance have led large firms to support research of sustainability and green building as a provision of market differentiation. Moreover, the green premium has also stimulated the interests of investors with existing interests in the sustainability markets. Prior studies have shown higher rents and higher occupancy rates for buildings with LEED or BREEAM certification. Further, research is required in the contexts of economic and environmental relationships between BREEAM certified commercial properties and market demand.

This study assessed the importance of BREEAM certification for tenants' decision to occupy commercial real estate in the Glasgow City Core submarket. A methodology framework was developed to answer questions related to BREEAM certifications for premium office buildings, energy efficiency, and occupier benefits in the commercial built environment for the United Kingdom; and more specifically for the office spaces within the City Core of Glasgow. An analysis of the rental and vacancy rates for office buildings was conducted using financial and economic data from 2008 forward.

Key Terms: BREEAM, United Kingdom, Glasgow, City Core, occupier, energy efficiency, environment.

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# 1. INTRODUCTION

The United Kingdom is blessed by centuries old built environments which reign in aspects of remarkable architecture, renaissance aesthetics, and historic reflections of the Kingdom's culture. However, the age, fabric, and nature of the design of the old buildings are also a cause of massive energy consumption and inefficiency, bolted down in the centres of Digital Era infrastructures (Crown, 2016). The institution of stringent energy efficiency and environmental sustainability requirements conflict in regard to conservation versus long run efficiency regimes (Pan et al., 2015). In addition to traditional determinants used for market values and rents, such as the age and location of the property, commercial property investors must now consider energy consumption and cost efficiency (Neagle, 2017). Moreover, office occupiers are challenged by pressure to adopt cost saving initiatives such as downsizing the office space, political and economic uncertainty, skill in the labour force, comfort, and the amenities and overall experience of the workspace (Williams, 2017). This study assessed BREEAM certified office buildings in the Glasgow City Core submarket as case studies along with quantitative data analysis. The methodology will consist of a qualitative investigation of the office buildings' energy performance history along with semi-structured interviews with occupiers to generate data for statistical analysis.

## 1.1 BACKGROUND

The commercial built environment is, globally, one of the largest consumers of non-renewable energy (Labeodan et al., 2015). Subsequently, the LEEDs City Council (2011) advocates for commercial developments above 1,000 sq m in floor space to qualify for the BREEAM standard as a minimum. The European Union's adoption of the Energy Performance of Buildings Directive (EPBD Directive, 2002/91/EC) in 2002 significantly enhanced the European legislative framework for energy efficiency in the built environments (Papaglastra, 2017). Subsequently, cohesion policy is changing the preconditions for economic



developments in Europe (Kersan-Skabic & Tijanic, 2017). Heightened awareness of environmental sustainability in light of global warming and future energy supply demands has crossed over from pollution and energy consumption crises in manufacturing industries to energy efficiency and cost effectiveness in buildings (Neagle, 2017; Papaglastra, 201; Lovell, 2013). The largest investments originated from overseas investors in Scotland and Wales, totalling £3.1 billion (Matthews, 2018).

The BREEAM (2018) Technical Manual classifies the BREEAM commercial properties as:

1. Fully fitted;
2. Simple;
3. Shell/core; or
4. Shell

The building types are classified as commercial, residential, public, or “other”; whereas, the commercial includes office spaces, retail, and industrial buildings, to include data centres. The most common tools for Building Environmental Assessment (BEA) are EcoHomes, GBTool, and LEED-NC (Gu, Wennersten & Assefa, 2007). As with other sectors, the interest in the impact of energy efficiency as potential investment interventions is diverse across commercial property owners and occupants (Crown, 2016). Overall, commercial property investors are driven by government regulation, increases in energy prices, available service providers, and trends in globalization (McGraw-Hill, 2011).

Prime rents for office space in the United Kingdom averaged £32 per sq. ft. between 2016 and 2017 (Roberts, 2018). Figure 1 shows the regional investments in office space in the United Kingdom, outside of Greater London, from 2017:

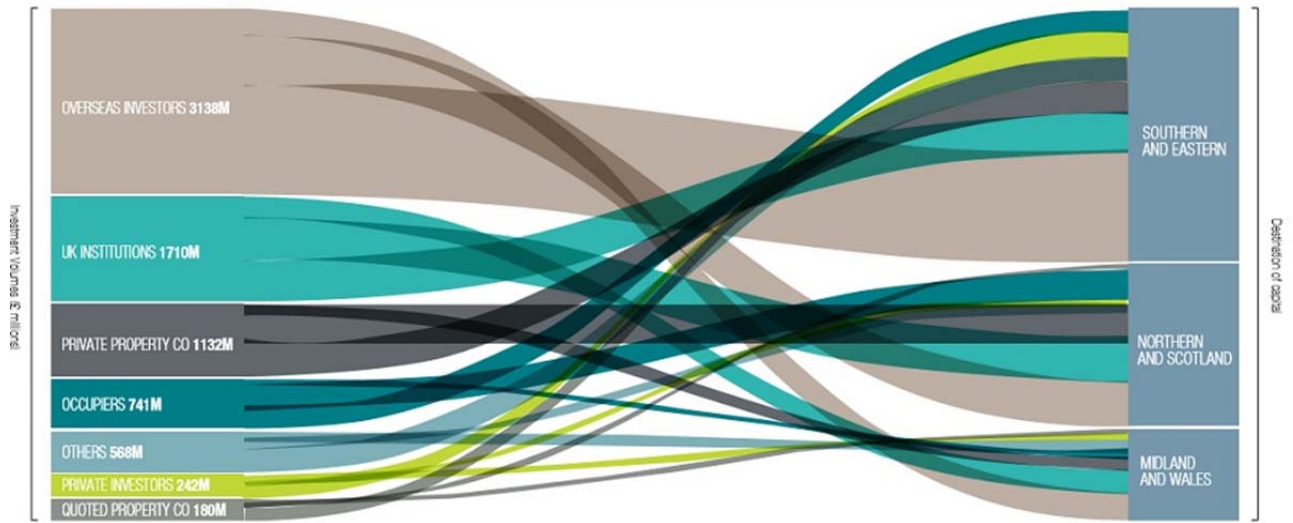


Figure 1. Regional Capital Investments in United Kingdom Office Space (Matthews, 2018)

Environmental friendliness has become an expected character trait for high end commercial properties in the United Kingdom. The Minimum Energy Efficiency Standards (MEES) also dictate how large commercial properties are renovated, maintained, and managed. However, many commercial property investors who pursue sustainability are driven by factors other than regulatory compliance, to include opportunities for research funding, new product development, and marketing strategies.

## 1.2 STATEMENT OF THE PROBLEM

Much of the commercial building stock in the United Kingdom consists of some of the world’s oldest properties; which in turn, consume massive amounts of energy and efforts toward refurbishment and maintenance (Crown, 2016). Much of the aged UK commercial building stock has been challenged with demands to upgrade properties toward higher energy efficiency (Papaglastra, 2014). Property developers and investors have refurbished many of the old buildings, following structural element failures; however, some of the buildings have proven to be beyond propping.

A paradigm shift in occupier and rents rates for the commercial real estate market has emerged from the growth of a global knowledge economy (Denham,

2017). Market analysts project that, although structural drivers of occupier demand will remain unchanged, occupiers will adopt intensive research in tight commercial property markets increase understanding of the market dynamics and discover new options (Roberts, 2018). New demands in the commercial property market create challenges of obsolescence due to legislation, not being able to let, reduced property value, and reduced occupancy rate. For the occupiers, occupying green buildings is now one way to demonstrate commitment to the green agenda and for proving that they care for the wellbeing and health of their employees. Therefore, an increased awareness of the need for higher energy efficiency in old buildings and how the energy performance of old buildings impacts the investors and occupants is needful.

### **1.3 RESEARCH QUESTIONS**

This research study aims to answer the following research questions:

$R_1$ : How is the decision to occupy office space in Glasgow's City Core affected by the building's BREEAM certification?

$R_2$ : How significant is energy efficiency in the decision making to select an office in one of the buildings in the Glasgow City Core submarket?

$R_3$ : What occupancy benefit does a firm derive from occupying office space in a BREEAM certified office building in the Glasgow City Core submarket?

$R_4$ : Compared to other branches that they occupy, do Glasgow City Core office buildings' stakeholders enjoy lower operating expenses in relation to employee health and energy expenses?

## **1.4 METHODOLOGY**

The methodology is a mixed method approach toward an investigation of the energy performance of BREEAM certified office buildings in the Glasgow City Core submarket. The methodology will be used to investigate the energy performance based upon the perspectives of the occupiers. The interview method is the primary mode of data collection from a sample of nine tenants in three selected BREEAM certified buildings in the Glasgow City Core submarket. There is a total of 17 BREEAM certified office buildings in Glasgow's City Core.

## **1.5 RESEARCH INSTRUMENT**

The research instrument is a list of interview questions compiled for the sample population. The questions in the Commercial Building Energy Efficiency interview were developed based upon questions in the 2014 - 2015 Building Energy Efficiency Survey (BEES) for England and Wales and the Minimum Energy Efficiency Standards (MEES) requirements. The questions are semi-structured interview questions which were designed to provide the textbook approach to generating answers to the research questions.

## **1.6 RESEARCH AIMS**

The research is designed to achieve the following aims:

$A_1$ : To explore factors supporting the tenant decision to occupy office space in Glasgow's City Core in terms of how the buildings are affected by the BREEAM certification.

$A_2$ : To identify the role of energy efficiency in the decision making process to occupy office space in the BREEAM certified buildings in the Glasgow City Core submarket.

$A_3$ : To identify primary occupancy benefits derived from the firm from occupying BREEAM certified office space in Glasgow's City Core.

$A_4$ : To compare Glasgow's City Core BREEAM certified office buildings' operating expenses in the contexts of employee health and energy expenses compared to comparable properties.

## **2. LITERATURE REVIEW**

### **2.1 INTRODUCTION**

Multi-scale energy proportionality based upon smart connectivity encompasses the proportionalities of the building, user, and organization used in automated, location based energy controls (Pan et al., 2015). The Building Research Establishment Environmental Assessment Method (BREEAM) was established in 1990 as the first scheme for green building accreditation in the United Kingdom (Oyedokun, 2017). Since then, a number of environmental sustainability standards, strategies, and financial market theories have been presented across industries and academic disciplines (Crown, 2016; Aroul & Hansz, 2012; Pan et al., 2015; Neagle, 2017; Oyedokun, 2017; Ruggiero et al., 2017; Lovell, 2014; Labeodan et al., 2015). The structure of the theoretical framework for this study is based upon classical and current theories of price premiums for commercial properties, theories and models of economic market drivers, values, and availability; and the role of energy efficiency and environmental sustainability on rent prices and occupancy rates.

The literature for the research was extracted from official government and common global databases for peer reviewed articles in regard to energy efficiency in commercial buildings, and perspectives of commercial tenants on energy efficiency, comfort, and overall performance of the occupied space. The databases used to extract literature thus far include EBSCO Host, Elsevier, NEXIS UNI, ProQuest, and JSTOR. Key search terms for the search include

“energy efficiency”, “commercial”, “hedonic pricing model”, “occupier”, “occupier rate”, “green building market”, “Internet of Things”, “building proportionality”, “abatment”, “BREEAM”, “office rents”, “environmental”, “absorption”, “vacancies”, “let”, “net absorption”, “grade A”, “five star”, “UK”, “Glasgow”, “Scotland”, and “sustainability”.

## **2.2 SUSTAINABILITY AND THE BUILT ENVIRONMENT**

Labeodan et al. (2015) supported that the built environment is a primary consumer of non-renewable fossil fuels, and account for 33% of the total energy consumed in OECD and non-OECD countries. Pan et al. (2015) contributed that smart technology provides ideal strategies for energy monitoring, evaluations, and Internet of Things systems for change applications in conventional buildings. A McGraw-Hill (2011) study supported that the perception of sustainability and green building is a provision of market differentiation for the corporation and an opportunity for financial performance improvement. Approximately 67% of the sample expressed that their customers’ demands for sustainability services drives the commercial property engagements in green building and sustainability movements. Moreover, approximately 16% of the sample asserted that they would be willing to pay premium rent prices for green retrofitted office spaces.

Oyedokun (2017) set out to determine how the green premium impacts investments in commercial properties in order to stimulate foreign investments in developing countries. The research assumptions included that an increase in foreign investors will create a sustainable market in challenged economies. Roberts (2018) contributed that businesses in the United Kingdom have been under pressure due to environmental regulation and digital disruption, which caused shifts in business models and volatility to market demand. Lovell (2014) contributed that the commercial real estate industry growth has been tremendously affected by the enhancement of environmental consciousness, which has impacted the demand for physical property space.

As with many of these researchers, others have focused on the impact of green design on demand for office space. Wiley et al. (2010) argue in their text that stakeholders in the real estate sector who are considering the development of new buildings or the retrofitting of existing buildings often wonder whether a green design will lead to higher selling prices, higher rents, and higher occupancy rates. Therefore, Wiley et al. (2010) conducted a study to evaluate the merits of the green design. The results of their study showed that the selling prices have a significant impact on the design features incorporated into new buildings or the retrofit features incorporated into existing buildings (Wiley, et al., 2010). Wiley et al.'s (2010) study showed that the incorporation of a green design resulted in superior rent charges and higher occupancy rates. The results showed that the improved energy performance of the green office buildings was one of the factors that drew organizations towards them (Wiley et al., 2010). The presence of the organizations led to increased demand for office space in those buildings and this justified building owners' decision to charge higher rates (Wiley, et al., 2010). The results of the study also suggested that the LEED or the BREEAM certification of buildings resulted in higher rents and higher occupancy rates (Wiley, et al., 2010). These findings suggest that a building's energy performance is one of the factors companies consider when determining the location of their offices (Wiley, et al., 2010). Therefore, reputable firms with a large market share in their respective industries would deliberately seek out office space in buildings with a superior energy performance because they see as crucial to their ability to position themselves as organizations that have a positive impact on the environment (Wiley, et al., 2010). The positive energy performance of the building becomes an important aspect of their quest to project an image that underlines their commitment to conserving the environment.

Apart from the focus on the positive effect of an office building's superior energy performance on the occupiers, companies will opt for office buildings with green design because of their knowledge of the effect of office building construction on the environment (Eichholtz, et al., 2010). Statistics indicate that office and

residential property construction account for 40% of the energy consumption in many countries (Eichholtz, et al., 2010). Additionally, the companies are aware that up to 55% of the wood that is not utilized as a source of fuel will end up in the office and residential property construction (Eichholtz, et al., 2010).

Therefore, they are aware that their decision to choose office buildings with a green design will have a direct impact on energy consumption and the destruction of forests (Eichholtz, et al., 2010). This knowledge leads them to choose office buildings with a green design.

### **2.3 BENEFITS OF SUSTAINABLE COMMERCIAL PROPERTIES TO THE OCCUPIER**

Scholars have made numerous contributions on the issue of the benefits of green design to the occupiers. The results of their studies suggest that occupiers of office buildings with green designs derive many benefits from their continued occupation of offices in those buildings. One of the benefits the experts have observed is the green design minimize occupiers' desire to shift from one office building to another because of their dissatisfaction with the quality of their accommodation. The argument is that the green design gives tenants a positive experience, thereby minimizing reactive requests and their desire to cancel their tenancy agreement and shift from one building to another. Neagle (2017) and Lovell (2014) are among the scholars who have undertaken an investigation into the correlation between sustainability in commercial properties and improvement in property owners' ability to retain their tenants. Neagle (2017) argues that a critical component of commercial tenant retention is the ability to minimize tenant reactive requests by maintaining a positive experience within the built environment.



Lovell (2014) asserts that significant relationships exist between the value of the commercial real estate and:

1. Lower utility bills;
2. Length of the lease;
3. Occupancy levels;
4. Rates for rents;
5. More efficiency in energy, water, and waste use;
6. Premium on yield, and
7. Real estate taxes

Of the aforementioned factors, the most impactful included refurbishment costs, premium on yield, and the use of energy, waste, and water. Lovell's (2014) arguments appear to confirm that the positive accommodation experience in the sustainable office buildings is one of the core factors that increase tenants' willingness to continue with their tenancy. Tenants' positive experience from lower bills and improved utilization of natural resources like light and water will have an influence on their decision to continue with the tenancy. They will overlook the premium cost they are paying because the burden of the extra cost is pale is offset by the positive experiences that come from their continued tenancy in the building with the green design.

Scholars have also listed positive health outcomes on employees in the list of benefits that accrue to occupiers of office buildings with a green design. They assert that the sustainable office buildings confer many positive effects on employees. Singh et al. (2010) conducted two retrospective studies aimed at evaluating the impact of green building design on the health and productivity of employees in the building. In particular, the study sought to assess how the improvement in the quality of the indoor environment affected the occupants' perceived productivity and health (Singh, et al., 2010). The office buildings that were subject of the study had the highest Leadership in Energy and Environmental Design (LEED) rating (Singh, et al., 2010). The results of the

study suggested that occupants of the office buildings with the green design witnessed a significant reduction in the rate of staff absenteeism immediately after they became tenants in the office building (Singh, et al., 2010).

The occupants attributed the reduction in staff absenteeism to the positive impact of the improvement in the quality of the indoor environment on stress, depression, respiratory allergies, and asthma (Singh, et al., 2010). Further, the results of the retrospective study showed that the reduced incidence of staff absenteeism and illnesses like stress, depression, and asthma contributed to an improvement in the productivity of employees (Singh, et al., 2010). These findings confirm that occupiers of office spaces in buildings with a green design experience improvements in the health and wellbeing of employees. In the long term, these improvements translate into a significant surge in the level of employee productivity. The surge in productivity springs from a massive decline in absenteeism.

While Brown et al. (2010) acknowledge that the green design can have a positive effect on health and wellbeing of employees working in office buildings with a sustainable design, they assert that occupiers' ability to obtain those benefits will depend on factors that are unique to the occupiers. Brown et al. (2010) assert that the positive health and productivity outcomes do not accrue to all occupants of green buildings. They only accrue to the tenants that have made heavy investments in an organizational culture that is supportive of such outcomes. According to Brown et al. (2010) green buildings have the potential to generate significant gains for the occupants and their work environment, but organizations' ability to access those benefits will depend on factors that extend beyond the quality of the space they occupy. Employees' perception of positive health will increase when the green design leads to improvements in the quality of air circulating in the building (Brown, et al., 2010).

They will also develop a positive health perception when the green design improves their mood by giving them access to water and sunlight (Brown, et al.,

2010). They will also develop a feeling of wellness and health when the green design grants them regular access to gym facilities (Brown, et al., 2010). However, they will develop these positive health perceptions when the contextual factors are favourable (Brown, et al., 2010). These perceptions will emerge when the organizational culture, reporting hierarchy, and other contextual factors were supportive of the health and wellbeing of employees. These arguments indicate that occupants' ability to obtain the health and productivity benefits of the green design will depend on the presence of other contextual factors. If an organization's work environment, culture, and hierarchy are supportive of a toxic situation, the outcome will be negative even when the company moves to a building with a green design. In this regard, the green design does not replace or substitute the role of contextual factors. It merely facilitates or catalyses the realization the positive health and productivity effects. It creates the conditions necessary for the organization to realize increased productivity and improvement in the health and wellbeing of employees. However, the organization must create the contextual factors that will lead to the realization of the full benefits of the green design.

## **2.4 VALUATION OF COMMERCIAL REAL ESTATE**

Oyedokun (2017) contributed that the absence of green building regulations negatively impacts the reliability of commercial property valuations in developing nations; therefore, green certification must be incorporated into certain building ratings and policies. Research of economic pricing models reflects correlations between a diversity of factors based upon long periods of time (Pan et al., 2015). Aroul & Hanz (2012) presented that the assumption which underpins hedonic pricing models is the premise that the valuation of the product or service is decomposable by specific, quantifiable features or benefits. Pan et al. (2015) described primary energy data for commercial property consumption as variables for heating, cooling and electricity consumption; and more specifically, daily averages for temperature, humidity and total electricity consumption.

Aroul & Hanz (2017) found that the premiums for green building features are positive and significant. Ruggiero et al. (2017) assessed the hedonic contribution of the energy efficiency to the commercial property value using economic analysis to measure energy performance. The Market Comparison Approach (MCA) was used to calculate the hedonic price relative to CO<sup>2</sup> features and energy performance. The energy performance index was used to measure the energy consumption against occupier comfort requirements. Whereas energy performance hedonic price for energy performance; annual variable income; capitalization rate; and transitional period of generic year. Ruggiero et al. (2017) found that a significant relationship exists between energy efficiency and returns for commercial property investors due to the relationship between the budget for property management and the costs of energy consumption.

### **3. METHODOLOGY**

The method for this study consists of a mixed method qualitative data collection by interview; and a quantitative regression analysis of CoStar commercial property data; and a case study of three BREEAM certified office buildings which are St Vincent Plaza, Bothwell St, and CONNECTION110NS. The interviews were conducted with professionals from the sample commercial property sectors. The integration of qualitative and quantitative databases for summative and formative evaluations is required for mixed methods. Creswell (2014) supported that researchers who select both qualitative and quantitative approaches generate more well-rounded understanding of the research questions.

The outcomes of the statistical analysis may be interpreted and experiment enhanced more fully by direct interrogations with people in addition to the gathering of data (Creswell, 2014). The sample population for the case studies consisted of nine tenants, three each from the three commercial buildings which is analysed along with historical data collected from CoStar. The methodology will be used to investigate the energy performance based upon the perspectives of the occupiers.

### **3.1 RATIONALE FOR THE RESEARCH DESIGN**

The rationale for the selection of method is the complexity, or technical nature questions. Creswell (2014) presented that the structure and content of the research question or problem may merit the selection of more complex methods. Therefore, singular methods may prove insufficient to fully address the research problem. Gubrium et al. (2012) supported that the interview methodology is one of the most common methods used for the collection of data in qualitative social studies. The researcher meets with the participants of the sample population with the aim of interrogation regarding BREEAM. The objective of the interview is to extract knowledge on the subject (Edwards & Holland, 2013). Questions have been compiled to evaluate the energy performance of three BREEAM certified office buildings within the Glasgow City Core submarket. The sample of occupiers was selected due to extensive knowledge on energy efficiency and their involvement in the decision to occupy their respective buildings.

### **3.2 METHODOLOGY FRAMEWORK**

A methodology framework was developed in accordance to the research aims to answer questions related to BREEAM ratings, energy efficiency and occupier benefits in the commercial built environment for the United Kingdom, and more specifically for the office spaces within the City Core of Glasgow. Moreover, the aim of the method for this study is to generate knowledge and intelligent information that may be used to answer the research questions.

The energy efficiency of the buildings has a direct influence on the market value of the rents. Therefore, the market value becomes an indicator for market availability. The approaches to urban commercial property offerings are either new constructions or absorption of the cost to retrofit existing buildings. All of the relationships combine to decide if a contract is created between the investor and occupier. The framework for the study defines the relationships between the commercial property investor and the occupier in the contexts of market

availability and price based upon the hedonic pricing method of valuation based upon features or benefits. Figure 2 illustrates the relationship variables and expected outcomes for the method:

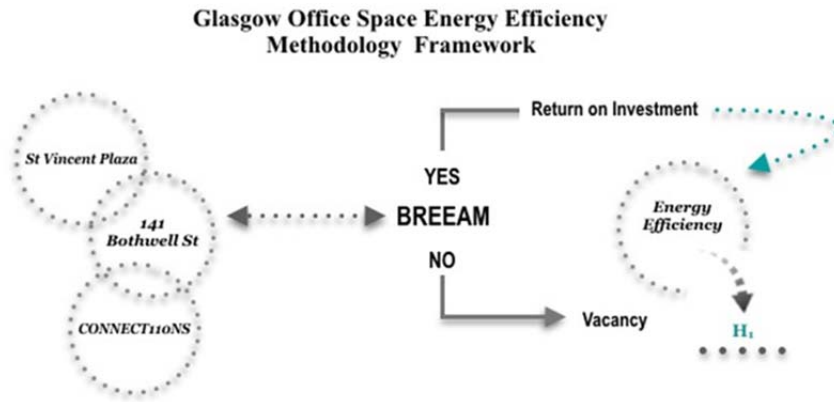


Figure 2. Energy Efficiency Methodology Framework

### 3.3 DATA COLLECTION

Data was collected from CoStar for the three buildings in the sample set. The interview method was also used to collect data that is relevant to the resolution of the research problem. In particular, the tenants were questioned as to whether concerns about a building's energy performance was among the most important issues the tenants considered before they decided to rent office space within their building.

### 3.4 CoSTAR DATA ANALYSIS

An analysis of the state of rental rates and vacancies for commercial properties was conducted using financial and economic data from 2008 forward (CoStar, 2018). Grade A vacancies and pre let activity data is compared as well as the square footage of speculative developments that have not been completed. Microsoft Excel was used to run the regression analysis and to generate graphs from the datasets. The market analysis predominantly utilises CoStar data, which is considered the most reliable property database of commercial properties within

the UK, to analyse rental and vacancy rates of a total of 17 BREEAM certified office buildings and comparing their performance with a total of 46 similar quality non-BREEAM certified office buildings in the Glasgow City Core submarket.

### **3.5 SAMPLING PROCEDURES**

The simple random sampling approach was used to select the three case study buildings and to recruit research participants who would participate in the study. Simple random sampling is a probabilistic sampling technique in which the researcher assigns random numbers to each participant, determines the sample size, and uses a computer system to identify the numbers that will feature in the study as research participants (Frerichs, 2008). When the computer randomly picks out a number, the researcher counterchecks the number against that of existing names to determine the name of the respondent. One of the advantages of simple random sampling is that it gives all members of the main population an equal opportunity of participating in the study.

The researcher used the semi-structured interviews to confirm some of the insight that emerged from the interview and address some of the outstanding issues. In relation to the semi-structured interviews, the convenience sampling technique was used. Convenience sampling is a non-probabilistic technique in which the researcher recruits research participants by identifying them from the list of research participants who took part in the interview. The sample population was selected from the segment of the wider population due to their extensive knowledge on BREEAM and their decision to occupy the buildings. The responses were analysed in order to determine whether they collectively showed that the energy performance of a building is among the factors they consider when choosing office location.

### 3.6 STUDY INTERVIEW QUESTIONS

The case study portion of the method consisted of interviews with nine participants who occupied space in one of the three commercial properties: St Vincent Plaza, 141 Bothwell St, and CONNECT110NS. A total of 10 questions were compiled to present to the sample of occupiers for the study. The interview questions used in the case study are presented in Table 1:

| BREEAM Certified Commercial Real Estate Case Study Interview Questions |   |
|--|---|
| Question 1   | What informed your organization’s decision to locate in the building? Was the building’s BREEAM certification the decisive factor or were there other factors?                      |
| Question 2   | Compared to your old location, does the new location provide better energy efficiency?  |
| Question 3   | How significant is energy efficiency in corporate decision to locate within the building?   |
| Question 4   | Is it typical for BREEAM certified office buildings to be in the market as shell and core?  |
| Question 5   | What do you think had the greatest impact on your operation?  |
| Question 6   | What occupancy benefit do you think your organization derives by occupying the BREEAM certified building?   |
| Question 7   | Compared to other branches, would you say that your branch here enjoys lower operating expenses in relation to employee health and energy expenses?                                 |
| Question 8   | In terms of occupancy comfort, is your organization convinced that this building is a better building compared to non-BREEAM certified buildings you occupy in different locations? |
| Question 9   | How is the BREEAM certified building enhancing your organization’s capacity to engage in green practices?   |
| Question 10  | Does this location help promote active transport methods. Does it have facilities such as bicycle racks and showers for employees?  |

Table 1. BREEAM Commercial Case Study Interview Questions

The sample was questioned in regard to their perspectives in terms occupancy; transports links; operating expenses; comfort; and perceived level of BREEAM compliance with focus upon how green efficiency affected their professional experience as tenants.



### **3.7 RESEARCH LIMITATIONS**

The graphs which display information collected from CoStar figures might show inaccurate reflections of the market due to the low number of BREEAM certified office buildings in the Glasgow City Core submarket. Information collected from the interviews might be subjective. Interviewee might be inclined to answer the question in a positive way due to fear of retaliation by the employer. The participants were given the option to remain anonymous to ensure confidentiality and to give freedom to answer in complete honesty.

## **4. RESULTS AND ANALYSIS**

The mixed method methodology presented three approaches in the research design for qualitative and quantitative analysis:

1. A statistical analysis of CoStar data for all 17 BREEAM certified office buildings and comparing them with data for the total of 46 similar quality but non-BREEAM certified office buildings in the Glasgow City Core submarket.
2. A case study of the market performance of three selected BREEAM certified office buildings in Glasgow City Core; and interviews with three tenants from each of those three buildings. Representatives from a total of nine out of 19 tenants that occupy all three buildings were interviewed.

At the end of the interviews, the participants provided an overall rating of their respective office space.

## 4.1 PROPERTY CASE STUDY

The three commercial properties in the Glasgow City Core submarket that were selected as case studies for this research are:

| Building Name    | Location          |
|------------------|-------------------|
| St Vincent Plaza | 319 St Vincent St |
| 141 Bothwell St  | 141 Bothwell St   |
| CONNECT110NS     | 110 Queen St      |

Table 2. Names and locations of the selected case study buildings in Glasgow's City Core

The tenants' demographics in CoStar (2018) reflect that the property owners have secured long term leases with companies to include KPMG, Mott MacDonald Group, JP Morgan, PWC, Deloitte, and Grant Thornton. The sample for this study was selected based upon total square footage, location, and landmark status in Glasgow's City Core. The selected commercial properties were discussed and compared based upon qualities such as management, energy efficiency, health and wellbeing, and in the area of transportation or mobility to generate a BREEAM score or rating (BREEAM 2018; Ward et al., 2018).

Nine interviews were conducted across the sample of three selected commercial properties. The participants were occupiers and were questioned in regard to their perspectives of the properties in terms of six variables:

1. Occupancy benefits;
2. Transports links;
3. Operating expenses;
4. Comfort; and
5. BREEAM compliance.

The participants expressed beliefs in regard to the importance of BREEAM ratings and compliance in the commercial building and the benefits of BREEAM

certified buildings. The sample participants were also asked to give an overall rating of the facility based upon the BREEAM qualities and other relevant factors discussed in the interviews.

#### **4.1.1 ST VINCENT PLAZA**

The first case study property from the sample is the St Vincent Plaza, which was purchased for £70 million in the last quarter of 2017 (CoStar, 2018). Owned by Starwood Capital Operations LLC, St. Vincent Plaza is a twelve storey building that specializes in offering office space and retail space services to its clients. The St Vincent Plaza is classified as speculative, Grade A commercial space and is comprised of 2,136 sq ft of space across 10 floors (Norman, 2016). The retail space covers the ground floor; while the office space covers all 12 floors. The location of St. Vincent Plaza is strategic because of its proximity to Glasgow's local, regional, and international transport network.

As the largest city in Scotland with more than 800,000 square feet of commercial grade space, Glasgow remains bustling with high demand for office space (Tudor, 2015). Tenants at St. Vincent Plaza can access the Charing Cross Station, the Anderston Station, the M8 motorway, and the Glasgow International Airport. St Vincent Plaza holds leases for Whyte & Mackay, Wood Group, KPMG and others. The property is 84.3% let at £23/SF fully repairing and insuring with 27,068 square feet of vacant space (CoStar, 2018).

#### **4.1.2 141 BOTHWELL ST**

The second case study property is 141 Bothwell St. Owned by PGIM, 141 Bothwell Street is a landmark, nine storey building, located within the International Financial Services District (IFSD) of Glasgow's CBD (CoStar, 2018). The building provides office space accommodation to some of the world's leading consultancy and financial services firms, including J.P. Morgan, Pinsent Masons LLP, Price Waterhouse Coopers LLP, HSBC Bank, and Genpact Ltd. J.P.

Morgan and Pinsent Masons LLP are the tenants with the largest share of office space in the building (CoStar, 2018). J.P. Morgan occupies 49,582 sq. ft. of office space in the building; while Pinsent Masons LLP occupies 36,539 sq. ft.

The building's central location makes it easily accessible by different modes of transportation including sustainable urban transport such as walking and bicycling.

### **4.1.3 CONNECT110NS**

The third case study property from the sample is the CONNECT110NS, which is a 10-storey, Grade A office building with a ground floor level retail space, and a basement car park (CoStar, 2018). Located on junction of Ingram Street and Queen Street, CONNECT110NS is close to Glasgow's local and regional transport network. CONNECT110NS is owned by DWS Group, a company with interests in Scotland's financial services sector (Edgar, 2014). Tenants and customers visiting the building can access the Buchanan Bus Station, the Glasgow Central Station, and the Queen Street Station. The strategic location in the heart of Glasgow business and industrial districts is a feature that is consistent in all of the buildings in the Glasgow City Core area.

## **4.2 CoSTAR DATA ANALYSIS**

Availability rates measure the percentage of total space divided by total existing inventory rates (CoStar Group, 2016). The space is also represented of all that is being marketed for lease, to include vacant, sublease, available and occupied in existing buildings for the present or a future date. Tables 2 and 3 are descriptive statistics presentations of BREEAM certified square footage data that was extracted from the CoStar:

**Available Square Footage of Commercial Space 2008 Q4 to 2018 Q2**

| Alpha (significance level)      | 5%                        |                           |                          |
|---------------------------------|---------------------------|---------------------------|--------------------------|
|                                 | Total Available SF Direct | Total Available SF Sublet | Total Available SF Total |
| Count                           | 39                        | 39                        | 39                       |
| Mean                            | 371,065.94872             | 9,539.30769               | 380,605.25641            |
| Mean LCL                        | 300,237.98878             | 6,904.55032               | 307,694.61974            |
| Mean UCL                        | 441,893.90866             | 12,174.06506              | 453,515.89308            |
| Variance                        | 47740200000.00            | 66,062,607.21862          | 50589000000.0            |
| Standard Deviation              | 218,495.22980             | 8,127.89070               | 224,920.02208            |
| Mean Standard Error             | 34,987.23776              | 1,301.50413               | 36,016.02789             |
| Coefficient of Variation        | 0.58883                   | 0.85204                   | 0.59095                  |
| Minimum                         | 123,109                   | 0                         | 123,109                  |
| Maximum                         | 885,110                   | 32,887                    | 902,673                  |
| Range                           | 762,001                   | 32,887                    | 779,564                  |
|                                 |                           |                           |                          |
| Median                          | 280,891                   | 8,279                     | 280,891                  |
| Median Error                    | 7,021.61950               | 261.20001                 | 7,228.08829              |
| Percentile 25% (Q1)             | 198,300                   | 1,853                     | 207,324                  |
| Percentile 75% (Q3)             | 500,268.5                 | 17,563                    | 509,050                  |
| IQR                             | 301,968.5                 | 15,710                    | 301,726                  |
| MAD (Median Absolute Deviation) | 604,219                   | 9,284                     | 621,782                  |
| Mean Deviation                  | 179,744.71137             | 6,131.52663               | 184,588.50756            |
| Mode                            | 415,335                   | #N/A                      | 423,614                  |
| Skewness (Fisher's)             | 0.87017                   | 0.78915                   | 0.88722                  |
| Kurtosis (Fisher's)             | -0.31489                  | 0.42595                   | -0.30131                 |

Table 3. Available Square Footage Commercial Office Space (CoStar, 2018)

A total of 39 instances were used to analyze each of the available square footage variables, N = 3. Of the three variables, the majority of the available square footage comes from the direct commercial category. The variance between instances of direct available footage is substantial at 47740200000, with a more modest standard deviation of 218,495 sq ft. The mean deviation from a maximum 885,110 is 179,745. Moreover, the difference between the max and min, 885,110 - 123,109 = range 762,001. The direct Fisher skewness measure of symmetry is between 0.87 and 0.88, a positive skewness to the right. The direct

Fisher kurtosis is negative for the available square footage direct and the total; however, it is positive for the sublet. Table 3 shows the outcomes of the regression analysis for net absorption from 2008:

| Net Absorption Square Footage of Commercial Space 2008 Q4 to 2018 Q2 |                          |                          |                         |
|--|--------------------------|--------------------------|-------------------------|
| Alpha (significance level)   | 5%                       |                          |                         |
|  | Net Absorption SF Direct | Net Absorption SF Sublet | Net Absorption SF Total |
| Count  | 39                       | 39                       | 39                      |
| Mean   | 29,976.56410             | -250.48718               | 29,726.07692            |
| Mean LCL   | 9,696.31808              | -951.38553               | 9,397.63231             |
| Mean UCL   | 50,256.81012             | 450.41117                | 50,054.52154            |
| Variance   | 3,914,000,637.72605      | 4,675,031.36167          | 3,932,626,989.80972     |
| Standard Deviation   | 62,561.97438             | 2,162.18208              | 62,710.66089            |
| Mean Standard Error  | 10,017.93346             | 346.22623                | 10,041.74235            |
| Minimum  | -70,381                  | -7,959                   | -70,381                 |
| Maximum  | 255,808                  | 7,301                    | 255,808                 |
| Range  | 326,189                  | 15,260                   | 326,189                 |
| Median   | 15,000                   | 0                        | 15,000                  |
| Median Error   | 2,010.50787              | 69.48445                 | 2,015.28610             |
| Percentile 25% (Q1)  | 177                      | 0                        | 0                       |
| Percentile 75% (Q3)  | 41,931                   | 0                        | 43,829                  |
| IQR  | 41,754                   | 0                        | 43,829                  |
| Mean Deviation   | 40,691.10454             | 919.02827                | 40,893.43195            |
| Mode   | 0                        | 0                        | 0                       |
| Skewness (Fisher's)  | 1.83610                  | -1.03175                 | 1.83216                 |
| Kurtosis (Fisher's)  | 4.83728                  | 9.84247                  | 4.79614                 |

Table 4. Net Absorption Square Footage of Commercial Space 2008 Q4 to 2018 Q2 (CoStar, 2018)

The net absorption represents net change in the occupied space for an expressed period and is measured as the sum of all positive changes minus all negatives in occupancy (CoStar Group, 2016; IREM, 2018; CoStar, 2017). The net absorption as a percentage of the inventory is measured against existing inventory. When the supply drops below demand, the vacancies decrease with positive absorption (IREM, 2018).

A total of 39 instances were used to analyze net absorption for square footage variables,  $N = 3$ . Of the three variables, the majority of the available square footage comes from the direct commercial category. The variance between instances of direct available footage is even more substantial for direct square footage at 3,914,000,637, with a more modest standard deviation of 62,562 sq ft. The mean deviation from a maximum 255,608 is 40,691. Moreover, the difference between the max, 255,808 and min - 70,381 = range 326,189. The direct Fisher skewness measure of symmetry is 1.83610, a positive skewness to the right  $>1$ . The Fisher kurtosis is positive for the overall available square footage direct and total.

Ryden (2015) presented that the demand for office space in Glasgow and in Edinburgh is accelerating with favorable timing for new commercial developments. However, Ward et al. (2018) supported that since its inception in 1990, the BREEAM standards have been evidence based and extend well beyond the scope of standards and regulation. The premiums for green building features were found to be positive and significant. The majority of the commercial property transactions were carried out by the largest global firms and national institutions (CoStar, 2018). Overall, the case study effectively solicited perspectives that were analyzed in regard to rents, the role of energy efficiency in value added, and the satisfaction of the tenants. The interviews reflected diversity in experiences and perspectives between the participants. Overall, energy efficiency is a priority with all of the sample participants; however, it is not the top priority for all. The outcomes of the analysis show that an increased awareness of the need for higher energy efficiency in office buildings and how the energy performance of office buildings impacts the investors and occupants is needful.

### **4.3 MARKET ANALYSIS**

A recent trend in BREEAM certification and commercial property management in the United Kingdom and Scotland is the integration of projects for BREEAM and

WELL certifications into one effort (Eltringham, 2018). Collaboration was announced between BREEAM and International Well Building Institute (IWBI) in a recent report regarding health and wellbeing in the commercial built environment. BREEAM representations for the sample region energy efficiency assessments were drawn by Glasgow Southern General, Laboratory Services Centre, the University of St Andrew, Goodmans Field Retail & Hotel Development in London, and Riverside East Office Development (BREAM TUV SUD, 2018).

A comparison of energy performance based upon BREEAM, LEED and GreenStar showed that the energy performance between groups is dependent upon the selection of assessment method (Roderick, McEwan, Wheatley & Alonso, 2009). The vacancies and occupancies for the regions in this study were assessed for office spaces with consideration for bespoke, industrial, health care and global sector developments. Table 4 shows a comparison in BREEAM ratings for the United Kingdom, Scotland and Glasgow:

| Comparison BREEAM Ratings UK, Glasgow and Scotland |                         |                                    |               |                                    |
|--|-------------------------|------------------------------------|---------------|------------------------------------|
|  | Average Daylight Factor | Min Area Compliance m <sup>2</sup> | Credits       | Average Daylight Factor            |
| Office Buildings                                   | 2%                      | 80%                                | 2             | 300+ lux per 2,000 hours annually+ |
| Industrial Buildings                               | 2%                      | 80%                                | 1             | 300+ lux per 2,000 hours annually+ |
| Creche Buildings                                   | 2%                      | 80%                                | 2             | 300+ lux per 2,000 hours annually+ |
| Retail   | 2%                      | 60%                                | 1             | 300 lux per 2,000 hours annually+  |
| (Mean for City Core)                               | <b>Vacancy</b>          | <b>Occupancy</b>                   | <b>Demand</b> | <b>Average Rent</b>                |
| United Kingdom                                     | 0.286976                | 89%                                | 3,773,445     | 32.40                              |
| Glasgow  | 0.172332                | 82.8%                              | 2,313,155     | 21.88                              |
| Scotland   | 0.210446                | 76.1%                              | 2,7336,919    | 19.7                               |

Table 5. Comparison BREEAM Ratings - United Kingdom, Glasgow and Scotland<sup>1</sup>

<sup>1</sup> Deutsche Asset Management. 2016. Grundbesitz Europa. Moid, K. 2018. UK Commercial Market in Minutes Savills.; Barnes, M. & Smith, D. 2017. Scottish Office Market.



A substantial amount of the difference in ratings is associated with different rates of energy consumption (GCU, 2018). An additional factor in the differential is the diversity in architectural design of the buildings; the percentage of the building that is actually used by the occupants; and the areas of circulation and storage (SEC, 2018). The improvements to Scotland's building standards are managed by BRE Scotland, which was founded in 1949 to support post war reconstruction (BRE Scotland, 2018).

The measures of pollution and surrounding land use were counted as aspects of the building construction and management schemes (BREEAM TUV SUD, 2018). Location played the largest role in the bottom line for vacancies and occupancies for all properties (McLuckie, 2018). Several international investors from Zurich to the West have focused on St Vincent Plaza (St Vincent Plaza, 2018). McAvoy (2018) confirmed that the Glasgow office spaces reflect high engineering skill and a focus upon building services that is unique to the United Kingdom and carried over to other regions around the world. Recall that Ruggiero et al. (2017) assessed the hedonic contribution of the energy efficiency to the commercial property value using economic analysis to measure energy performance. The Market Comparison Approach (MCA) was used to calculate hedonic price relative to CO<sup>2</sup> features and energy performance. The energy performance index was used to measure energy consumption against comfort requirements.

#### **4.3.1 UNITED KINGDOM**

The UK market for sustainable office buildings is robust; however, the Brexit transition has had a profound effect on investor behavior. The primary investors for office space in the United Kingdom are overseas investors, domestic institutions, occupiers, and individuals (Barnes & Smith, 2017). Purchases increased in the United Kingdom from 2016 by approximately £2 billion in transactions (Mofid, 2018). Geopolitical issues, interest rates, the Bank of

England, United States tariffs, and Brexit are significant factors in the future, long term performance of the UK commercial sectors.

### 4.3.2 GLASGOW CITY CORE

Glasgow's market for sustainable office buildings is increasing disrupted by innovative technologies which endorse renewable energy and BREEAM certifications. Figures 3 and 4 show the historical relationships of vacancy and rental rates between BREEAM certified and similar quality non-BREEAM certified office buildings in the Glasgow City Core submarket generated by CoStar data.

#### **Vacancy Rates:**

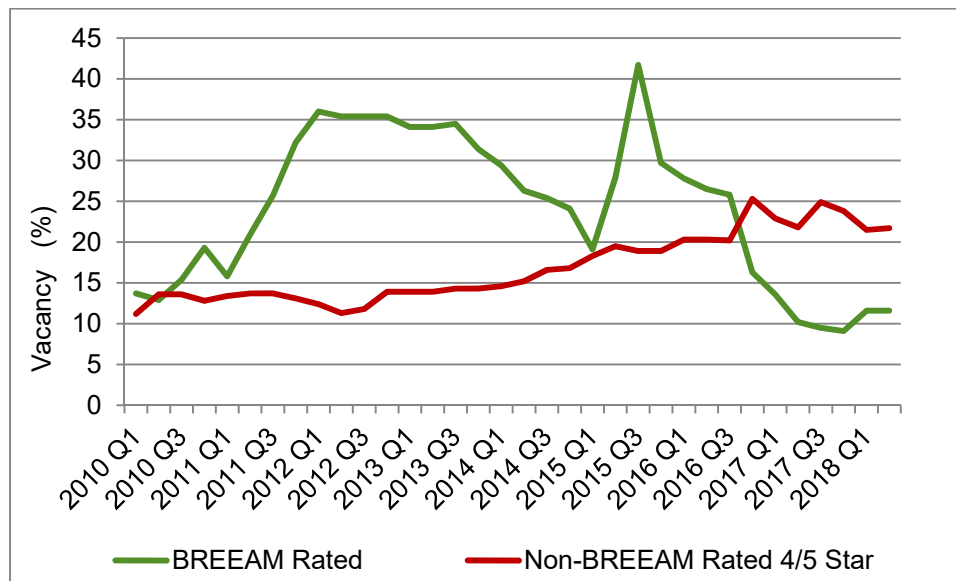


Figure 3. Vacancy rates for BREEAM certified office buildings and non-BREEAM high quality (4/5 Star) office buildings in Glasgow City Core. Source: (CoStar, 2018)

An increase in vacancy rates for BREEAM certified buildings was reflected in Glasgow's City Core submarket from 2010 to 2013; whereas non-BREEAM certified buildings stayed somewhat consistent over the years with a steady increase from 2013 onwards. The vacancy rate for BREEAM certified buildings have decreased after 2013. However, the trend turned in 2015 when vacancy rates began an upward spike possibly due to the completion of St Vincent Plaza

and CONNECT110NS developments which contained a big portion of the available BREEAM certified office building stock in the City Core of Glasgow. Since 2015, vacancy rates for BREEAM certified office buildings have significantly dropped and have continued to outperform non-BREEAM certified office buildings since 2016 Q4. As of 2018 Q2, the vacancy rate for BREEAM certified office buildings is at 11.6% and 21.7% for non-BREEAM certified office buildings of similar quality.

**Rental Rates:**

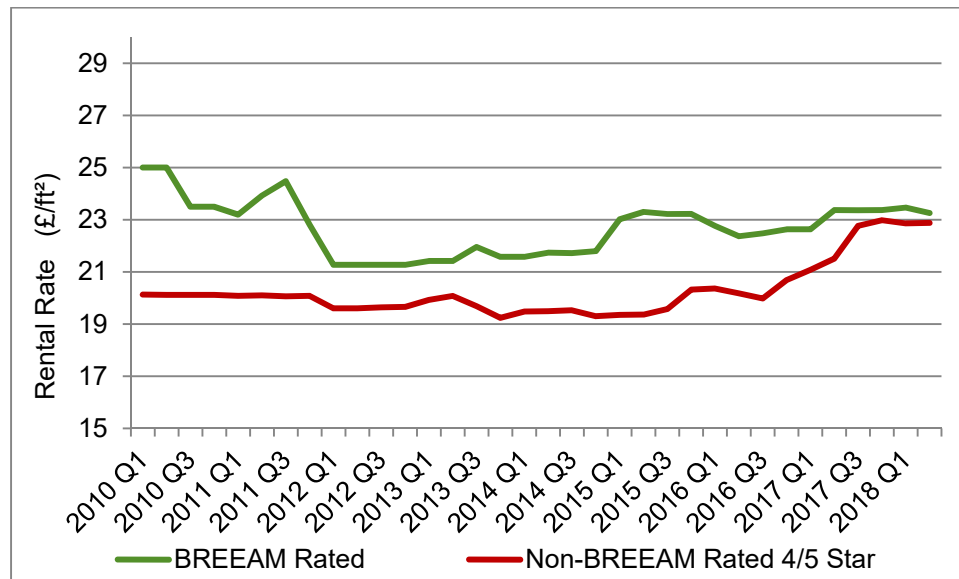


Figure 4. Rental rates for Glasgow City Core office buildings. Source: (CoStar, 2018)

Since 2010, the rental rate for BREEAM certified office buildings in the City Core of Glasgow has remained consistently higher than that of similar quality but non-BREEAM certified office buildings. Non-BREEAM certified buildings have seen an increase from 2016 Q3 due to the high demand and low supply of high quality office space in Glasgow. As of 2018 Q2, the rental rate for BREEAM certified office space in Glasgow is £23.26 per sq. ft. and £22.88 per sq. ft. for non-BREEAM certified office buildings of similar quality.

## **4.4 INTERVIEW RESULTS AND FINDINGS**

A total of 9 interviews were conducted for occupier perspective of St Vincent Plaza, 141 Bothwell St and CONNECTION110NS. The interview findings for each building are divided into two main themes. The first part focuses on the importance of BREEAM certification, and the second part focuses on the benefits of it to the occupier.

### **4.4.1 ST VINCENT PLAZA**

This section provides the general results for St Vincent Plaza which is located on 319 St Vincent St. Tenants in this building have reported that they have decided to occupy the building prior to the completion of the construction. Office spaces in major commercial real estate developments are typically built as shell and core, Tenant 1 further explains that:

“We took this building shell and core, so everything you see is what we chose as the fit out that fits our requirements. What tends to happen with pre lets is while you take them as shell and core, you then have better control on the overall delivery date, because effectively you are managing the fit out from the completion of the building to occupation of the office space.”

#### ***Importance of BREEAM certification:***

There was a ‘consensus’ in the responses of the three participants that were interviewed for this building. The results of the interviews show that location and access to public transportation were the prevailing benefits. Tenant 1 asserted that:

“Other factors took precedence in choosing this new building - mostly its location and access to highly desirable conveniences in the area. We have looked at multiple offices in the vicinity for that reason and have found this office to be the best fit.”

Tenant 1 further explained that:

“In the city centre you have transport hubs that come in from different parts of the city and the country. Being in the city centre our employees and clients can benefit from being close to the subway and the train stations. From a client’s perspective, the location of this building is considered top of the market.”

Sharing a similar view, Tenant 2 noted:

“We looked at a large and diverse group of factors including parking, necessary conveniences, leisurely conveniences, operating cost, energy cost, foot traffic, and office space. There were more but that is all I can think of at this moment. Now our two most important were accessibility to public transportation for employees and clients, and surrounding land uses. We wanted to make sure getting to our office was efficient and accessible.”

In regard to the importance of BREEAM certification; Tenant 3 asserted that:

“I would say it was not high on the list, especially in terms of looking for a specific building that has been BREEAM certified. It is one thing to look for energy efficient systems to be used in our homes as a cost cutting practice, but on a company of our magnitude, it’s not a top priority.”

Tenant 2 had a different take on the importance of occupying a BREEAM certified building to their organisation:

“The BREEAM certification is a huge plus which was discussed in a few meetings but as we mentioned before, it was not the deciding factor in our office choice, but I don’t want to downplay its role in the decision making, because it was brought up in a number of meetings with our top management.”

***Benefits of Occupying a BREEAM certified office building:***

There was a ‘consensus’ in the responses of the three participants that were interviewed for this building. The results of the interviews show that energy efficiency and lower utility costs were also important. Tenant 1 asserted that:

“It seems that this building has been carefully designed not just to reduce numbers in utility costs but also engages the user in a positive manner towards the environment. Many of the details were carefully executed to positively impact working conditions in the space as well. The intangible factors of our building’s performance are something I find much more astonishing and important, and something I didn’t even consider when moving into this building.”

Sharing a similar view, Tenant 2 noted:

“Energy expenses – yes, definitely. There has been a reduction in our energy expenditures for the office since we moved in to this building, and that doesn’t take into account that this office is much larger.”

Regarding their dedication to their environmental corporate responsibility, lowering energy consumption and utility costs, Tenant 3 asserted that:

“For any organization nowadays it is important to take this issue into the decision making for two reasons. The first one is the corporate social responsibility, even if it’s not part of your mandate, it’s important to have in today’s corporate environment, as well as good publicity for the organization. The second is the reality that energy efficient systems can and will bring costs down. We are still an organization and something that can decrease costs without affecting our services or products is a huge benefit.”

#### **4.4.2 141 BOTHWELL ST**

This section provides the general results for 141 Bothwell St. Tenants in this building have reported that they have decided to occupy the building during the early stages of construction. Tenant 5 explained:

“We agreed to occupy space in this building when it was a hole in the ground. That gave us certain advantages in terms of we could change in the base build as we developed our design, because it was early enough in the landlord’s development process that allowed us to influence some of those decisions, for example, we were able to get diverse power and we were able to negotiate more bicycle racks in the buildings.”

***Importance of BREEAM certification:***

There were similar views that were shared in the responses of the three participants that were interviewed for this building. The results of the interviews show that location and energy efficiency were primary factors for tenants in occupying this building. Tenant 4 asserted that:

“Other factors were more important in relocating to this new building - mostly its location and easy access to the Central Station. We looked at multiple offices in the City Centre for that reason and we found this office to be the best fit. This building is in a desirable location for the business we do, our accessibility to public transport is a lot better than our previous location.”

Tenant 5 noted that energy efficiency was one of their main deciding factors when the firm chose to occupy this building:

“If we had taken into account our energy expenditures on a per square foot platform and compare that to our previous tenement, it is even safer to say that our costs have been much lower.”

In the context of the importance of BREEAM certification; a Tenant 6 asserted that:

“The amount of reduction in operating and energy costs has been obvious. The data has been shared with our HQ office and could possibly become the new standard in future decisions. We are the first branch of our company to move into a BREEAM certified building.”

***Benefits of Occupying a BREEAM certified office building:***

There was a ‘consensus’ in the responses of the three participants that were interviewed for this building. The results of the interviews show that office layout and comfort, and temperature control were important. Tenant 4 contributed that:

“The overall environment is a lot better. The space itself is much more comfortable and inspiring to be in. Our spaces get plenty of light and circulation and transition from one space to another is much more fluid.”

Sharing a similar view, Tenant 5 noted:

“The office layout is an upgrade in terms of space, and the even its accessibility from how you enter the building from the street until I arrive at the entry of the office floor is better laid out. The office space does not feel confined and there is plenty of natural light entering illuminating our spaces.”

With regard to the environmental control systems that affect the temperature of the workspace, Tenant 6 asserted that:

“The temperature in our office seems to be much more evenly distributed. What I mean with that is there doesn't seem to be cold spots or warm spots in people's work stations. That kind of inconsistency is often brought up in most work environments where one person changes the temperature dial because of a much colder work space than the one adjacent to it.”

### **4.4.3 CONNECT110NS**

This section provides the general interview results for CONNECT110NS which is located on 110 Queen St.

#### ***Importance of BREEAM certification:***

There was a common theme in the responses of the three participants that were interviewed for this building. The results of the interviews show that overall comfort and cost were primary factors in deciding to occupy the building. Tenant 7 asserted that:

“I can also tell you that the number of ‘it's too hot’ or ‘it's too cold’ complaints that we get now is much lower compared to our old building, which was a 30 year old building. This can be attributed to the smart environmental control systems in the building and the BREEAM rating that this building has achieved.”



When searching for a new location for their Glasgow City Core branch, Tenant 7 noted:

“I remember a couple of the buildings that we have been looking at, all of them had a 5 Star rating, but only one of them had a BREEAM rating of excellent. I’m not saying that it was the critical factor, but it was definitely an added benefit.”

When questioned about employee health and wellbeing, Tenant 8 noted:

“With regards to and overall improvement in employment health, we have examined our numbers of people taking days off and compared to our previous occupancy. We haven't stayed in this building long enough to accumulate such data.”

Regarding the importance of BREEAM certification, Tenant 9 asserted that:

“The central location and being close to other companies we work with has certainly been beneficial. Am I saying we wouldn't have chosen this building if it didn't have a BREEAM certification? I think we probably would still have chosen this building because the cost was compelling. You want to be close to your competitors and you want to be close to your market. A lot of our competitors are competing for business and we often pull together in terms of how we provide solutions to the client.”

***Benefits of Occupying a BREEAM certified office building:***

There were slight differences in the responses of the three participants that were interviewed for this building on what they perceived as benefits of occupying a BREEAM certified building. The results of the interviews show that utility costs, employee health and retaining talent were the primary concerns. Tenant 7 argued that occupying a BREEAM certified building helps attract and maintain talent. They further explained:

“What is important for our corporation is attracting talent and maintaining talent. This is an attractive building to work in. We want our employees to be proud that they work in this building. It's a great place to work with a great environment. We want them to believe that

we are serious about our corporate responsibility and energy efficiency. That means we get a competitive edge on trying to maintain talent.”

With regard to utility costs and space efficiency, Tenant 8 noted that:

“If you take cost as a criteria that we need to manage going forward, then cost of energy is a factor that we have to build into our financial modelling packages. You also cannot look at each sustainability element in isolation to assess its impact. This building certainly has a positive impact on energy consumption. I think the office workstation density we have gone for also is highly efficient, so these things are interconnected.”

In the context of the employee health and wellbeing, Tenant 9 asserted that:

“For me, I will say it’s the climate control and air quality. I am aware of the benefits that BREEAM can bring to employee productivity because of improved air quality, circulation and natural light etc.”

## 4.5 INTERVIEW OUTCOMES

The outcomes of the interview questioning were organized as data which is presented in Table 6:

| Interviews Data St Vincent Plaza, Bothwell St, & CONNECT110NS |   |                            |  |                                |               |                |
|---|---|----------------------------|--|--------------------------------|---------------|----------------|
|   | Interviews - Category/Variables                   |                            |  |                                |               |                |
|   | Occupancy Benefits                                | Transport Links            | Operating Expenses                     | Comfort                        | BREEAM        | Overall Rating |
| <i>St Vincent Plaza</i>                                       |   |                            |  |                                |               |                |
| <b>Tenant 1</b>   | price; climate control; mobility; location        | E - high profile, landmark | high rent premium; above market prices | E - luxury                     | E - excellent | AS/ 4 ≥ 55     |
| <b>Tenant 2</b>   | mobility; space newness, price                    | E - high profile, landmark | average; above market prices           | AS - corporate/regional hub    | E - excellent | E/ 5 ≥ 70      |
| <b>Tenant 3</b>   | size; climate control; cost, location             | AS - flexible              | average; above market prices;          | AS - corporate/regional hub    | E - excellent | E/ 5 ≥ 70      |
| <i>141 Bothwell St</i>  |   |                            |  |                                |               |                |
| <b>Tenant 4</b>   | local market influences, price, location, comfort | AS - flexible              | high rent premium; above market prices | F - above standard with issues | E - excellent | E/6 ≥ 85       |

| Interviews Data St Vincent Plaza, Bothwell St, & CONNECT110NS |   |                            |   |                             |               |           |
|---|---|----------------------------|---|-----------------------------|---------------|-----------|
| Tenant 5  | utility costs; comfort; location                            | E - high profile, landmark | high rent premium; above market prices; higher cost of doing business | E - luxury                  | E - excellent | E/6 ≥ 85  |
| Tenant 6  | utility costs, mobility, climate control; location          | AS - flexible              | high rent premium; above market prices                                | AS - corporate/regional hub | E - excellent | AS/4 ≥ 55 |
| <i>CONNECT110NS</i>   |   |                            |   |                             |               |           |
| Tenant 7  | climate control; comfort; location                          | E - high profile, landmark | average; above market prices  | AS - corporate/regional hub | E - excellent | E/5 ≥ 70  |
| Tenant 8  | utility costs, climate control; energy conservation; layout | E - high profile, landmark | high rent premium; above market prices                                | E - luxury                  | E - excellent | AS/4 ≥ 55 |
| Tenant 9  | comfort; climate control; location                          | E - high profile, landmark | high rent premium; above market prices; higher cost of doing business | E - luxury                  | E - excellent | AS/4 ≥ 55 |

Table 6. Interviews Data St Vincent Plaza, Bothwell St & CONECT110NS

Key: P = poor or subpar; A = adequate; G = good; F = fair or acceptable; AS = above standard; E = Excellent; DK = do not know; NS = not sure; BREEAM scale 1 = poor; 2 = fair; 3 = good; 4 = above standard; 5 = excellent; 6 = outstanding

The tenants placed different values on the factors associated with commercial property value. Some tenants viewed the changing landscape of the office spaces as a part of other global trends in technology and national drives for environmental sustainability. Table 6 shows the input data from the interviews:

| Quantified Data for Interview Questions |   |                              |                          |                          |
|---|---|------------------------------|--------------------------|--------------------------|
|   | Questions   | Sample Responses             | Mean                     | Standard Deviation       |
| Q1                                      | a. What informed your organization's decision to locate in the building? b. Is it anything to do with the building's BREEAM certification or other factors? | a. 131221311<br>b. 112113112 | a. 1.66667<br>b. 1.44444 | a. 0.86603<br>b. 0.72648 |
| Q2                                      | Compared to your old location, does the new location provide better connectivity?   | 133112131                    | 1.77778                  | 0.97183                  |
| Q3                                      | How significant is energy efficiency in corporate decision to locate within the building?   | 113111211                    | 1.33333                  | 0.70711                  |
| Q4                                      | What do you think had the greatest impact on your operation?  | 331322121                    | 2                        | 0.86603                  |
| Q5                                      | What occupancy benefit do you think your organization derives by occupying the building?  | 111321333                    | 2                        | 1                        |

| Quantified Data for Interview Questions |   |                              |                  |                    |
|---|---|------------------------------|------------------|--------------------|
| Q6                                      | Compared to other branches, would you say that your branch here enjoys lower operating expenses in relation to employee health and energy expenses? | 212221112                    | 1.55556          | 0.52705            |
| Q7                                      | Is your organization convinced that this building is a better building compared to other buildings you occupy in terms of occupancy comfort?        | 331321331                    | 2.22222          | 0.97183            |
| Q8                                      | Does the building enhance your organization's capacity to engage in green practices?  | 314112122                    | 1.88889          | 1.05409            |
| Q9                                      | a. Does this location help promote active transport methods. b. Does it have facilities ie bike racks and showers for employees?                    | a. 111211121<br>b. 311123132 | 1.2222<br>1.8889 | 0.44096<br>0.92796 |

Table 7. Quantified Data for Interview Questions

Coding: Q1a: Energy Efficiency = 1, Price = 2, Location = 3; Q1b: Yes = 1, No = 2; Somewhat = 3; Q2: Yes = 1, No = 2; Somewhat = 3; Q3: Not significant = 1, Somewhat Significant = 2, Significant = 3; Very Significant = 4, Extremely Significant = 5; Q4: Shell = 1, Core = 2; Q5: Energy Efficiency = 1, Price = 2, Location = 3; Q6: Energy Efficiency = 1, Price = 2, Location = 3; Q7: Yes = 1, No = 2; Somewhat = 3; Q8: Yes = 1, No = 2; Somewhat = 3; Q9: Technology wise = 1, Access wise = 2, Price wise = 3, Not Sure = 4; Q10a: Yes = 1, No = 2; Somewhat = 3; Q10b: Yes = 1, No = 2; Somewhat = 3.

The responses to each question in the interview were diverse. The tenants expressed different views of what was deemed beneficial and what was insignificant about the office space. According to the sample responses for question 1a, the average response was either location or price, with a standard deviation of 0.86603. The sample was split between location and price as the most influential factor in the firms' decision making. For question 1b, the average response was yes, with a standard deviation of 0.72648. The majority of the sample also asserted that BREEAM certification was not the most crucial part of the decision making process. For question 2, the average response was no, with a standard deviation of 0.987183.

According to the sample responses for question 3, the average response was somewhat significant, with a standard deviation of 0.70711. This indicates that the tenant's firm may place higher value on other factors although BREEAM certification is also important. For question 4 the average response was price,

with a standard deviation of 0.86603. For question 5, the average response was location, with a standard deviation of 1. These outcomes indicate that short term budgeting outweighs the long term benefits of energy efficiency in some firms.

According to the sample responses for question 6, the average response was yes, with a standard deviation of 0.52705. This outcome indicates that BREEAM certified buildings have a positive impact on employee health and wellbeing, which could increase productivity over the long term and lower absenteeism rates. For question 7, the average response was yes, with a standard deviation of 0.97183. This outcome indicates that some of the tenants are well informed about the benefits of BREEAM, green building, and the negative effect of energy inefficiency. For question 8 the average response was yes, with a standard deviation of 1.05409. The sample had a high standard deviation for this question, which indicates that the tenants have had a diversity of experiences in the sample buildings. For question 9a, the average response was yes, with a standard deviation of 0.44096. The sample agreed that the location supported mobility which coincides with access wise as a priority in previous questions. For question 9b, the average response was yes, with a standard deviation of 0.92796.

## **4.6 SUMMARY**

A quantitative analysis was conducted of the state of rental rates and vacancies for commercial properties based upon CoStar data for all BREEAM certified office buildings in the City Core of Glasgow. The standard for rating the commercial properties ranges from “no minimum standard” to “outstanding”. Averages, variance, and standard deviation were analysed. An analysis was also conducted of tenant perspectives using a sample of nine tenants from the sample of three selected BREEAM certified office buildings. Semi-structured interviews provided data for BREEAM certification effectiveness and the benefits of BREEAM to the occupiers in terms of occupancy benefits, operational costs, employee health, and comfort.

The market analysis method was conducted based predominantly upon CoStar data, a reliable global property database of commercial properties within the United Kingdom in order to investigate the influence of BREEAM on vacancy and rental rates. StatPlus was used to run the regression analysis and to generate descriptive statistics from the datasets. The criteria for the sample of tenants were as follows:

1. Each of the respondents participating in the survey were occupiers of offices at one of the three office buildings in the sample; and
2. Each must have occupied offices in one of those buildings over a 12-month period

The tenants provided considerable insight as perspectives of BREEAM certification and energy efficiency as it relates to the tenant experience. The recruitment approach adopted by the researcher had a significant influence on the capacity to generalize the findings of the study to the rest of the population. In this case, the method used to recruit the research sample had a significant influence on the researcher's ability to generalise the views of the occupiers of the sample commercial buildings to the rest.

The outcomes of the analysis show that the demand for BREEAM certified office buildings in the City Core of Glasgow has been increasing at a higher rate compared to demand for office buildings that are not BREEAM certified. CoStar data showed that the rate of vacancies decreased from the second half of 2015 to 2018.

## **5. CONCLUSIONS**

The research aimed to answers questions pertaining to energy use for commercial buildings in Glasgow's City Core; energy performance as perceived by the occupants of BREEAM certified office buildings; and the primary factors

that influence the decision making to occupy. An investigation of energy efficiency in commercial real estate was conducted by a case study of BREEAM certified office buildings to solicit the perspectives of the occupiers in regard to the growing demand for green buildings. The answers to the research questions are as follows:

1. Location was a more important occupancy benefit that firms derive from occupying office space in Glasgow's City Core, followed by comfort;
2. Mobility and easy access to public transportation are highly significant to the in decision making process to occupy office space. These are considered important elements in achieving a BREEAM certification; and
3. Compared to other branches, tenants who occupy BREEAM certified office buildings enjoy moderately lower operating expenses in relation to employee health and energy expenses.

The interviews reflected diversity in experiences and perspectives between the participants. Overall, energy efficiency is a priority for all of the sample participants; however, it is not the top priority for all.

## **5.1 GLASGOW CITY CORE EVALUATION**

The premiums for green building features in the BREEAM certified office buildings in Glasgow's City Core were found to be slightly positive. BREEAM certified office buildings enjoy a lower vacancy rate than non-BREEAM certified office buildings of similar quality. The investment volumes in prime commercial properties in the region improved significantly from 2015 to 2017 (CoStar Group, 2017). The outcomes of the analysis support the research hypothesis that an increased awareness of the need for higher energy efficiency in old buildings and how the energy performance of old buildings impacts the investors and occupants is important. Eurostat (2017) reports extended the need to include a

reassessment of pricing and measures for the changes which have driven further research in commercial office space markets.

All of the buildings in the Glasgow City Core area are close to the regional, local, and international transport network; therefore, office buildings in the area enjoy the benefits of the location and accessibility to services and public transportation regardless of BREEAM certification. The results of the study indicate that occupiers of BREEAM certified office spaces in Glasgow's City Core benefit from a significant increase in the level of employee productivity.

## **5.2 SUMMARY OF RESULTS AND ANALYSIS**

The case study showed that many of the buildings in the Glasgow City Core district have achieved a BREEAM certification due to the growing demand for high quality office space and interest in energy efficiency and dedication to environmental corporate responsibility. The interviews of tenants solicited perspectives in regard to occupancy benefits, energy efficiency, and tenant satisfaction. The analysis of responses showed that the perspective of the office buildings and the significance of the BREEAM certification are diverse. Location prevailed in the assessment of commercial property qualities. Comfort and energy efficiency were the next most common preferences across the sample.

The quantitative analysis of the CoStar data revealed that, of 39 instances, the median total available square footage of commercial space between 2008 and 2018 was 280,891 sq ft compared to max and min of 885,110 and 123,109 sq ft, respectively. The sublet Fisher kurtosis was positive while the Fisher kurtosis was negative for the available square footage. The available square footage variance is high for the period, especially for direct square footage; which indicates volatility. The majority of the available square footage was from the direct commercial category.



### **5.3 BREEAM CERTIFICATION**

The outcomes of the interviews and data analysis support that BREEAM ratings have somewhat of an influence over the perspectives of all stakeholders in the commercial property market in the Glasgow City Core submarket. Recall that Oyedokun (2017) confirmed the value of green building regulations and how the absence of which negatively impacts the reliability of commercial property valuations in developing nations. Sayce, Sundberg & Clements (2010) investigated the impact of green building features on the value of commercial office space and found associations between green features, rents, and yields. The outcomes also highlight perspectives on the effectiveness and the impact of BREEAM certification on commercial real estate.

BREEAM is described as the leading global sustainability assessment tool for buildings (BRE 2018). It addresses the primary industry challenges that surround energy performance, construction, lifecycle assessments, and benefits to developers, users, and investors. BREEAM (2018) also addresses elements relating to sustainable travel and best practice for environment.

Researchers project that sustainability rating systems, such as BREEAM, will expand to the degree that will require old buildings with low energy performance to be refurbished (Jones Lang LaSalle, 2017). Lonsdale (2018) attributed the declining availability of vacant commercial properties in Scotland to a stronger demand and shortage of new supplies.

### **5.4 FINAL CONCLUSION**

The overall aim of this study was to assess the level of influence that BREEAM certification has on commercial tenants' real estate strategy. The literature showed a significant relationship between BREEAM certification and tenant satisfaction in occupying office space through lower utility bills, length of the

lease, occupancy levels, rental rates, premium on yield, lower taxes and energy efficiency.

Data from CoStar indicates that BREEAM certification does not have a great impact on the rental rates for high quality office buildings in Glasgow's City Core due to the overall shortage of high quality office space in the city. However, vacancy rates for BREEAM certified office buildings are significantly lower than non BREEAM certified office buildings. The majority of occupiers of high quality office buildings with energy efficiency standards are multi-national corporations who are considered low risk tenants.

The results of the interviews show that location of the buildings, accessibility to public transportation, and comfort were the main factors that influenced the tenants' decision to occupy office space. These are considered fundamental elements that are incorporated in the building design in order to achieve a BREEAM certification. Interviewees in this study reported improvement in employee health and wellbeing, decreased levels of absenteeism and increased economic benefits. These indirect benefits can be attributed to the buildings' achievement of BREEAM certifications.

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# APPENDICES