CHALMERS


From Grey to Green

- An analysis of potential value creation through green renovation of existing commercial real estates

Master's Thesis in the Master's programme Design and Construction Project Management

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ABSTRACT

If the challenge of the climate change is to be successfully addressed there is a need to upgrade the existing building stock. However, retrofit existing buildings is significantly more difficult that to build new green buildings. With this in mind, the topic of this Master's thesis is to examine if there is a perceived value in renovating a *grey* commercial real estate into *green*?

The aim of the study is to analyse if there is a value for tenants in renovating existing commercial real estates according to green processes in Sweden. The purpose is to evaluate if labelling existing commercial real estates with environmental classifications will enhance the value for tenants, and ultimately also for the Real estate Company. To fulfil this purpose, two research questions have been formulated: (1) Does renovation of commercial real estates according to green processes enhance the value? (2) Does labelling of commercial real estates according to an/several environmental classification system(s) enhance the value of the commercial real estates? (2a) If it does, are there any system(s) that (may) result in higher value for both the Real estate Company and the tenants?

The conducted method consisted of a literature review along with qualitative and quantitative studies. In order to answer the research questions, this thesis has two different approaches: building green, and the environmental classification systems. The subjects discussed within building green are the cost, potential benefits, the marketing value, and the value of green in real estate valuation. The explained and compared environmental classification systems are BREEAM, the Environmental Classification System, GreenBuilding Programme, and LEED.

To conclude, the value of building green and certifying real estates according to environmental classifications systems depends on both individual preferences and the level of knowledge of the stakeholders involved. From a sustainability point of view the most important agenda, for the Real estate Company, is to upgrade their real estates according to green processes, and maybe not to certify them according to environmental classification systems. The systems can, on the other hand, act as a tool for the real estate companies to market their green work towards tenants and the public.

Key words: Commercial real estate; Cost of Green; Environmental classification system; Green building; Value

Från fulfastighet till finfastighet

– En analys av ett potentiell värdeskapande genom grön renovering av befintliga kommersiella fastigheter

Examensarbete inom Mastersprogrammet Design and Construction Project Management

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SAMMANFATTNING

Om utmaningen med klimatförändringarna ska lyckas så finns det ett behov av att uppgradera de befintliga byggnaderna. Att renovera en byggnad är avsevärt mycket svårare än att bygga en ny ”green building”. Med detta i åtanke tar denna masters uppsats upp ämnet och undersöker om det finns ett värde i att renovera en *fulfastighet* till en *finfastighet?*

Målet med denna studie är att analysera om det finns ett värde för hyresgäster i Sverige att renovera befintliga kommersiella fastigheter genom gröna processer. Syftet är att utvärdera om en certifiering av kommersiella fastigheter enligt miljöklassningssystemen ökar värdet för hyresgästerna och därmed också fastighetsbolaget. För att uppfylla detta syfte har två frågor formulerats: (1) Kan grön renovering av kommersiella fastigheter skapa en värdeökning? (2) Kan miljöklassningssystem öka värdet av fastigheten? (2a) om så är fallet, finns det system som kan resultera i ett högre värde för både fastighetsbolaget och hyresgästerna? Den genomförda metoden har bestått av en litteratur studie tillsammans med kvalitativa och kvantitativa studier. För att besvara frågeformuleringarna så har denna tes undersökts från två vinklar, bygga grönt och miljöklassningssystem. Bygga grönt tar upp ämnen som rör kostnader, potentiella fördelar, marknadsföringsvärde och det gröna värdet i fastighetsvärderingar. Miljöklassningssystemen BREEAM, Miljöklassad byggnad, GreenBuilding och LEED är förklarade och jämförda.

Sammanfattningsvis, värdet av att bygga grönt och att certifiera fastigheter enligt miljöklassningssystem beror både på individuella preferenser och på kunskapsnivån hos berörda parter. Ur ett hållbarhetsperspektiv är den viktigaste agendan, för ett fastighetsbolag, att renovera fastigheter till ”green buildings” och inte att certifiera dem enligt miljöklassningssystemen. Systemen kan däremot ses som ett verktyg för fastighetsbolaget att marknadsföra deras ”gröna arbete” till hyresgäster och allmänheten.

Nyckelord: Kommersiell fastighet; Gröna byggnader; Miljöklassningssystem; Kostnad av grönt byggande; Värde

Contents

Preface

This Master's thesis is the final part of the Master's programme at the Chalmers University of Technology. The thesis project consists of 20 weeks of fulltime work and it gives a total of 30 University credits. All three authors have contributed equally to the study. The project started in January 2010 and was completed in June the same year. The thesis has been carried out at the Department of Civil and Environmental Engineering, *Division of Construction Management*, Chalmers University of Technology, Sweden. This thesis project has also been carried out in cooperation with the real estate company Platzer fastigheter AB.

We want to, first and foremost, thank our supervisor Ann-Charlotte Stenberg at the Division of Construction Management, Chalmers University of Technology for your help and guidance during the work with our thesis. Your enthusiasm made us perform better.

Thanks to Platzer fastigheter AB and our supervisors Henrik Nordqvist and Erik Fisher for providing us with helpful support and advice during our Master's study. It has been a pleasure for us to conduct our study at your company.

Finally, we want to thank Olof Hermansson for the objective view you have given us on both the questionnaires and the report. The comments have been very helpful in improving our language, and to clarify our ideas.

Göteborg June 2010

Mattias Andersson Helén Fässberg Caroline Johansson

Basic Concepts

The Brundtland Report	This is a report dealing with environmental aspects initiated by United Nation. The name *"Brundtland"* was given to the report because the Prime minister of Norway was the chairman of the meeting (The UN, 2009).
Carbon footprint	According to the UN (2009), it is the impact of people's activities on the environment through the amount of greenhouse gases they produce, that measures the carbon footprint. Units are measured in carbon dioxide (CO_2).
Green building	According to Build Green (2005): *"A green building is an environmentally sustainable building, designed, constructed and operated to minimize the total environmental impacts."*
Green processes	According to the U.S Environmental Protection Agency (2010): *"…the practice of creating structures and using processes that are (!) environmentally responsible and resource-efficient throughout a building's life-cycle from siting to design, construction, operation, maintenance, renovation and deconstruction."* Synonyms are ecological design, ecological sustainable design, and green design (Kibert, 2005).
Green standards	Green standards are referring to environmental classification system such as BREEAM, the ECS, GBP, and LEED.
Sustainable Development	According to the Brundtland Report (1987), pp. 9 sustainable development is defined as: *"…meeting the needs of the present without compromising the ability of future generations to meet their needs."*

Abbreviations and Vocabulary

ASHRAE	The American Society of Heating, Refrigerating and Air-conditioning Engineers.
BREEAM	Building Research Establishment Environmental Assessment Method. A certification system from BRE, U.K.
BRE	Building Research Establishment, U.K.
BRE Global	An independent third party approval body.
The ECS	The environmental certification system, our abbreviation. A certification system from the Building-living-dialogue, Sweden.
GBCI	The Green Building Certification Institution.
GBP	GreenBuilding Programme, our abbreviation. A certification system in the EU.
Gross lease	Rent including heating and electricity.
HVAC	Heating, Ventilating and Air Condition.
LEED	Leadership in Energy and Environmental Design. A certification system from USGBC, USA.
LEED Online	LEED Online is the tool LEED project teams' uses to manage the registration and certification processes.
LCA	Life Cycle Analysis.
ISO 9001	International Organisations for Standardisation – Quality management systems.
ISO 14001	International Organisations for Standardisation – Environmental management systems.
Net lease	Rent excluding heating and electricity.
Refurbishment	Large renovation.
Retrofit	Small renovation with replacement of new parts.
USGBC	U.S Green Building Council.

1 Introduction

Climate change is a widely discussed subject that has grown intensely during the past years (Nelson, 2007). It appears that the dialogue has changed from a subject debated between scientists, and between policy makers to be a subject that is present in our everyday lives, in for example, news articles, and popular culture. One significant factor in *"awaking"* the public was when Al Gore released the film and the book "*An Inconvenient Truth"* in 2006, and thereafter also receiving the Nobel Peace Prize the following year. Al Gore's success and increasing media coverage of the climate situation has lead to an enhancement of the general public's awareness of global warming. However, global warming is just one of the environmental problems that are obvious today.

The process of dealing with environmental problems involves everyone, and the construction sector is often, worldwide, referred to as the *"the 40 percent sector"* (PWC, 2010). The name *"the 40 percent sector",* in Sweden, comes from the fact that the construction sector consumes approximately 40 percent of the total amount of energy and materials used in the country (The Ecocycle Council, 2010). It furthermore refers to that the sector creates large parts of the entire amount of waste and uses approximately 10 percent of the total transports made in Sweden. The Ecocycle Council[1] is an association of approximately 30 organisations within the Swedish building and real estate sector. They have set up an agenda that involves working toward four major goals in order to reduce these numbers. These four goals involve: energy conservation, economising with building materials, fading out hazardous substances, and secure sound indoor environments.

It is not clear what to do with existing buildings, since they represent such a large part of the market, and whether and/or how these should be renovated for sustainability (Miller and Buys, 2008). According to Langley *et al.* (2008), the existing buildings in Europe stand for approximately 98 percent of the total building stock. Additionally, Nelson (2007, pp. IV) states that:

> *"As one of the principal users of natural resources, the real estate sector stands as a central target of global efforts to reduce the 'carbon footprint' of economic activities."*

Cassidy (2003) suggests that two parallel agendas are drawn up for the construction sector in order to reduce environmental impact and to create a green building:

1. Build new buildings and major reconstructions according to green standards.
2. Upgrade the existing buildings to fulfil green standards.

To build new green buildings is significantly easier than to renovate existing buildings (Cassidy, 2003). As the existing building stock represents such a massive part of the total building stock, Miller and Buys (2008) suggest that there is a need of upgrading these buildings in order to succeed in the challenge of reducing their carbon footprints.

There are as many different ways to make a building *"green"*, as there are organisations that have a suggestion of their best way (Biblow, 2009). GREC (2009) supports this idea that there are a number of ways to *"go green"*, but recons that in the end it usually comes back to demand and supply if it is to happen. The green

[1] Kretsloppsrådet

building concept is an expansion and complement to the classical building design concerns (The U.S. Environmental Protection Agency, 2010). Even if the concept only dates back a couple of decades, Bradley Guy *et al.* (2002) mention that paying attention to the environment and consider green building techniques is considered as a prominent criteria of a *"good"* construction today. What constitutes a green building is another agenda. Kozlowski (2003) says that over the years' researchers and organisations have defined green buildings in ways that have suited their purposes, and this has confused the public that is not as aware about what a green building really is.

Even though, there have been a range of definitions of green building, many researchers have been able to agree upon the features of it. Some of the mentioned features are reductions made in energy and water consumption, the usage of recycled and renewable resources, and the assurance of healthy indoor environment (USGBC, 2010). Even if there has been a consensus of the features of green buildings the definition of green buildings is not as easy (Kozlowski, 2003). This is also supported by Nelson (2007) who suggests that, in order to investigate what constitutes a green building it turns out that finding a definition of green building for the real estate sector is not as straightforward. One problem in defining green buildings is that there are two distinct definition-categories. Firstly, there are those who define green building as a process in designing buildings, and secondly, those who define what this design means for the actual building – i.e. the artefact. Table 1 shows some definitions from both these categories.

Table 1 – Definitions of Green building

Definition of green building, - the process	Reference
"A movement in architectural and building circles aimed at creating structures that are occupant and environmentally friendly. Criteria such as sustainability, energy efficiency and healthfulness are considered."	Window & Door (2010)
"…the practice of creating structures and using processes that are (!) environmentally responsible and resource-efficient throughout a building's life-cycle from siting to design, construction, operation, maintenance, renovation and deconstruction."	The U.S. Environmental Protection Agency (2010)
Definition of green building, - the artefact	**Reference**
"It's a building that uses a careful integrated design strategy that minimizes energy use, maximizes daylight, has a high degree of indoor air quality and thermal comfort, conserves water, reuses materials and uses materials with recycled content, minimizes site disruptions, and generally provides a high degree of occupant comfort."	Kozlowski (2003, pp. 27)
"A green building is an environmentally sustainable building, designed, constructed and operated to minimize the total environmental impacts."	Build Green (2005)
"Building that is aimed at energy conservation, saving natural resources, and preserving the environment"	Global Green Building (2010)
"A property designated as holding particular status as 'environmentally friendly'. The term 'sustainable' is often applied interchangeably …"	Pierce Eislen (2010)

The definitions presented in Table 1 are important for the concept of building green since it is needed to have a process to be able to produce an artefact.

Stenberg (2006) discuss that the green building definition needs to be separately defined depending on the context it is used in. The science community needs an *"open-minded"* attitude (heterogeneity approach) while society needs one universal definition (homogeneity approach). This Master's thesis focuses on the real estate sector and, specifically, on existing buildings. Thus, a definition of green building as a process, and a definition of green building as an artefact, needs to be presented. With

this in mind, green processes will from now on be referred back to the definition made by the U.S. Environmental Protection Agency (2010):

> *"…the practice of creating structures and using processes that are (!) environmentally responsible and resource-efficient throughout a building's life-cycle from siting to design, construction, operation, maintenance, renovation and deconstruction."*

Additionally, green buildings will be referred back to the definition made by Building Green (2005):

> *"A green building is an environmentally sustainable building, designed, constructed and operated to minimize the total environmental impacts."*

As mentioned earlier, there are many ways in creating green buildings and this uncertainty in not knowing whether or not the building is *"good"* from an environmental perspective has created a focus on certifying buildings according to environmental classification systems. One indicator of this is that several large companies within the Swedish building sector have made press releases, during 2009 and 2010, that they will use one or several specific environmental classification systems in order to verify that they are building green. Recently, this focus has also reached the real estate sector, and during the spring of 2010 there have been several articles in Swedish trade magazines, for example, Lokalnytt (2010) and FASTIGHETSvärlden (2009) discussing real estates, green buildings and some of the environmental classification systems. A number of large Swedish real estate companies have also made press releases that they will use specific environmental classification systems for their buildings.

Having seen this increased concern in the construction as well as the real estate sector, a question comes to mind: What do tenants of these companies gain from a green building – i.e. what is the perceived value for a tenant of going from *Grey* to *Green*?

1.1 Purpose

The aim of the study is to analyse if there is an added value for tenants by renovating existing commercial real estates according to green processes in Sweden. By examining the value of building green, along with some of the environmental classification systems, the purpose is to evaluate if labelling existing commercial real estates with environmental classifications will enhance the value for tenants, and ultimately also for the Real estate Company.

In order to fulfil the purpose, the following questions have guided our research:

1. Does renovation of commercial real estates according to green processes enhance the value?
2. Does labelling of commercial real estates according to an/several environmental classification system(s) enhance the value of the commercial real estates?
    - If it does, are there any system(s) that (may) result in higher value for both the Real estate Company and the tenants?

In order to answer the research questions, the study has been approached from two different angles: building green, and the environmental classification systems. These two parts will be the key structure throughout the thesis.

We hope that the results of this study can be used to suggest new ways of conducting *"green thinking"* within real estate companies.

1.2 Delimitations

The thesis is limited to examine the value of commercial real estates if implementing green standards. As there are several environmental classification systems in the world a selection had to be made. The study is delimited to examine and compare BREEAM, the ECS, GBP, and LEED, as these systems are either already established on, or are being revised to suite, the Swedish market. Furthermore, these four were chosen to get a good balance, and a wider perspective as the systems have different range, dept and origins.

When examining these four systems, we have focused on those areas in the environmental classification systems that are appropriate for real estate companies that have existing commercial real estates. None of the systems have been used and/or tested for this thesis and the categorisation and analysis is entirely based on written documents. The study takes the perspective of the Real estate Company and all respondents to the interviews and questionnaires have been located in the Gothenburg, Sweden.

2 Methodology

This chapter presents the methodological aspects of our research. It starts with an introduction of the research approach and continues with a description of the empirical data for this study.

2.1 Research approach

In research, the outcome of the study will be influenced by the choice of how you approach your research question. It is important to evaluate different approaches before determining which one to use, it is also important to explain and discuss the selected approach.

Teorell and Svensson (2007) and Yin (2009) were used as support for structuring and guiding our research processes. According to Teorell and Svensson (2007), the three main ways of data collections are direct observations, interviews, and surveys. We chose to focus on the last two data collection methods together with a literature review as our main sources of information for this thesis. The literature review constituted as a base to our qualitative interview study. Our findings from the interview study together with an additional literature review resulted in the development of a quantitative survey.

2.2 Empirical data collection

To be able to answer our research questions, different data collecting methods have been used. A thorough literature review provided us with a stable foundation for the subsequent studies. Further, by conducting semi-constructed interviews, and a questionnaire study, our intention was to provide our thesis with a qualitative and a quantitative point of view.

2.2.1 Literature review

In the beginning of January 2010, we conducted a literature review to identify the current discussions and trends within the fields of environmental classification systems in general, and specifically in the commercial real estate sector. A search in available databases at the Chalmers library was performed. The search was based on keywords such as: green building, real estate, classifications system, environmental issues and BREEAM, LEED, GBP, the ECS, green, refurbishment and property. We used combinations of these keywords to limit the number of hits, and we focused on research published mainly within the last ten years. This is because the "green thinking" and the system are constantly updated. The initial results from our literature review built the foundation for our interview study.

The literature review can be divided into two parts: building green and environmental classification systems. The first part examined the cost, the potential benefits, the marketing value, and the value of green in real estate valuation. The second part investigated the different environmental classification systems, their origin and widespread.

2.2.2 Interview study

In order to examine the tenants' view of what can contribute to enhanced values in commercial real estates, qualitative interviews were conducted. Openness is the virtue of qualitative interviews according to Kvale (1997). There are no typical techniques or rules for an interview; however, there are certain methods at different stages of an interview (Kvale, 1997). There are different ways to get from a question to an answer, but this is what method is all about. We used "the Seven Stages of Interview

Research" by Kvale (1997), to outline our interview guide. Yin (1994), states in general, that a study uses the preferred strategies, when questions like "how" or "why" are being posed. These influenced us in our questions for the interview guide.

The qualitative interviews conducted were a total of 10, and the selected interviewees represented tenants from five real estates, located in Gothenburg. The interviewees had their occupation in different industries and had job titles such as: Restaurant owner, CEO, Head chief of the region, Property manager, Environmental manager etc. An interview guide was created from our literature review, and by using a semi-structured approach our aim was to cover the same topics during all the interviews. We used open-ended questions, and avoided leading questions, which allowed the interviewees to speak freely around the subject. The interviews were conducted, in most cases, by the three of us. One of us focused on covering the topics, while the others asked follow-up questions and took notes. All interviews were conducted with a single interviewee and the interviews started with a brief introduction of us, and our thesis project. The interviews lasted between 20 to 75 minutes and were held at the interviewees' workplace. The interviews were audio-recorded, and later transcribed.

2.2.3 Questionnaire study

We decided to use a questionnaire because the purpose of the quantitative study was to measure, and generalise a broader view. A questionnaire study faces some obstacles such as practical issues and personal factors. The practical restrictions are that people might not answer the questionnaire, the questionnaire might get lost in the mail etc. To limit the practical restrictions, we organised a distribution with help from our supervisors at the Real estate Company. A follow-up reminder was also sent out to ensure that we got a high response rate on the questionnaire. Personal factors that can affect the result include: difficulties to ask follow-up questions, to clarify misunderstandings, and make the questions suitable for all the respondents.

We are satisfied with the findings, and the answering quota, as the information received has been useful to our study. We formulated the questions together, and during the formulation process we considered that the respondents could have different backgrounds and that the questionnaires should be suitable for all respondents. When formulating the questions, and the structure of the sentences, we tried to avoid words with plural meanings in order to make them easy to understand. Both questionnaires can be viewed in Appendix A.

The questionnaires were sent out to 105 respondents, representing the Real estate Company and their tenants, with an answering quota of 41 percent. The two questionnaires were similar to each other; one was directed towards and sent to the Real estate Company, and the other was directed towards and sent out to the tenants of the Real estate Company. The questionnaire sent to the Real estate Company was addressed to their facility managers. Furthermore, the questionnaire sent out to the tenants was addressed to their premises manager. However, there were quite few premises managers that actually answered the questionnaire. The majority of the respondents were instead CEOs, or had a leading position within the companies. The aim with the questionnaire was to grasp the overall opinions of the tenants, but also to get the view from the Real estate Company.

2.2.4 Data analysis

All documents: journals, books, articles, trade magazines, and website information that were collected during the study have provided useful information when we conducted our literature reviews, interview guide, and questionnaires. The interviews

were transcribed and the recordings were listened to several times to not miss any vital information. Quotations were taken from each of the transcribed interviews and put under the same topics/subtopics in the interview guide, to better grasp the interviewees' opinion. To be able to analyse all the responses from the questionnaires, they were collected and inserted in a Microsoft Excel document. Since the questionnaire study was divided into two separate questionnaires, we kept most of the responses to the questions apart. The interviews and the questionnaires were then combined and analysed in order to find differences and similarities within the answers. Further, the combined analysis was linked to the literature review in order to relate our findings to research within the field.

2.2.5 Reliability and Validity

The problem of validity can be reduced by using multiple sources of evidence that allows the researcher to find information that converge (Kvale, 1997). This process is usually referred to as triangulation. Silverman (2006, pp. 404) states that:

> *"Triangulation involves comparing different kinds of data (e.g. quantitative and qualitative) and/or different methods (e.g. observations and interviews) to see whether they corroborate one another."*

Triangulation has been used in this study by comparing our quantitative study with our qualitative study, and also by comparing our literature review with the interviews and questionnaires. In order to enhance the reliability and to minimize the risk for misinterpretations were all the interviews recorded. All the interviews ended with us asking for the ability to ask follow-up questions by e-mail or phone in order to verify possible uncertainties. The transcriptions of the interviews were conducted immediately in order to connect the interview and the observation made during the interview.

3 Building green

There are various aspects in building green, and this chapter will discuss the cost, potential benefits, the marketing value, and the value of green in real estate valuation.

3.1 The cost of building green

> *"Clearly there can be no single, across-the-board answer to the question 'What does green cost?' On the other hand, it is possible, and quite easy, to answer the question 'What will green cost me on my project?' It is also possible, and quite easy, to manage those costs so that sustainable features can be delivered in a cost-effective and efficient manner."*
>
> (Morrison and Langdon, 2007, pp.55)

Continuously, Langdon (2007) suggests that strategies in green design for higher quality buildings are to become the norm and the opinion that green design adds an extra cost to the project will eventually diminish. However, according to Fuerst and McAllister (2008), there exist additional costs that are associated with the certification process for commercial real estates. These are additional production costs associated with meeting the certification standards, and payments to the certifying body for rating (Fuerst and McAllister, 2008).

A survey conducted in the real estate context has found that tenants are willing to pay a higher rent to reimburse the owner for the supplementary costs of green buildings (Fuerst and McAllister, 2008). The tenants' demand for green spaces is fairly new and is therefore limited (Miller *et al.*, 2008). However, there are also some positive rent differentials existing, as green buildings are still a rarely small proportion of the total space. Miller and Buys (2008), concludes that many of the tenants were familiar with the positive effects of sustainability, but few had an interest in paying considerably more to access sustainable features. This is supported by Pitt *et al.* (2009), who propose that the perception that higher costs are associated with sustainable construction can be linked to the lack of customer awareness and the absence of client demand. Further, cost-benefit analyses and pay-back calculations were a few things that tenants expressed to be useful before determining about sustainable features in the building (Miller and Buys, 2008). In the literature, one of the most cited reasons for not including green components into the design is the initial increase in cost (Morrison and Langdon, 2007). Therefore when deciding to build green, Miller and Buys (2008), express that the financial cost is one of the key factors for many companies. Pitt *et al.* (2009), presents variables, through their literature review, that were seen as key drivers and key barriers towards sustainable construction. The drivers of sustainable construction can, for example, be building regulations, client awareness, client demand, labelling, and financial incentives. Additionally, the barriers of sustainable construction can, for example, be affordability, building regulations, lack of client demand, lack of client awareness, and the lack of one labelling standard.

The major cost difference between a conventional building and another building with an applied green strategy is according to Kats (2003b), the increased time spent on architectural and engineering design that is required in order to integrate the strategy into the project. However, this is difficult to validate as Kats (2003a, pp. 14) state that there is:

> *"Virtually no data has been collected on conventional buildings to determine what the building would cost as a green building. And, surprisingly, most green buildings do not have data on what the building would have cost as a conventional building."*

Despite this fact, the most common approach of finding the cost of a *"green"* project is to compare it to the original or the expected costs (Morrison and Langdon, 2007). Furthermore, two major problems arise with this type of comparison; firstly, it takes for granted that the original budget were correct from the beginning. Secondly, it is also assumed that no other changes or improvements were made during the construction period.

Creating a new building according to green building standards is much easier than to retrofit an existing building (Miller and Buys, 2008). Further, sustainable retrofits or technology upgrades in existing commercial real estates will involve the participation and cooperation of the involved stakeholders, for example, owners, tenants and contractors. An existing building presents both physical and technical constraints, and this is a genuine challenge for anyone trying to line-up with the sustainable criteria, and a refurbishment might offer a cost-effective way to lengthen the economic life of a commercial real estate (Mansfield, 2009b). Further, Mansfield (2009a) suggests that the existing buildings have a shortcoming in comparison with new buildings. They were constructed according to old standards, and these standards are now expired because modern standards have been redrafted to address sustainability issues and increased in extent and depth. An expensive part of real estates budget is operation and maintenance, which often represent about 90 percent of the total budget (Qualk and McCown, 2009). Therefore, reductions in operation and maintenance costs will often be made, with little or no additional up-front cost, by making the right decisions during the design and construction phases (Qualk and McCown, 2009). Furthermore, Langdon (2004) proposes that an important point to keep in mind during the establishment of a design and budget for green buildings is that sustainability is a program issue and not added requirement. This is also supported by Qualk and McCown (2009), who state that it is important to notice that sustainability is a programming issue that must be addressed before any budgets are set.

Morrison and Landon (2007) suggest that realistic levels of green design can be included into buildings at a minor or no additional cost. This is supported by Kats (2003a, pp.32), who states:

> *"As expected, the cost of green buildings generally rises as the level of greenness increases, while the premium to build green is coming down over time. Importantly, the cost of green buildings tends to decline with experience in design and development, as clients and their design and architecture teams move beyond their first green building."*

However, Qualk and McCown (2009) suggests that if there are any additional costs for building green then these will be recovered within one to two year, with exponential cost savings. Additionally, the construction cost premium, has been found, in studies, to be covered by the lowered operating costs (Fuerst and McAllister, 2008). Nonetheless, in the short term, sustainable retrofits will in most cases result in higher rent, and it is uncertain if there exist demands and/or if the organisations are willing to pay for them (Miller and Buys, 2008). Eichholtz *et al.* (2009), on the other hand, suggests something entirely different, that green buildings are typically higher-quality buildings and leasing this type of real estates would instead be a result of that

the tenant prefer high-quality real estates, rather than that it would be a conscious act of *"responsible behaviour"*.

3.2 Potential benefits with building green

According to the U.S. Environmental Protection Agency (2010), economical benefits of building green include improvements of occupant productivity, reducing the operating costs, and optimizing life-cycle economic performance. Further, Fuerst and McAllister (2008) suggest that developers, occupiers, and owners may obtain a variety of benefits that are associated with green buildings. Tenants, for example, can have benefits related to reduced operating costs of the real estate, possible tax and other incentives, improved productivity of the occupying business, and other competitive advantages linked to marketing and image benefits (Fuerst and McAllister, 2008). Fuerst (2009) develops this idea and proposes that benefits can also include improved image for occupiers and owners. However, despite the known benefits there is still a reluctance to apply the technique in every building. Yudelson (2008, pp. 43) mention that one reason is:

> *"...benefits are generally long-term while costs are immediate, so many people tend to shy away from anything that will add costs, no matter what the potential benefits."*

This is supported by Cassidy (2003), which state that there are several actors in the industry still seeing the high initial costs of building green as a problem. However, it is also stated that there are more actors willing to invest in green buildings today than just a few years ago.

According to Miller and Buys (2008), little is known about the interest, expectations, and support in sustainable retrofits from the general market. Storey (2007) concludes from respondents' answers that the corporate market is still not fully convinced about the value and merits of incorporating sustainable design into their rented spaces particularly if it means that a rental premium has to be paid. Further, Storey (2007) recon that many clients still prioritise location, view, image, and visible appearance related improvement instead of operational performance, but this is about to change. By implementing sustainable features into an existing building, Mickaitytė *et al.* (2008) suggests that it is important that the satisfaction level among tenants is essential for a sustainable refurbishment provision. Nonetheless, Bartlett and Howard (2000) propose that a disadvantage with green building features is that they are often invisible and can only be appreciated when the building is occupied and used by the tenants.

Another aspect to potential benefits is adopted from Lorenz *et al.* (2007), who list a number of green building features that can result in economic effects. Among them is energy efficiency that for example can result in lower operating and maintenance costs. For more examples, see Figure 1.

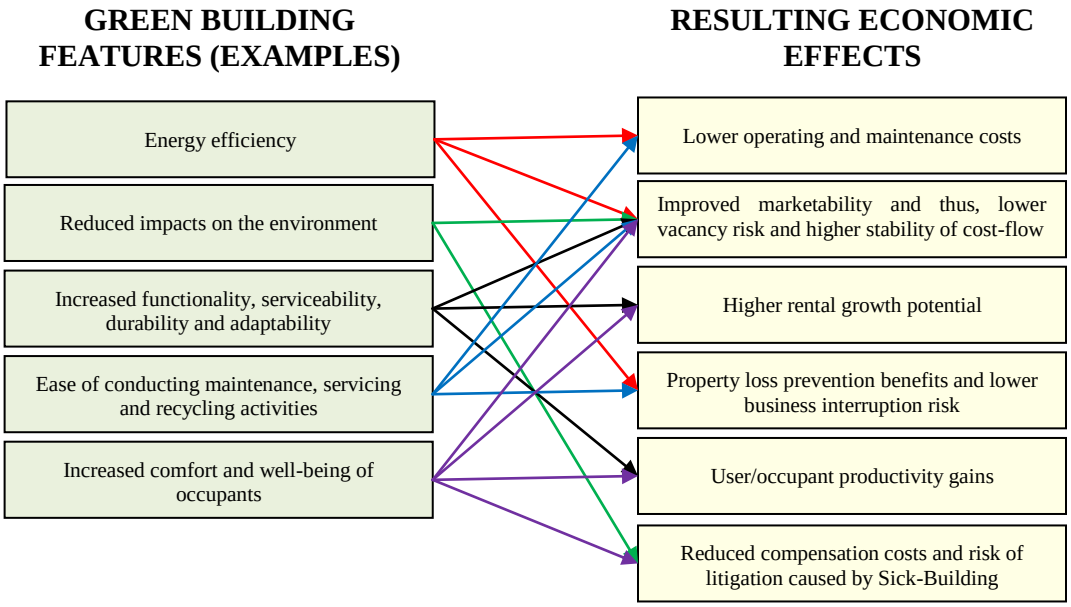

Figure 1 – Possible links between green building features and economic benefits. (Modified from Lorenz et al., 2007)

3.3 The marketing value of building green

According to Kohler (1999), the concept of *"green"* has a marketing value and most people are not opposed to green buildings. Miller and Buys (2008) mentions that for larger companies the financial cost involved with green buildings is not as relevant as they tend to see green buildings as a way of expressing their corporate social responsibility, CSR. Further, according to Eichholtz *et al.* (2009), stakeholders and customers may receive signals that a company has a long-term commitment to their CSR when the company uses a green headquarter and green spaces in general. Furthermore, Eichholtz *et al.* (2009) point out that incorporating real estate(s) in their strategic decision-making signals that companies are very conscious of CSR. Further, occupying a green building can have an indirect economic effect if the long-term commitment to their CSR policy translates into an improved reputation of the company.

Persram and Larsson (2007) expresses that the company brand value is higher if the leased real estate meets green standards. Additionally, Eichholtz *et al.* (2009) proposes, from their studies, that corporations are perhaps more prone to lease green spaces in real estates if the company are involved in environmentally sensitive operations. Further, Pitt *et al.* (2009) recommend that incorporating sustainable features may create a good social environment that can enhance the brand and image of the corporation by supporting staff retention and recruitment.

Further, green buildings are often presumed to have something extra when compared to conventional buildings and that this extra quality creates an additional cost. Kohler (1999, pp.317) continue the discussion by stating that:

> *"It has always been a mystery as to how people could affirm that green buildings are more expensive than normal buildings without any common agreed definition of what green buildings are."*

Wiley *et al.* (2008) suggest that even though a green building may cost more to produce, the rental rate may be impacted in at least two positive ways for the real estate company. Firstly, the green building often, in many cases, has a unique appeal

to potential users. Secondly, current users taste and preference is vital for the impact of green design on the rents because some tenants place a high individual value on green space because it enhances some other aspect of their business operations. Finally, Reed and Wilkinson (2007) expresses that it is important that real estate agents emphases the sustainable aspects of a building even more in their marketing program.

3.4 The value of green in real estate valuation

There are two clear perspectives when linking real estate valuation with the green features of the building. One perspective is mentioned by Lorenz *et al.* (2007), who state that it is difficult for professional advisors to link the building's environmental performance with its investment performance. This problem has two different aspects that contradict one another; on the one hand there is a shortage in knowledge about how to estimate market value, and on the other hand, the financial professionals will not account for the green features before understanding those (Lorenz *et al.*, 2007). Another perspective, according to Lorenz and Lützkendorf (2008), is that real estate valuation is the primary mechanism that aligns economic returns with the environmental and social performance of the building assets. Real estate valuation can in other words be used to express and communicate what is good with building green. This was supported by The RICS (2005, p. 3), who summarized in their study that:

> *"A link is beginning to emerge between the market value of a building and its green features and related performance."*

Miller and Buys (2008) express that location and cost where the key factors in the selection of buildings for smaller organisations, but that sustainability were an emerging consideration. Additionally, as suggested by Fuerst and McAllister (2008), despite widely propagated financial and environmental benefits there is still little empirical evidence that commercial real estate prices are influenced by their sustainability characteristics.

Fuerst and McAllister (2008) recommend that rational investors will need a mixture of higher income and/or reduced risk in order to compensate for the additional costs associated with the construction of certified buildings. Additionally, increased construction costs due to higher specifications do not always lead to an increased value of the real estate (Fuerst and McAllister, 2008).

Fuerst (2009), states that the potential for certified buildings depends to a large degree on the future changes in the regulatory environment. At the moment, there is still a developer premium associated with building green and the reason for this is that there are still certification costs for most of the rating systems (Miller *et al.*, 2008).

In rented commercial real estates, Reed and Wilkinson (2007) suggests that, tenants having a gross lease contract may have little interest in housing in a sustainable building. Conversely, tenants having a net lease contract would probably prefer a real estate with lower operating costs if this is possible but the owner of the real estate may not be willing to spend for improved sustainability features. Further, according to Reed and Wilkinson (2007), it is important to consider whether the leases are net or gross leases because this affects who can gain the benefits from housing in a sustainable building with lower operating costs. Finally, Eichholtz *et al.* (2009) state that before a differential in the rent levels between green and conventional buildings occur, there is a need for more tenants to lease green spaces.

4 Environmental Classification Systems

An environmental classification system is a tool which indicates the quality of the building from an environmental point of view (Building-living dialogue, 2010). The classification scheme can be used as an incentive to speed up the development of green buildings. Additionally, it also indicates which part of the real estate that could be improved. Examples of some certification systems around the globe are listed in Table 2.

Table 2 – Various Environmental Classification systems

Environmental Classification Systems		
	Country	**Reference**
BREEAM[1]	UK	BRE Global Ltd. (2009)
CASBEE system	Japan	Casbee (2010)
CEEQUAL	UK	Ceequal (2010)
Energy Star	USA	Energy Star (2010)
The ECS[2]	Sweden	Building-living dialogue (2010)
ESCALE	France	Escale (2010)
GBP[3]	EU	GreenBuilding (2010)
GB Tool, GBC 2000	International	GBC 2000 (2010)
GreenCalc	The Netherlands	GreenCalc (2010)
Green globes	International	EC3 Global (2010)
Green Star rating system	Australia	GBCA (2010)
Guideline for Sustainable Building	Germany	DGNB (2010)
HK-BEAM	Hong Kong	BEAM society (2010)
HQE	France	Association HQE (2010)
LEED[4]	USA	USGBC (2010)
Økoprofil	Norway	Byggsertifisering (2010)
1-4: for more information see sections 4.1-4.4		

In common for most of the certification systems is that they measure the level of sustainable design in the real estate, and in order to qualify for the different types of classification there is a need to evaluate the building against different rating systems (Nalewaik and Venters, 2009). However, Morrison and Langdon (2007), emphasises that it is important to reflect upon that each system are based on a mixture of environmental values, and that the cost impact differs among them. Morrison and Langdon (2007), further suggests that it is necessary for building owners and/or investors to decide upon one (or maybe two) certification system(s) that will match his or hers own values the most.

The environmental classification systems BREEAM, the ECS, GBP, and LEED were chosen to be presented since these systems are either established on, or are being revised to suite, the Swedish market. These four were also chosen to get a wider perspective as the systems have different range, dept and origins. The systems are individually explained in the following sections, and each certification process will be described in more detail. To note, we have concentrated on the specific parts of the environmental classification systems that might be important for a commercial real estate company's existing buildings.

4.1 BREEAM

Building Research Establishment Environment Assessment Method, BREEAM, is the oldest among the rating system within environmental performance assessment (Gowri, 2004). BREEAM is also the leading classification system used for buildings,

which is something that the UK Green Building Council (UK-GBC) fully stands behind.

Although Europe has been thinking *"green"* for more than 80 years, it was not until the beginning of the 1990 that the BREEAM rating system was developed by the British Research Establishment (BRE) (Anonymous, 2003). It is recognized as the benchmark for assessing environmental performance by the U.K.'s building industry. Other countries like Australia, Canada, and some European countries have used BREEAM to develop variations of the U.K. rating systems (Anonymous, 2003). BREEAM have created specific versions of their certification and are available for the U.K., the Gulf, and Europe. They can also be specially tailored for any specific region or country, within:

- Environmental issues
- Environmental weightings
- Construction methods, materials and products in details
- Local codes, good practice guides and standards as references

BREEAM is a design and management stage assessment tool providing a credible, transparent, environmental label for buildings based on good practice (BRE Global Ltd., 2009). It is also designed to be able to analyse both new and existing buildings environmental performance (Anonymous, 2003). One aim of BREEAM is to encourage the usage of materials, which should have a low impact on the environment, and taking interest of the materials full life cycle.

According to BRE Global Ltd., (2009), the classification system mainly provides clients, designers and developers with:

- lower environmental impact buildings trough market recognition
- best environment practice is incorporated into the building
- minimised environmental impact by finding innovative solutions
- a higher benchmark than regulation
- reduction in running costs, improve working and living environments by a helping tool
- progressing towards corporate and organisational environmental objectives through standards

The success of BREEAM has been supported by evidence indicating its influence in changing building design and the reduction of the environmental damage (Holmes and Hudson, 2000).The system is also comprehensive and highly visible in the market. It is significant to get influenced by BREEAM in the design process as well as among the designers, although the influence is not explicit in the real estate market (Holmes and Hudson, 2001).

BREEAM is according to Saunders, (2008) updated annually, which is to keep ahead of the U.K. Building Regulations, and in line with modern best practice.

4.1.1 BREEAM rating systems

All types of buildings can be certified e.g. homes, offices, industrial, retail and communities. Starting from having only two covering offices and homes in 1990, there is today in total fifteen different rating systems (BRE Global Ltd., 2009):

- BREEAM Other Buildings
- BREEAM Courts
- The Code for Sustainable Homes
- BREEAM Ecohomes
- BREEAM Ecohomes XB
- BREEAM Healthcare
- BREEAM Industrial
- BREEAM International
- BREEAM Multi-residential
- BREEAM Prisons
- BREEAM Offices
- BREEAM Retail
- BREEAM Education
- BREEAM Communities
- BREEAM Domestic Refurbishment

Certified BREEAM buildings, can be categorised for the environmental performance of varies types of building, existing and new (BRE Global Ltd., 2009). BREEAM international are used on buildings outside the U.K. Other buildings, for example, leisure complexes, laboratories, community buildings, and hotels are assessed according to BREEAM Other Buildings. BREEAM Industrial, BREEAM International, BREEAM Offices, and BREEAM retail will be presented briefly in the following chapters.

4.1.1.1 BREEAM Industrial

BREEAM Industrial certifies storage and distribution, light industrial units, factories, and workshops at the design stage and post construction (BRE Global Ltd., 2009).Within this category the buildings get subdivided into either speculative or fitted out, where the speculatively developed buildings does not have an end occupier. On the other hand, the fitted out division does have an end user and are especially designed for the occupier (BRE Global Ltd., 2009).

4.1.1.2 BREEAM International

Organisations outside the U.K. have increasingly approached BREEAM Global to obtain BREEAM certification or even replicate BREEAMs system into their country or region (BRE Global Ltd., 2009). Recently, BRE Global has launched two geographical schemes, BREEAM Europe and BREEAM Gulf, which are available for use by BREEAM International assessors. Specific BREEAM schemes can be tailored to suit specific needs, and one example is the scheme that was developed for all Toyota car showrooms located in Europe (BRE Global Ltd., 2009).

4.1.1.3 BREEAM Offices

BREEAM Offices is the world's most widely used category within BREEAM and it focuses on the reviewing and improving the environmental performance of office buildings (BRE Global Ltd., 2009). Assessments can be carried out whether the building is existing or new, occupied or non-occupied.

4.1.1.4 BREEAM Retail

To carry out environmental assessments for retail development, BREEAM retail is mostly used (BRE Global Ltd., 2009). It can vary from size of the development and different number of stakeholders to individual tenants, landlords or even managing agents (BRE Global Ltd., 2009).

4.1.2 What BREEAM measures

The main aspects of BREEAM Certifications are categorised through these three main headings (BRE Global Ltd., 2009):

- Global issues
- Local issues
- Indoor issues

The system rewards performance above regulations that delivers higher comfort, environmental or health benefits. According to BRE Global Ltd. (2009), the environmental impacts are divided and awards credits for:

- *Energy* – To reduce buildings consumption of operational energy and carbon dioxide (CO_2).
- *Management* – Investigate management policy, commissioning, site management and procurement to assess the overall management.
- *Health and Wellbeing* – Both indoor and external issues (lighting, noise and air quality etc.) are considered and important for the environment we live in.
- *Transport* – Examine the transport and various location-related CO_2 factors that affect the environment.
- *Water* – Investigate the consumption, both inside and outside the buildings and also look into the efficiency due to fixtures, appliances and fittings.
- *Materials* – Take into consideration the impacts of building materials, especially embodied materials, which include lifecycle, embodied carbon dioxide impact.
- *Land use* – Examine whether the buildings footprint and type/size of site are both during the construction and after completion according to sustainability.
- *Pollution* – Investigate the external air and water pollution to make sure there are no extreme values that are damaging to the environment.
- *Ecology* – Important to keep the conservation, enhancement and ecological value of the site.

Each category is weighted according to the supposed importance of environmental impact that the issues in each section aims to address (Anonymous, 2003). The number of points in each section are summarised and multiplied by this environmental weighting factor, value/credit, which have different importance. An example on how these factors can be seen in Table 3. The sections are then added together for an overall score. The score are applied in percentage and then added to give an overall total environmental score. The total score achieved are then the ground for which BREEAM rating the development will be awarded for (Anonymous, 2003).

Table 3 – Example of the weighting system in BREEAM (Anonymous, 2003)

How the UK's BREEAM system works			
Category	Nr of Credits	Value/Credit	Maximum Score
Energy	9	1.67	= 9*1.67= 15
Management	15	1.00	15
Hell & Wellbeing	17	0.83	14
Transport	13	0.83	11
Water	6	0.83	5
Materials	11	0.91	10
Land use	2	1.50	3
Pollution	8	1.50	12
Ecology	11	1.36	15
Total			100

4.1.3 The certification process for BREEAM

Licensed assessors are carrying out the BREEAM assessments and it is BRE that trains, examines and licenses organisations as well as individuals to collect appropriate data and go through with the assessments. There are two different types of certification routes: a *standard* BREEAM version and a *bespoke* BREEAM certification for less common building types. Within each version, the main assessments are: design and procurement, post construction or management and construction (BRE Global Ltd., 2009). The fifteen categories in BREEAM are divided between the two different assessments and according to BRE Global Ltd. (2009), the *standard* certification process include the following steps:

1. *Pre-Assessment Estimators* - To give users a full understanding of BREEAM and their issues, the pre-assessment estimators has been designed.
2. *Level of rating* - Before contacting the assessor, an idea of what level of rating the owner of the building is aiming for.
3. *Contact a licensed assessor* - as early as possible a licensed assessor should be contacted to gain an assessment quote. Additionally, the assessor will help to understand the requirements for the desired rating.
4. *Information* - Provide all information to assessor to complete the assessment.
5. *Quality assurance* - As quality assurance, on completion of the BREEAM assessment, a copy of the report to BRE's BREEAM Office are sent from the assessor.
6. *Certification* - A certificate and details of the building are added to the BREEAM Database, once BRE has quality assured the assessment.

If the process instead a *bespoke* assessment, which is a more customized assessment (BRE Global Ltd., 2009). The certification process looks nearly the same, and the last three points are identical as the standard certification process:

1. *Basic plans* - Forward basic plans of the development to the BREEAM Office to establish whether a standard BREEAM version can be used or not. BRE will give cost estimation for the assessment for that specific building.
2. *Level of rating* – when the proposal from BRE is accepted, an assessor should be contacted. If more complex building, BRE might require more information. Discuss together with assessor what level of rating your building is aiming for.
3. *Information*
4. *Quality assurance*
5. *Certification*

For a detailed description of the certification process see Figure 2.

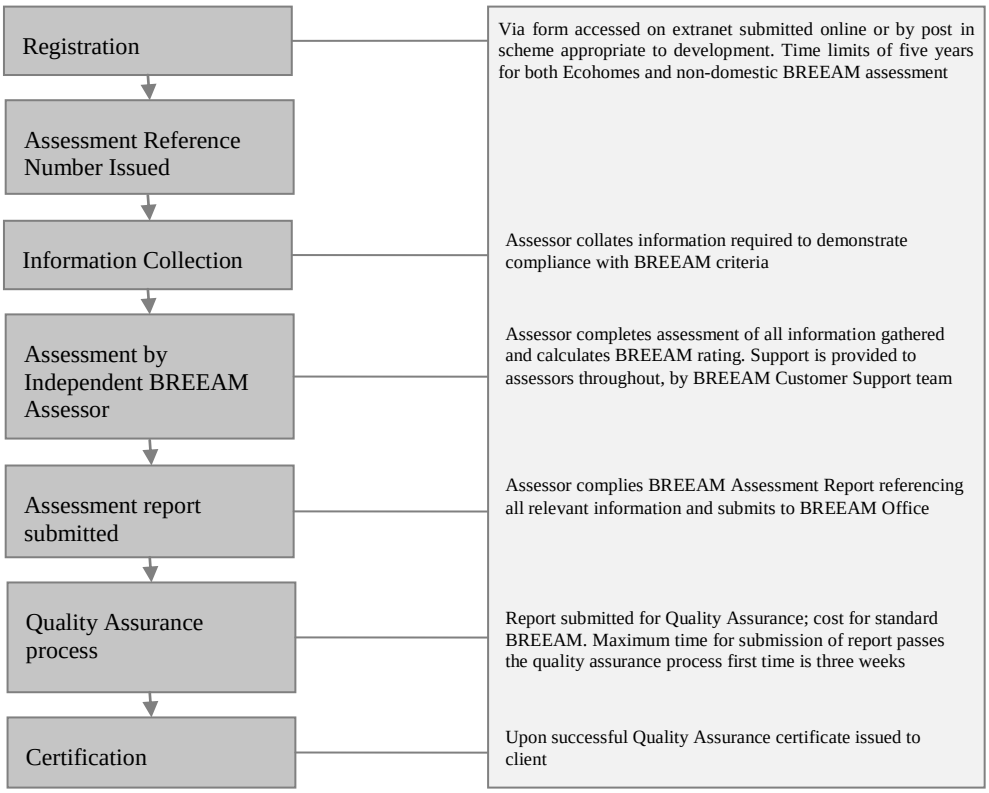

Figure 2 - BREEAM certification process (Saunders, 2008)

Once the building has a total score it will get rated according to the scale of (BRE Global Ltd., 2009):

- Pass > 25 percent of the credits
- Good > 40 percent of the credits
- Very good > 55 percent of the credits
- Excellent > 70 percent of the credits
- Outstanding > 85 percent of the credits

The building will also get a star rating from 1 to 5, which indicates 1 for pass and 5 for outstanding and is than awarded with a certificate (BRE Global Ltd., 2009).

4.1.4 Validity period

The certification is valid until further notice[2]. Buildings can only get assessed in the U.K when they are *"in use"*. An international adaption will be available some time during 2010.

4.2 The ECS

The Environmental Classification System, the ECS[3], was created by the Building-living-dialogue in Sweden, in order to give the construction industry a tool to develop their buildings toward being more environmentally friendly (Building-living dialogue, 2010). The initiative to create the ECS was taken in 2005 by the Building-living dialogue[4], and the development, which continued to the early 2008, was led by a team of researchers from Chalmers University of Technology, the Royal Institute of

[2] Mail correspondence with the Environmental Manager, NCC Property Development Nordic AB
[3] Miljöklassad byggnad
[4] Bygga-bo-dialogen

Technology (KTH), and the University of Gävle (Building-living dialogue, 2010). The aim of the system was to create a tool with simple and clear guidelines that was based on both research made in Sweden and abroad. One of the most important aspects that were taken into consideration during the development was the life-cycle approach, seeing the classification as an ongoing process of showing what could be improved instead of just putting a label on each building (Building-living dialogue, 2010). Even though the system is completed, the guidelines clearly states that experiences from these early years will be used to improve the system further. From the year 2010, the ECS is lead by a non-profit organisation called Environmental Classification[5] (Building-living dialogue, 2010).

4.2.1 The ECS rating system

The ECS is divided into two categories: new buildings and existing buildings (Jansa and Johansson, 2009). The first category includes all buildings that started to be built after July 1st 2009, and existing buildings that have gone through major extensions. Existing buildings can be classified in the new building category if there is documentation that verifies that no dangerous substances are present in the buildings structure (Jansa and Johansson, 2009). All the other buildings are classified in the category existing building.

4.2.2 What the ECS measures

The ECS consists of four levels: category, aspects, indicators, and classification data (Jansa and Johansson, 2009). Level one, the category in which the building will be assessed in is: Energy, Indoor environment, and Chemical Substances. There is also an additional fourth category, Special Environmental Requirements, for buildings with their own water- and sewage systems. An example of this four level model is the category: "*Energy*", with the aspect: *"Energy consumption"* the indicator *"Energy bills"* and finally the classification criteria, the amount in kWh/m^2 see Figure 3.

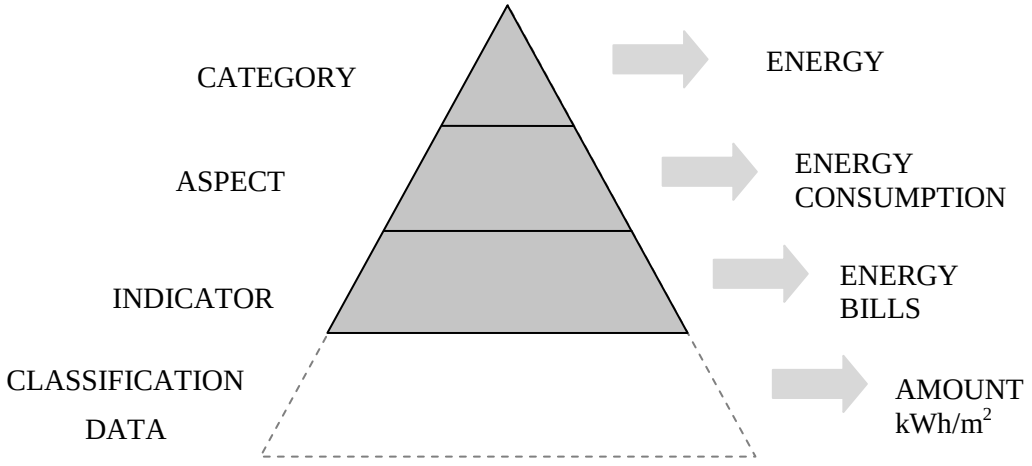

Figure 3 - Illustration of the parameters in ECS. (Figure is translated) (Jansa and Johansson, 2009)

The aspects, ranging from two to five different, of the categories can be seen in Table 4.

[5] Intresseföreningen Miljöklassad byggnad

Table 4 – The categories and aspects in the ECS (Building-living dialogue, 2010)

Category	Aspect
Energy	Energy consumption
	Energy requirement
	Energy type
Indoor environment	Noise condition
	Air quality
	Thermal climate and daylight
	Moisture
	Water
Chemical substances	Occurrence
	Documentation
	Phase-out
Special Environmental Requirements	The level of overfeed substances in the sewage system The quality of the water

The classifications data needed can be found in for example existing documentation, the mandatory ventilation inspection (OVK), calculations/surveys, and the energy performance certificate questionnaires (Building-living dialogue, 2010). However, some of the categories classification data need to be measured in the building applying for the certification. When choosing the measurement points it is important that these are the most representative for the building in general, i.e. every level in the building needs be represented (Jansa and Johansson, 2009). When it comes to one of the four categories, Indoor environment, the most representative public room should be investigated. Important to notice is that in a commercial building, this point shall not be in the corridor or in the lunch-areas even if these areas have lower standards than other rooms.

The different categories, mentioned above, are individually classified by themselves into four levels ranging from A to D, whereas A is the highest and D is the lowest grade (Building-living dialogue, 2010). However, D does not meet the building regulations in Sweden, C is equal to the building regulation and, ultimately, A and B is better than the building regulation (Building-living dialogue, 2010). The grading process is conducted in three steps:

1. *Aspects* – the grade of the aspect is the same grade as the lowest individual indicator grade given.
2. *Categories* – the grade is given by no more than half of the aspects may be in the next class down, see example in Table 5.
3. *Overall building* – the grade given is the lowest grade of the different categories.

Table 5 - Example on individual grades and the final grade for the category (Building-living dialogue, 2010)

Example result: categories and aspects				
Category	**Aspect**	**Based on**	**Example result**	**Grade for category**
Energy	Energy consumption	Energy bills	B	B
	Energy requirement	Calculations, bills	C	
	Energy type	Estimate	A	
Indoor environment	Noise condition	Assessment, survey	A	C
	Air quality	Radon survey, ventilation check, etc.	C	
	Thermal climate and daylight	Survey, installed cooling effect, etc.	C	
	Moisture	Inspection of moisture damage	C	
	Water	Survey	A	
Chemical substances	Occurrence	Inspection, analysis, etc.	C	B
	Documentation	Create database, logbook	B	
	Phase-out	Expert knowledge	B	

4.2.3 The ECS certification process

Parties involved, or their representatives, in the application process are: the ECS secretary, the ECS technical board, an independent inspector chosen by the technical board, and, if the result is appealed, the ECS board of directors (Building-living dialogue, 2010). The certification process, according to Building-living dialogue (2010):

1. The applicant fills in the input-protocol and sends it in along with the required information to the environmental classification secretary. A registration fee is to be paid.
2. The secretary assures that the input-protocol is correct, and sends it to the approved inspector.
3. The inspector controls the documentations.
4. The secretary forward it to the technical board for notification and then back to the applicant. At this time, the applicant has the possibility to do a complement to the application or the ability to abort. If a complement is made, the documentation needs to be sent back to the secretary for a new evaluation. When the input-protocol and the grades are approved by the inspector, the secretary sends it to the technical board for a decision.
5. The technical board either approves or question the application. If the technical board questions it, they will handle the application themselves from there on. When the application is approved by the technical board it is forwarded to the ECS board of directors.
6. When the application is approved, the applicant will receive a classification certificate along with a plaque that shall be placed in the approved building in question.

If the applicant is not satisfied with the certification, he/she has the ability to appeal the classification result, in writing, to the board of directors one month after receiving the decision (Building-living dialogue, 2010).

4.2.4 Validity period

The classification is valid during a ten year period if no major refurbishments is done to the building or until there is changes in the regulations of one of the parameters

(Jansa and Johansson, 2009). After the validity period is over, there is a need of updating the classification in order to make it valid.

4.3 GBP

GreenBuilding Programme, GBP, was initiated by the European Commission in 2004 with the aim of improving the energy efficiency and expanding the integration of renewable energies in non-residential buildings in Europe (GreenBuilding, 2010). The aim is to market and build an interest in reducing the energy consumption in buildings (Swedish Property federation, 2010). The Swedish Property federation[6] is the organisation that leads the project with the department of energy as a co-sponsor. According to Swedish Property federation (2010), GBP provides the companies with:

- The help to lower the energy consumption within buildings.
- A public recognition for work associated with energy efficiency, and contribution to reach the European climate goals.

4.3.1 The GBP rating system

The GBP can be followed on a voluntary basis, and turns to both real estate companies and consultancy companies (GreenBuilding, 2010). There are two different types of certifications available: GreenBuilding Partner, for real estate companies, and GreenBuilding Endorser, for consultancy companies (GreenBuilding, 2010). The GreenBuilding Partner certification is divided into two levels; Company certification and Real estate certification (Swedish Property federation, 2010), see Table 6.

Table 6 – The levels of GreenBuilding Partner certification (Swedish Property federation, 2010)

The levels of GreenBuilding Partner certification		
Level 1	*Company certification*	The certification is received if more than 30 percent of the company's existing building stock, in Europe, has a GBP certification. A limitation is that the companies need to have ten or more real estates, and of their new buildings there is a need for at least 75 percent with GBP certification.
Level 2	*Real estate certification*	A certification for individual buildings.

According to Swedish Property federation (2010), the company certification can be used as an incentive for companies to certify all their buildings.

4.3.2 What the GBP measures

GreenBuilding (2010), describe that in order to become a GreenBuilding Partner the real estate company need to fulfil at least one of the following criteria:

1. *Existing non-residential buildings* that, after refurbishment, has a total primary consumption at least 25 percent lower than before, if this is economically viable.
2. *New non-residential buildings* that consume 25 percent less than the total primary energy listed in the building standards in the country or below the consumption levels of a conventional building presently constructed.
3. *Renovated or refurbished buildings*, where the renovation/refurbishment resulted in a reduction of the energy consumption by at least 25 percent or has had energy consumption 25 percent below the required building standard at the time of the renovation. The renovation has to been conducted at maximum five years before the day of application.

[6] Fastighetsägarna

4.3.3 The GBP certification process

According to Swedish Property federation (2010), the process of becoming a GreenBuilding Partner level 2 in Sweden, see section 4.3.1 for description, consists of the following steps:

1. Make a description of the energy consumption within the building.
2. Make an action plan on energy efficiency actions.
3. Send in the application to Swedish Property federation.
4. The GreenBuilding officials in Sweden make a decision, and if approved a recommendation is sent to the EU-officials, who in turn make the final decision.
5. An official welcoming letter and along with a diploma is sent to the approved applicants.

4.3.4 Validity period

The certificate, level 2, is valid as long as the GreenBuilding Partner reports the energy consumption for the building and, of course, these are within the requirements for the certificate.[7] The GreenBuilding Partner certificate level 1, on the other hand, is valid for 3 years after the last building is certified. This means that the company needs to continue to certify new buildings in order to keep the level 1 certification.

4.4 LEED

The Leadership in Energy and Environmental Design, LEED, Green Building Rating System is a credit based certification system which has been developed and is administered by the U.S Green Building Council, USGBC (USGBC, 2010). USGBC is a non-profit organisation whose 20 000 members come from government agencies, companies, corporations, and non-profit organizations. The first version of LEED was officially launched in 1998 and was inspired by the U.K certification scheme, BREEAM, which was released in the 1990's (ECOconsulting, 2010). In 2009, USGBC launched its new LEED version 3 which replaced the previous LEED v 2.2. The LEED v 2.2 had a maximum of 69 credits and the new LEED v 3 has a maximum of 110 credits (100 plus 10 extra for Innovation in Design and for Regional Credits, see Figure 5). A feature of LEED v 3 is its better and faster web-based LEED Online tool for project certification (USGBC, 2010). LEED Online is used by project teams to manage their registration and certification processes for LEED. The LEED certification provides a sustainability evaluation methodology and independent third-party verification that a building project meets the goal of green building and performance measurements during the building's lifecycle (ECOconsulting, 2010). Numerous of building types can be certified e.g. offices, homes, public buildings, retail, residential high-rise buildings, and commercial interiors. USGBC (2010) suggests that, LEED-certified buildings should be designed to:

- Lower the operating costs and increase asset value.
- Reduce waste sent to waste disposal sites.
- Conserve energy and water.
- Be healthier and safer for occupants.
- Reduce greenhouse gas emissions.
- Qualify for, if available, tax rebates, zoning allowances and other incentives
- Demonstrate owner's commitment to environmental stewardship and social responsibility

[7] Mail correspondences with the Swedish Property federation, Sweden.

4.4.1 The LEED rating systems

The LEED rating system is divided into nine different rating systems (USGBC, 2010):

- LEED for New Construction, LEED-NC
- LEED for Existing Buildings: Operations and Maintenance, LEED-EB
- LEED for Commercial Interiors, LEED-CI
- LEED for Core and Shell, LEED-CS
- LEED for Homes, LEED-H
- LEED for Neighbourhood Development, LEED-ND
- LEED for Schools
- LEED for Retail
- LEED for Healthcare

LEED-NC, LEED-EB, LEED-CI, and LEED-CS will be presented briefly in the following sections. Figure 4 shows the different project phases and where the different rating systems are implemented.

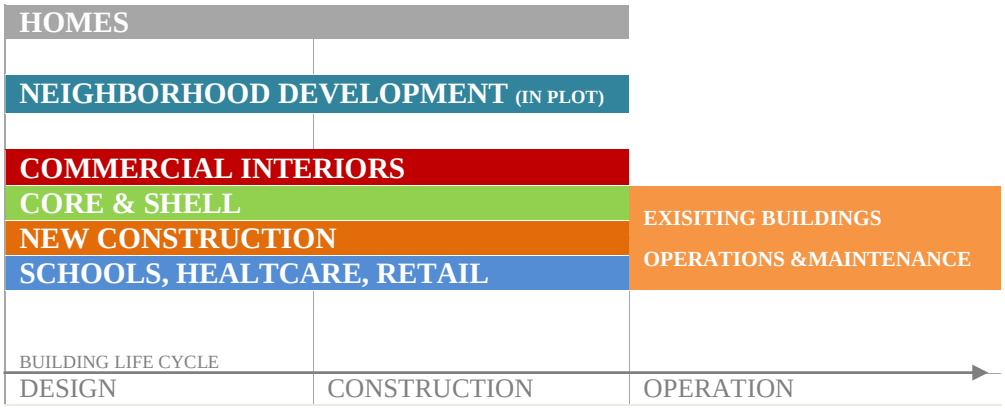

Figure 4 - Project phases with different rating systems (USGBC, 2010)

4.4.1.1 LEED for New Construction

The LEED-NC is, according to Yudelson (2008), the most recognised and used LEED rating system. It covers all new buildings and major renovations in commercial and institutional projects. A major renovation includes, according to USGBC (2009), large HVAC renovations, interior renovations, and façade renovations. Example of commercial and institutional projects that might seek certification under LEED-NC can include high-rise residential buildings, office buildings, governmental buildings, and manufacturing plants. Yudelson (2008), states that a LEED-NC rating system will, in most cases, be awarded after the building is finished and occupied. The final inspection, which is a process known as a building commissioning, is the last step towards certification under LEED-NC.

4.4.1.2 LEED for Existing Building

LEED-EB was originally designed to be a method for assuring sustainability of ongoing operations of existing buildings and it should act as an incentive for operators and owners to implement practices which are sustainable and to reduce their building's environmental impact over the building's life cycle (USGBC, 2010). The LEED-EB rating system addresses issues which are not dealt with in LEED-NC such as: sustainable purchasing policies, operations and maintenance practices, waste management (recycling programs), and exterior maintenance programs. USGBC (2009) suggests that LEED-EB can be used for existing buildings whose owners is applying for the first time and wants an entry point into further LEED certification. It

is also applicable for projects already certified under LEED-NC, LEED for Schools, and LEED-CS.

4.4.1.3 LEED for Commercial Interiors

According to Yudelson (2008), LEED-CI has been designed to address situations where the existing building's systems are not changed and where the tenants who seek certification lease their space or do not occupy the entire building. Further, this situation is problematic for the tenants because their ability to affect e.g. energy and water use for the whole building or landscaping is small and in some cases nonexistent. LEED-CI should act as a green benchmark for tenants who seek green interior improvements in their leased spaces (USGBC, 2010). Green building measures had to be included into the LEED-CI evaluation system to assure that the interiors should be less costly to operate and maintain, reduce its environmental impact, and be healthy. Yudelson (2008) suggests some Green building measures that the tenants can make choices about such as, paints, carpets, lighting and lighting control system, sub-metering etc. Finally, LEED-CI is also designed to work with LEED-CS, which is presented in section 4.4.1.4, because LEED-CS certify the core and shell of buildings and prepares the building for tenants who are environmentally conscious and wants to make their interior green (USGBC, 2009).

4.4.1.4 LEED for Core and Shell

LEED-CS is a rating system for builders, designers, developers, and new building owners who are willing to address sustainable design for new core and shell construction (USGBC, 2010). Core and Shell addresses the building's main element such as: the structure, the actual shell, and the HVAC system. LEED-CS is also designed to be complementary to LEED-CI because both systems establish Green building criteria for developers, owners, and tenants.

According to Yudelson (2008), LEED-CS allows a developer to pre-certify a design, and use this LEED pre-certification to attract tenants, and at occasions, financing. This pre-certification of LEED-CS has its origin in that developers are unable to wait until the building is finished to begin marketing a LEED certified building to tenants. Further, Yudelson (2008) points out that the USGBC assists the developer, and encourages them to build more Green buildings. This is because LEED-CS awards a point for developers when they create guidelines for tenants and encourages them to use LEED-CI rating system when, and if, they are willing to refurbish or extend their spaces.

The LEED-CS can, as mentioned before, be used for building projects where the developer are in charge of the design and construction of the entire core and shell but are not in charge of the design and construction of the tenant spaces (USGBC, 2009). Examples of projects that suit this can be a medical office building, retail centre, or a commercial office building. If these projects are to follow the LEED-CS certification, the owner of the building must occupy 50 percent or less of the buildings leasable floor area, otherwise the owner should follow the LEED-NC certification. The USGBC (2010) suggests that further reading is necessary about LEED-CS.

4.4.2 What LEED measures

According to Bunz *et al.* (2006), the building which is assessed for certification under LEED is evaluated over five major environmental and sustainability categories: Sustainable Sites, Water Efficiency, Energy & Atmosphere, Materials & Resources, and Indoor Environmental Quality. Other categories are also available to score credits for: Innovation in Design, Regional Priority, Locations & Linkages, and Awareness &

Education, whereas the last two categories are only applicable in LEED-H (USGBC, 2010). Figure 5 shows how these categories are evaluated under LEED-NC, and a brief summary of each category will be presented next.

LEED for New Construction	
Total Possible Points**	110*
Sustainable Sites	26
Water Efficiency	10
Energy & Atmosphere	35
Materials & Resources	14
Indoor Environment Quality	15
**Out of a possible 100 points +10 bonus points* ***Certified 40+ points, Silver 50+ points, Gold 60+ points, Platinum 80+ points*	
Innovation in Design	6
Regional Priority	4

Figure 5 - Categories under measurement (USGBC, 2010)

According to USGBC (2010), the categories differ from each other under each LEED rating system. In general is the environmental impacts divided and awarded credits for:

- *Sustainable Sites* – encourage design strategies that sensitive to water and air quality, plants, and wildlife.
- *Water Efficiency* – encourages smarter use of water, which is achieved through the use of more efficient appliances, fixtures and fittings inside and water-wise landscaping outside.
- *Energy & Atmosphere* – encourages a broad variety of energy strategies such as to monitor the energy usage and use more efficient appliances.
- *Materials & Resources* – encourages the use of sustainable materials and resources that are grown, harvested, produced and transported in a sustainable point of view. The category aims at reduction of waste at all phases and at product's source, and at an increase in reuse and recycling.
- *Indoor Environmental Quality* – encourage strategies that can enhance the indoor air, providing access to daylight within the facility, and improving the overall acoustics.
- *Innovation in Design* – provides extra points for projects that use new and innovative technologies and strategies to improve a building's performance, and if LEED Accredited Professional is included in the project team.
- *Regional Priority* – at the moment only applicable in the U.S, but it addresses environmental concerns that are locally most important for every region of the country.

4.4.3 The LEED certification process

As a part of the launching of LEED v 3 in 2009, the Green Building Certification Institute, GBCI, manages the administration of LEED certification for all commercial and institutional projects registered under any LEED Rating System (USGBC, 2010). All projects are candidates for LEED certification if it can meet the pre-requisites and reach the minimum points required for certification (USGBC, 2009). Within each of the rating systems available under LEED, according to Yudelson (2008), a LEED certificate can be awarded in four different levels:

- Certified > 40 percent of the credits
- Silver > 50 percent of the credits
- Gold > 60 percent of the credits
- Platinum > 80 percent of the credits

The GBCI (2008) suggests a certification process which includes the following steps:

1. *Registration* - Kibert (2005) points out that a registration made in the early phases of the project will increase the potential for achieving certification. Further, the registration is also important since it establishes contact with the USGBC, and along with the registration a selection of software tools and other necessary resources for certification under LEED becomes available. When the project team has selected LEED rating system, a registration fee has to be paid to the GBCI, and this process will also make the project available on LEED Online (GBCI, 2008).
2. *Prepare Application* - The project team has to begin to prepare the sets of documents and calculations as a part of the prerequisite and credit requirements that exist under the chosen LEED rating system (Kibert, 2005). The next step is to upload the material onto the LEED Online portal (GBCI, 2010).
3. *Submits Application* - According to GBCI (2010), for the review process to initiate, a complete application must have been submitted on the LEED Online portal and a fee for suitable certification must have been paid. Only the LEED project Administrator is entitled to submit the application for review, and important to note that the application requirements vary under each LEED Rating System and review path. Every application for certification under LEED is completed via LEED Online (GBCI, 2010).
4. *Application Review* - After the GBCI has received the complete application a formal review of the application will commence (GBCI, 2010).
5. *Certification* - If no appeal of the awarded certification is done, the LEED certification is final and may then, according to Kibert (2005), be referred to as a LEED-Certified Green Building.

Under the processes: submittal of application, the application review, and certification there is an option to accept or appeal the preliminary reviews and results that is sent back to the project team (GBCI, 2010). The review varies to some extent, according to GBCI (2010), for all LEED Rating systems and review paths but the general idea would still be that:

- Submitted documentation, in the initial application, will be reviewed for correspondence and completeness with the desired LEED rating system.
- All the reviewed pre-requisites and credits are marked as *"anticipated"*, *"pending",* or *"denied".* Technical advices from the review team are also attached to the pre-requisites and credits.
- All the reviewed project information forms are marked as *"approved"* or *"not approved"*. Technical advices from the review team are also attached to the project information forms.

4.4.4 Validity period

The LEED for Existing Building rating system is the only rating system that is required to re-certify every 1-5 years in order to maintain the LEED certification.[8] All other rating systems provide certifications that do not expire.

4.5 Comparison between BREEAM, the ECS, GBP, and LEED

In this section, the environmental classification systems BREEAM and LEED will foremost be compared since these are well renowned among researcher worldwide and, therefore, there is a vast amount of written material available about them. Reasons for this can be that they are the two oldest among the four chosen systems, and that they are both from English-speaking countries. The ECS are mentioned in some parts of the comparison, but the ECS is an environmental classification system developed for the Swedish market and, thus, it is not as well-known among researchers outside Sweden. GBP will not be mentioned by name in this comparison since this environmental classification system only treats reductions of the buildings' energy consumption by 25 percent. Although this is important the other environmental classification systems are much broader and deeper in range.

An important point when comparing the classification systems is that Sweden, the U.K, and U.S all have different building standards and building regulations (Bonde *et al.*, 2009). Further, Saunders (2008) suggests that neither BREEAM nor LEED perform well if they are used in countries other than those which the systems were originally designed to work in. Thus, when the systems are used outside its original countries the systems should be tailored to suit the local context (Saunders, 2008).

4.5.1 Transparency between the systems

The transparency between the different classification systems is relatively low which result in difficulties to compare the systems with each other (Bonde *et al.*, 2009). The reasons for the difficulties are e.g. that the systems deals with different issues and that the systems are built upon different building regulations and environmental laws. According to Rivera (2009), projects assessed under LEED must use U.S-recognised standards no matter where the project is located. This may be favourable for projects located in Europe where regulations are often seen as stricter, but less favourable for projects located in Africa, Asia, or South America, where regulations tend to be not as strict as in Europe or the U.S. (Rivera, 2009). Comparing the building regulations in the U.K. and the U.S., suggests that some of the targets for energy efficiency are lower in the U.S. than in the U.K. (Saunders, 2008). Additionally, Saunders (2008) also conclude, when comparing LEED and BREEAM, that standard practices in most areas of sustainability in the U.S. is at a lower level than in the U.K and that this is highlighted by a number of LEED credits. Therefore, comparing the two standards in environmental terms is especially difficult. Bonde *et al.*, *(*2009) suggest that the transparency gets even lower when the different systems treat the same subjects under different categories. One example of this, is the categorisation of Legionnaires' disease, where BREEAM treats the subject under the category *"Health and Wellbeing"*, the ECS treats it under the category "*Indoor environment"*, and LEED do not treat it at all (Bonde *et al.*, 2009).

[8] mail correspondence with GBCI

4.5.2 Assessment methods

Van der Schaaf and Sandgärde (2008) suggest that the ECS assess several important subjects but is not as comprehensive as LEED and BREEAM. The rating system is not adapted to different types of buildings either, but consists of a more general system. One of the major differences between the two international systems and the ECS is that the latter does not evaluate how the usage of the building affects the environment (Bonde *et al.*, 2009). Further, the reason is that the system is supposed to be simple and transparent, which has led to that there is no demand for third party verification. On the other hand, the lack of third party verification for the system has received criticism, because it can result in a lower credibility for the system. Both LEED and BREEAM provide an independent third party certification that is benchmarked against recognised regulations and standards to distinguish between levels of achievement (Rivera, 2009). Reasons for the systems, LEED and BREEAM, popularity is often associated with its third party verification in the certifying process, which is helpful as it acts as guidance for the project (Bonde *et al.*, 2009). In addition, each system is administered by different organisation, which has an influence on the real estate business in each country.

LEED and the ECS have some similarities, for example, a new construction or a major renovation of a building is not certified during design. Instead the certification takes place one year later after completion (Bonde *et al.*, 2009). There is long time between completion and certification as the building system needs a full run-in period.

4.5.3 Grading

Saunders (2008), concluded in his report that there exist variations between systems for the same *"grade"* when comparing BREEAM and LEED. Therefore, buildings designed to achieve higher levels of LEED in the U.K. will in most cases not score well against BREEAM. The LEED rating system score buildings higher in the U.K than BREEAM. Thus, if a building is designed and constructed in the U.K. to meet the requirements of LEED, it is most likely that it would only achieve a BREEAM rating of *"Good"* (Saunders, 2008). On the other hand, if the building is designed and constructed to meet the requirements of BREEAM it would most likely achieve a LEED rating of *"Gold"*, see Figure 6.

Figure 6 - Comparison between BREEAM- and LEED grades in the UK (Saunders, 2008)

Bunz *et al.* (2006), mention that despite the importance of considering the entire life cycle when designing with sustainable features, most of the current guidelines and certification systems do not address this. Further, Saunders (2008) also suggests that one of the main differences between LEED and BREEAM comes in the use of life cycle analysis. LEED uses an approach with checklists to assess the sustainability and Saunders (2008) concludes that this simplification can lead to potential inaccuracies. On the other hand, Brandon and Lombardi (2005), suggest that the current classification methods in use can be divided into those who believe in the sustainable development and those who believe that the current techniques are inappropriate for the assessment. Further, there is no consensus among scholars on the theoretical framework within each evaluation method.

There is, according to Seo (2002), a difference in the weighting of credits within the different models. It is difficult to assess the weighting of criteria between LEED and BREEAM because all criteria have equally weight in LEED, while BREEAM have fixed weight for different criteria. This is also supported by Saunders (2008), who concluded that there are no weightings incorporated in LEED as there is in BREEAM, and as there are no weightings the value of each issue is solely dependent on the number of points available.

According to Rivera (2009), one thing that can make the timeline for achieving certification under LEED considerably longer is that LEED requires reviews under both the design and construction phases. Further, it was not a long time ago that BREEAM only required completion of only a single stage assessment to obtain certification. This has now changed and BREEAM requires two reviews just as LEED does (Rivera, 2009).

4.5.4 Financial perspectives

Ding (2007), mentions that the financial aspects are not included in the evaluation framework for assessment methods such as BREEAM, and LEED. Langdon (2004) concludes that there was no major difference in average construction costs for LEED-seeking buildings as compared to non-LEED buildings. There are many factors that affect the cost, but the LEED-certification tends to have less impact than other. Additionally, Fuerst (2009) concluded in his study that a large part of the existing empirical studies identifies a cost premium associated with LEED-rated new buildings and that buildings which are rated higher tends to have a higher cost premium. Nevertheless, the cost premium tends to be comparatively low and depends on the level of rating. The cost premium often lies in the range between two and ten percent. Saunders (2008), on the other hand, suggests that the cost involved for a very large project to be BREEAM or LEED assessed can make it complicated to justify. According to Saunders (2008), project awarded with LEED platinum will get a full rebate of the certification fees.

4.5.5 The development of the systems

Even though LEED was originally based on BREEAM it has been modified and changed, and there are features and solutions from LEED that could be implemented in BREEAM (Saunders, 2008). Both LEED and BREEAM rating systems are encouraging the general public to improve by setting realizable standards that go further than the legal minimum (Saunders, 2008). Rivera (2009) suggests that considerations must be taken about things such as marketability, recognition, and uniformity because these things will often have a significant or great influence on the final certification system selected. When working with environmental classification

systems, Bunz *et al*. (2006), express that it is also important to extend the environmental work with more subjective assessments such as culture, history, the quality of life etc. Even though both BREEAM and LEED rating systems cover many of the same topics and have similar requirements they are applied during different circumstances (Rivera, 2009). The location of the project, project goals, and previous experiences of the project team with certification are some of the conditions that will influence the choice of rating system. Another aspect is presented by Rivera (2009, pp. 5) when choosing between the systems to be implemented is:

> *"If potential renters/buyers/customers do not recognise the 'brand' of the certification rating achieved, then any investments have not been wisely made"*

4.5.6 A summary of the four systems

A comparison of the four rating systems, listing for example the origin, governance, ratings, can be seen in Table 7.

Table 7 – Comparison between the four systems

	BREEAM	The ECS	GBP	LEED
Launch Date	1990	2008	2004	1998
Origin	U.K.	Sweden	EU	U.S.
Governance	UK Accreditation Service (UKAS)	Environmental Classification System	European Commission	USGBC
Ratings **(lowest first)**	1. Pass 2. Good 3. Very good 4. Excellent 5. Outstanding	1. D[1] 2. C 3. B 4. A	Certified	1. Certified 2. Silver 3. Gold 4. Platinum
Categories	• Ecology • Energy • Health & Wellbeing • Land use • Management • Materials • Pollution • Transport • Water	• Chemical Substance • Energy • Indoor environment • (Special Environmental Requirements)	• Energy	• Awareness & Education • Energy & Atmosphere • Indoor Environmental Quality • Innovation in Design • Locations & Linkages • Materials & Resources • Regional Priority • Sustainable Sites • Water Efficiency
Weighting	The category have different weighting	N/A	N/A	N/A
Information Gathering	Design /Management team or assessor	Design /Management team or Accredited Professional	Design /Management team	Design /Management team or Accredited Professional
Third Party Validation	BRE	N/A	N/A	GBCI
Validity	Until further notice	10 years (if no major renovations are done or until there is changes in the regulations)	Level 2 as long as the GreenBuilding Partner reports energy consumption Level 1 is valid for 3 years	Existing Building rating system is required to re-certify every 1-5 years
Update Process	Annual	N/A	N/A	Varies depending on USGBC

As a summary of Table 7, it can be seen that the four systems differ most in terms of rating system, categories, and validity period. It can also be seen that BREEAM and LEED are quite similar to each other, which is expected since LEED originates from BREEAM.

5 Empirical findings

The findings are arranged according to our two-part structure: building green and the environmental classification systems. The findings from the interviews and the questionnaires will be linked according to the topics of the questions asked. However, as the interviewees were encouraged to speak freely, the findings will in some cases overlap the structure. Important to notice is that the persons who have responded on the questionnaires will be referred to as "respondents" and that the responses from the interviews as "interviewees". The findings from the questionnaires are presented from the perspectives of the tenants, the Real estate Company or both groups combined. This will, hereafter, be presented in both text and in figures to clarify which category the findings comes from.

5.1 Building green

This section presents the findings from the interviews and the questionnaires that are associated with the topics on: important criteria when choosing office locations, environmentally friendly solutions, costs of building green, marketing value of green buildings, and speculations about the future.

5.1.1 Important criteria when choosing office locations

In an attempt to clarify changes in past, present, and future criteria when choosing office locations the interviewees were asked to list these different criteria. Firstly, the criteria mentioned to have been important for tenants when choosing the current office location, varied between the interviewees. Several interviewees stated that the *geographical location* was one of the most important criteria for them. This was mentioned both directly and indirectly in other criteria such as *accessibility* and *easy access by public transportations*. Some of the interviewees expressed that the geographical location could, further, be linked to environmental aspects, and this was stated by one of the interviewees as:

> *"An environmental aspect that was important for us was to be situated in a central area, because then we do not need to use our cars as much."*

Other criteria the interviewees expressed were: *the rent level, the features of the actual office building,* and *prior experiences concerning for example the location.*

Secondly, the findings from the interviewees indicate that the requested criteria can be related to general improvements of the real estates. Some of the requested criteria were *reduced energy consumption*, *improved indoor environment,* and *updated technical systems*. However, it was only the improved *indoor environment* along with *the cost* that was expressed by the interviewees as important criteria.

One interviewee expressed that the extra *costs*, associated with green renovations, could be accepted if the pay-back time is less than a ten-year period. Several interviewees that also mentioned the cost criteria further compared it to the specific type of contract they had with the Real estate Company. The answers from the interviewees indicated that there are differences regarding if the tenants are paying gross or net lease. One interviewee, who has a gross lease, expressed that:

> *"I know that some employees have extra radiators in their offices during winter, and that is crazy! Maybe this is a consequence of that we do not pay for the energy consumption ourselves, it is included in the rent.*"

Another interviewee stated that the reason for different perceptions on cost criteria lies within the different types of contracts. Tenants would be more aware of their own

costs if everyone has to pay for their own running costs. Furthermore, several interviewees suggested that the energy cost could be used as a good indicator to validate green renovations to tenants. One example that was suggested was to show how the cost of the energy consumption changes when for example the windows are upgraded.

The criteria *improvements in the indoor environment* were crucial for some of the interviewees because these improvements are perceived to be valued highest among their employees. A reason explained by one interviewee was that it is more important for their employee to get a confirmation of a good indoor environment instead of e.g. low energy consumption.

Thirdly, the answers from the different interviewees on key factors for the tenants when searching new office location varied depending on how satisfied they were with their current office location. Several interviewees mentioned that the *indoor environment* is an important criterion for them. However, the geographical location which was seen as the key factor for the interviewees when they chose their current office was expressed to be not as important for the interviewees in the future. Several interviewees further expressed that most of the criteria they have are depending on another specific criterion: *the cost*. An example of this dependency was mentioned by one interviewee as:

> *"If a reasonable amount of money has to be spent, then would an environmentally adapted office would be prioritised."*

To summarise the cost was mentioned as an important criteria for tenants when choosing office location in past, present and future. There is a tendency that the geographical location will not be as important for tenants, and that the tenants value good indoor environment even higher in the future.

5.1.2 Environmentally friendly solutions

In order to examine if there are differences between the awareness and demand of environmentally friendly solutions for the offices, the respondents were asked two questions:

- Have you noticed an increased awareness of environmentally friendly solutions regarding you office?
- Is environmentally friendly solutions demanded by your company?

Firstly, out of the responding tenants 62 percent had noticed an increase in the awareness for environmentally friendly solutions within their company, while 38 percent had not noticed an increase, see Figure 7.

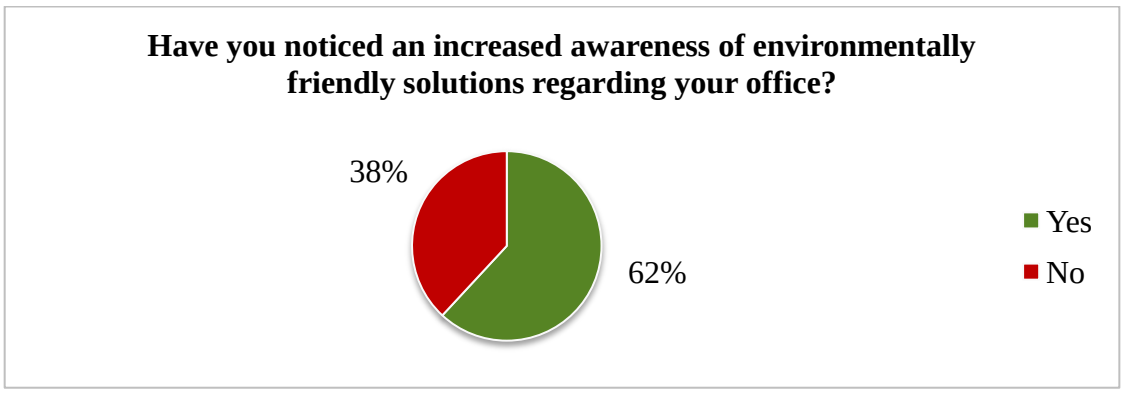

Figure 7 – Awareness of environmentally friendly solutions, tenants respondents

The 62 percent that answered that they had noticed an increase also listed in which features the awareness had acknowledged. The findings indicates that all given categories were approximately equally important for tenants, see Figure 8. Reasons for this was expressed by one tenant respondent as that all steps that are environmentally friendly, and can lead to cost savings are interesting for them.

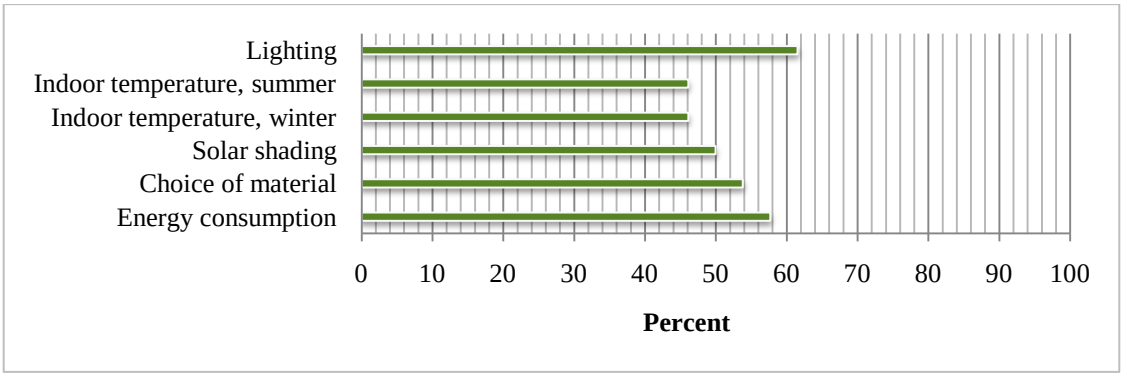

Figure 8 – Listed requirements in environmentally friendly solutions, responding tenants

The respondents from the Real estate Company had all noticed an increased awareness of environmentally friendly solutions from the tenants. One of these respondents suggested that the requirements are often associated with specific replacements, which in turn could lead to more environmentally friendly solutions. Another perspective from a respondent from the Real estate Company highlighted that:

> *"The most interesting aspect is the cost of the energy consumption. The tolerance of lowering the temperature during the winter [among tenants], to save energy is not accepted, and it is not accepted with higher temperature in the summer…"*

Secondly, the findings indicate that 21 percent demanded environmentally friendly solutions, 73 percent did not demand it, and 6 percent did not have the knowledge whether or not their company demand it, see Figure 9.

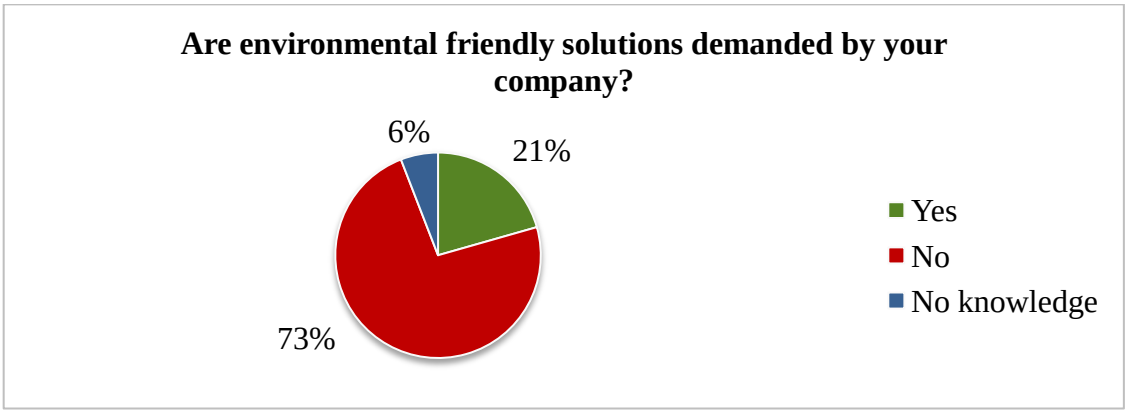

Figure 9 – Demands of environmentally friendly solutions, responding tenants

According to the 21 percent of the responding tenants that demanded environmentally friendly solutions energy consumption, along with the indoor temperature in both winter and summer were the most common demands, see Figure 10.

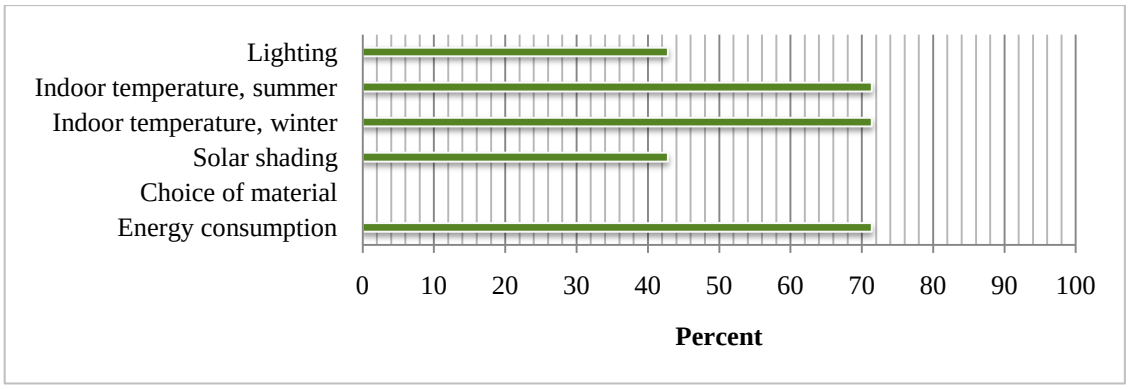

Figure 10 – Environmentally friendly solutions demanded, responding tenants

Almost all the respondents at the Real estate Company had noticed a demand among the tenants of environmentally friendly solutions, and the demands concerned all the given examples.

The findings from the interviews indicated that the tenants' demand of environmentally friendly solutions depended on several reasons. Firstly, one interviewee expressed that the demand of environmentally friendly solutions for buildings within companies depends on if the employees are interested in environmental issues. Secondly, another interviewee stated that the environmental demands they have are more related to the work they perform and the environmental demands they have on the real estate have the lowest priority. However, an additional comment from one interviewee about the future of environmental demand was:

> *"...there will be environmental demands for buildings in the future, but we are far from it now".*

Another perspective on environmentally friendly demands came from several interviewees who highlighted that it is important to validate the cost of the demand to the tenants by visualising the gains. One tenant respondent stated, an additional comment, while environmentally friendly solutions are positive, it is important to keep them on a realistic level. From the Real estate Company perspective, a respondent from this category expressed that the environmentally friendly solutions are based on demands and that:

> *"If the tenants want to pay for an environmental profile of the building it is a business opportunity [for the Real estate Company]... I hope that, in the future, tenants' demand of environmental certified buildings will be larger, and that the real estate companies that can supply this will have an advantage in the competition."*

The findings from the interviews indicate that the environmental demands came from different sources within the companies e.g. legislation and internal demands.

Finally, one interviewee expressed that the real estate companies in general starts to be interested in the "green thinking" when they perform large renovations of their real estates. The interviewee suggested that they should be more pro-active and begin to develop this way of thinking earlier. Another supporting perspective, made by another interviewee, was that real estate companies need to take more time to this question now, before the demands are visual. By doing so the interviewee expressed that there is a possibility for real estate companies to gain money.

To summarise, on the one hand, there is high percentage of the tenants that have noticed an increased awareness of environmentally friendly solutions regarding their offices. On the other hand, there are not many of the tenants that actually demand environmentally friendly solutions. Examples of reasons for the lack of demand were that they only came from employees interested in environmental issues and that the environmental demand on the office has lowest priority among some companies. Several interviewees expressed that the real estate companies need to work more pro-active and start to develop a "green thinking" before the demands are visual.

5.1.3 Costs of building green

In order to grasp the tenants and the Real estate Company's opinion of the cost associated with the cost of building green two questions were asked:

- Who should pay for minor and/or major renovations? Real estate Company/ the tenants/both parties?
- Will the tenants accept higher rent as a result of renovations according to green processes?

In the first question we have chosen to highlight the differences between the responses from the tenants and the Real estate Company. The question is also divided into two parts, *Minor renovations, and Major renovations;* see Figure 11, and Figure 12.

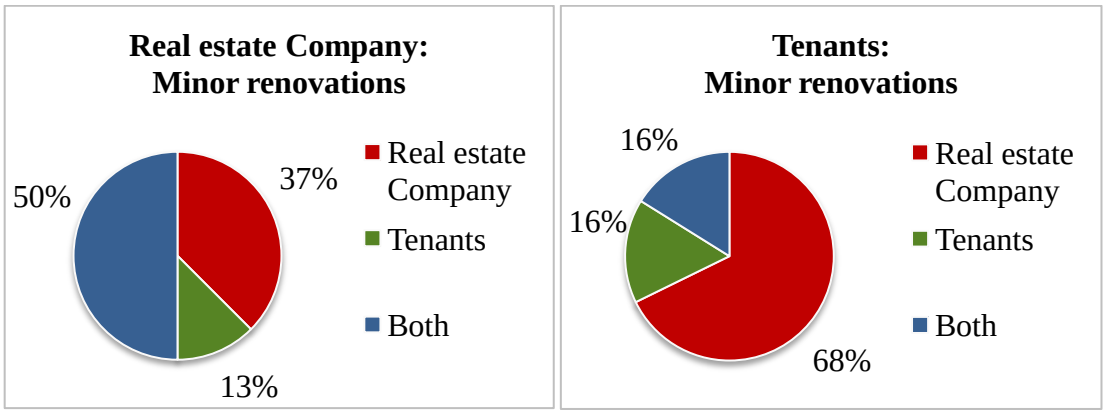

*Figure 11 – The Real estate Company's and the tenants' answers on who shall pay for **minor renovations** that will reduce the environmental impact*

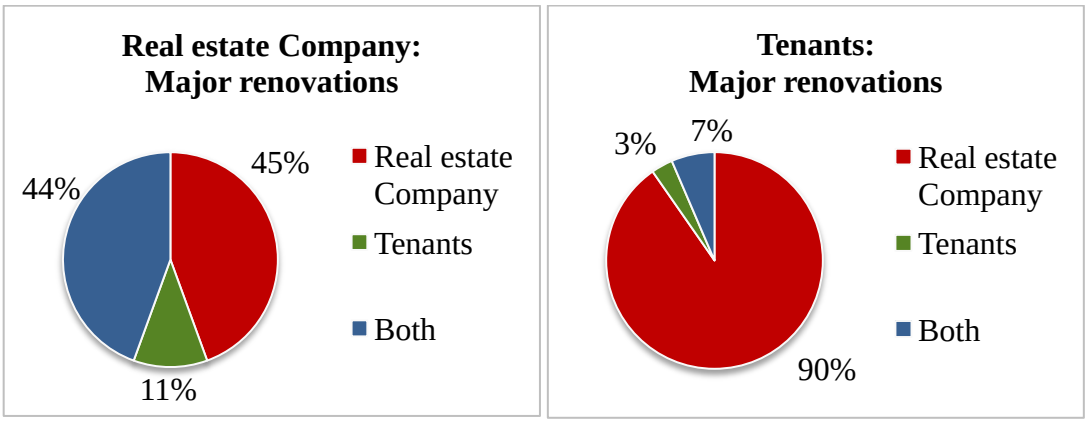

*Figure 12 – The Real estate Company's and the tenants' answers on who shall pay for **major renovations** that will reduce the environmental impact*

The findings from both the responding tenants and the respondents from the Real estate Company suggest that the Real estate Company should bear the cost of both

minor and major renovations. There is furthermore, a tendency that the responding tenants were more willing to pay for minor renovations than major renovations. One comment from a responding tenant suggested that the one who benefit from the renovation should bear the costs. This was supported by one respondent from the Real estate Company who expressed that:

> *"Most contracts are net lease, which means that the tenants pay for the heating of the real estate. Energy saving projects should be paid by the one who gains by the 'saving', in other words the tenant."*

Another perspective to this issue stated by one tenant respondent was:

> *"Does not this question seem irrelevant? It is always the tenant who pays anyway."*

In the second question, the findings indicate that the majority of the interviewees said that they could accept a higher rent, but that it depended on what type of renovation that should be made. Even though many could accept a higher rent, most of the interviewees commented that it would be very difficult to give an actual figure. However, one interviewee suggested that about 20-25 percent above the market based rent is reasonable. Whereas another interviewee stated that if the renovation leads to better business possibilities for them, about 10 percent higher would be a realistic level.

To summarise, the findings from both the responding tenants and the respondents from the Real estate Company suggest that the Real estate Company should bear the cost of both minor and major renovations. There was furthermore, a tendency that the responding tenants were more willing to pay for minor renovation than major renovations. However, the comments made by respondents from both categories suggested that the beneficiary of the renovation should bear the cost. The findings from the interviewees indicate that the majority of the tenants could accept a higher rent, but that this depended on the type of renovation.

5.1.4 Marketing value of green buildings

To visualise the marketing possibility of green buildings for tenants, the responding tenants and the interviewees were asked if and how they could use it as a part of their marketing programme. The findings in the question whether or not the tenants can use environmentally friendly and energy efficient buildings as a part of their marketing towards the public and customers can be seen in Figure 13. The findings among responding tenants indicate that 50 percent claimed they cannot use it in the marketing towards either one. A comment made by a responding tenant to the question was:

> *"I do not think it can be used in marketing. I am not sure if the 'green thinking' is a deciding matter within marketing"*

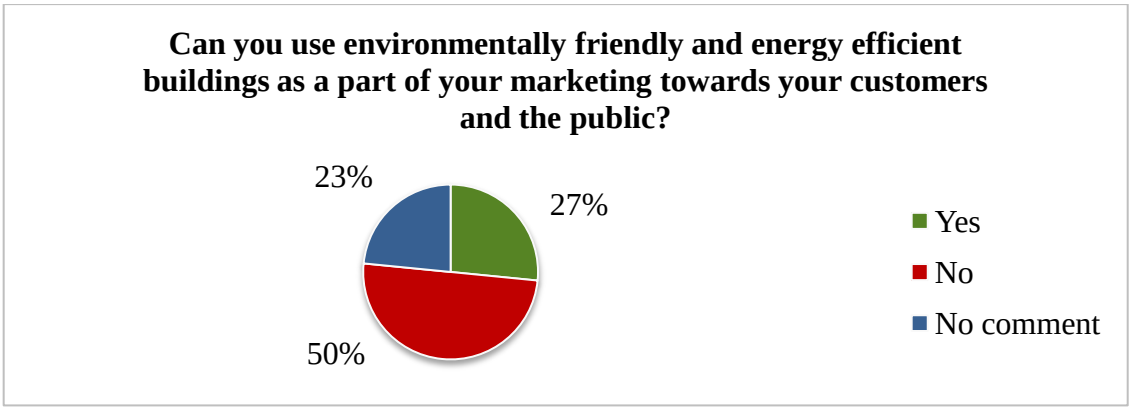

Figure 13 - The ability to market environmentally friendly and energy efficient buildings towards customers and the public, responding tenants

The part of responding tenants that stated that they cannot use it in marketing stated the reasons as: not relevant 69 percent; do not have the possibility from the Real estate Company 19 percent; and the last 12 percent recon both as a reason, see Figure 14.

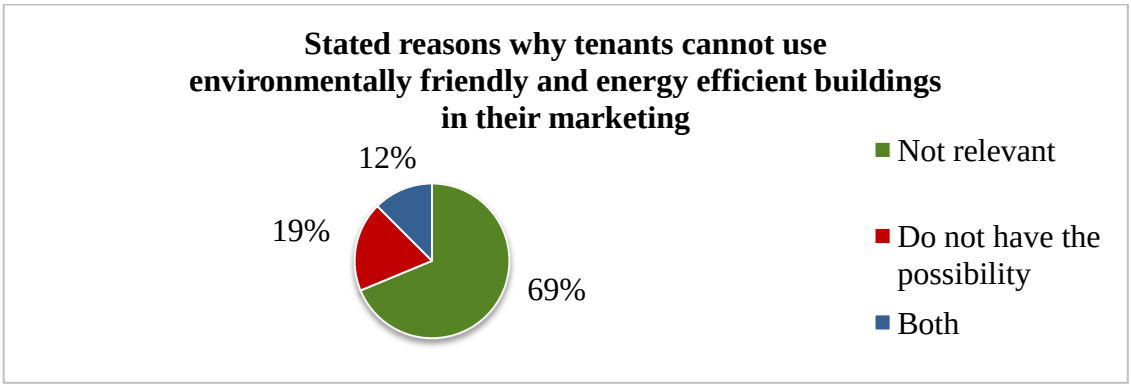

Figure 14 – The stated reason why environmentally friendly and energy efficient buildings cannot be used in marketing, responding tenants

The finding from the interviews indicate that depending on if the company lists itself as environmentally friendly and gains from being it in a competitive perspective, then the interviewees, expressed that they could use environmentally friendly and energy efficient office spaces in their marketing towards customers and the public. One interviewee explained that they use their ISO-certification in their marketing and that it would only be positive for them to be located in a certified real estate. Another perspective was given by one interviewee who questioned why the real estate sector does not use the branding value at all and made a comparison:

> *"You do not buy a Skoda if you want a BMW!? Why can it not be the same within the real estate sector, that to be situated in a building owned by a specific real estate company, that has the same branding value as the car dealers?"*

To summarise, the findings from the responding tenants indicate that 50 percent cannot use environmentally friendly and energy efficient buildings in their marketing towards customers and/or the public. However, out of these 50 percent, 19 percent did not have the possibility from the Real estate Company and the rest stated the reason as not relevant for them. The findings from the interviewees indicate that a company could use environmentally friendly and energy efficient buildings in their marketing programmes if they list themselves as environmentally friendly.

5.1.5 Speculations about the future

The questions regarding speculations about the future asked the respondents to list their perception about issues such as; the level of importance among some environmental topics, the level of prioritisation of buildings with low environmental impact, and whether or not rental subsidies will exist on the market in Gothenburg.

The findings of the level of importance among some environmental topics in a five to ten year perspective can be seen in Figure 15, and Figure 16. To highlight the differences and similarities between the two respondent groups, the findings are shown separately.

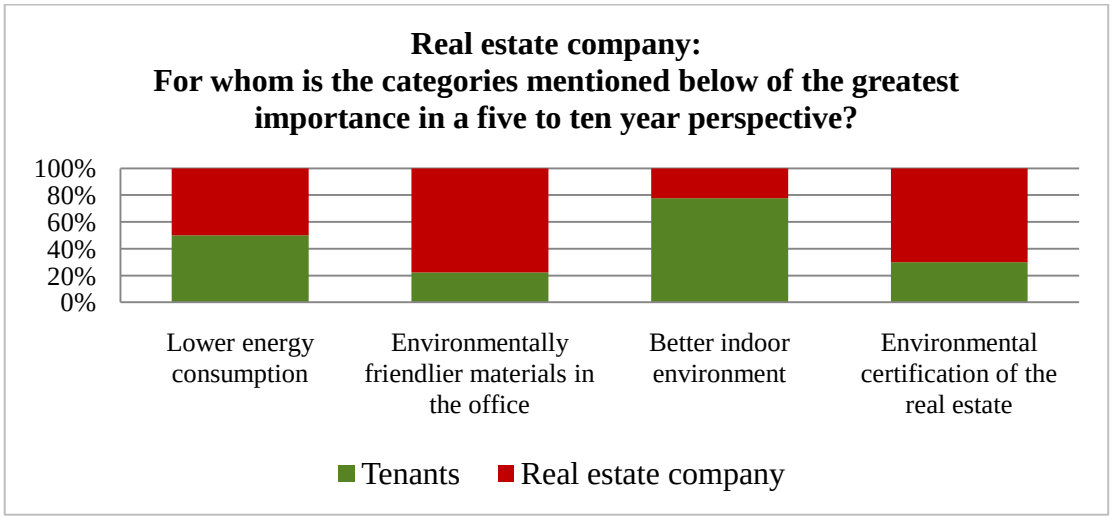

Figure 15 –The importance in the four categories, respondents from the Real estate Company

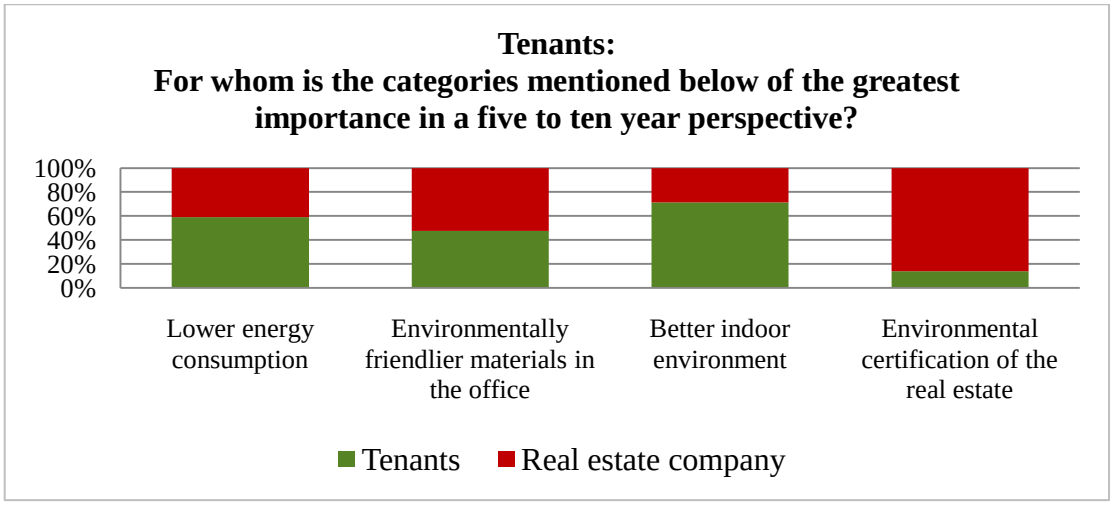

Figure 16 – The importance in the four categories, responding tenants

The findings in both respondent groups indicate that *better indoor environment* will have the greatest importance among tenants, *lower energy consumption* will be important for both groups and the last two categories will have the greatest importance for the Real estate Company. However, several respondents from both groups commented that both the tenants and the Real estate Company could be seen as winners when looking at these categories. One example, given by one respondent from the Real estate Company, is that low energy consumption can enhance the real

estate value, which is important for the Real estate Company, and it can be important for the tenant to be located in an office with low energy consumption.

The findings indicate that both respondent groups shared similar opinions on if the tenants will prioritise buildings with low environmental impact in the future, and they are therefore combined, see Figure 17. The findings indicate that 85 percent of the respondents think that tenants will or to some extent prioritise a building with low environmental impact when searching for a new office in the future.

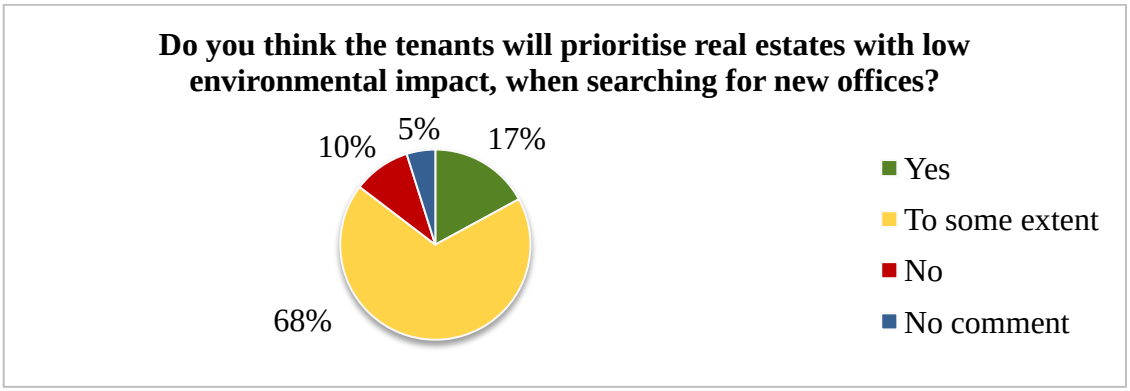

Figure 17 – Positions in prioritising real estates with low environmental impact, both respondent groups

The comments made to the question gave suggestions on reasons why it will be prioritised or not. One tenant respondent expressed that the prioritisation depended on the price of the building, while another respondent stated that there should be a balance between low environmental impact, on one side, and good indoor climate and low costs, on the other. Further, a comment from another responding tenant was:

> *"It is all about the running costs, a building with the correct environmental adjustments should lead to cheaper running costs."*

The findings in the speculative question if rental subsidies will exist for commercial real estates with low environmental impact on the future market in Gothenburg show that a majority of the respondents from both groups agreed or partially agreed with the statement, see Figure 18. 20 percent did not agree with the statement and 24 percent had no comments to the statement.

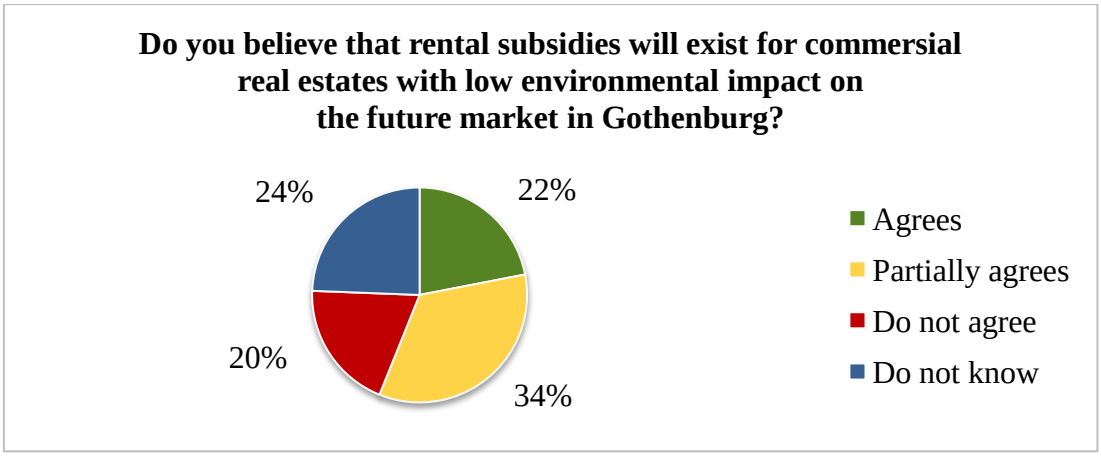

Figure 18 – Perception on if rental subsidies for commercial real estates on the market in Gothenburg will exist, both respondent groups

To summarise, the findings indicate that lower energy consumption and better indoor environment will be most important for tenants in the future, and that environmentally friendly materials in the offices and environmental certification of the real estate will be most important for the Real estate Company. The findings, further, show that the prioritisation of buildings with low environmental impact would be important for tenants in the future. Finally, there was no clear opinion among the respondent groups in the last statement whether or not rental subsidies will exist for commercial real estates with low environmental impact on the future market in Gothenburg.

5.2 Environmental classification systems

This section presents the findings from the interviews and the questionnaires that are associated with the perspectives on: the environmental classification systems and whether or not tenants could benefit from the certification.

Firstly, the findings from the responding tenants indicate that 24 percent of the tenants had any knowledge of the environmental classification systems, see Figure 19. The Real estate Company was asked same question, and the result indicate that all respondents from this group had knowledge of the systems.

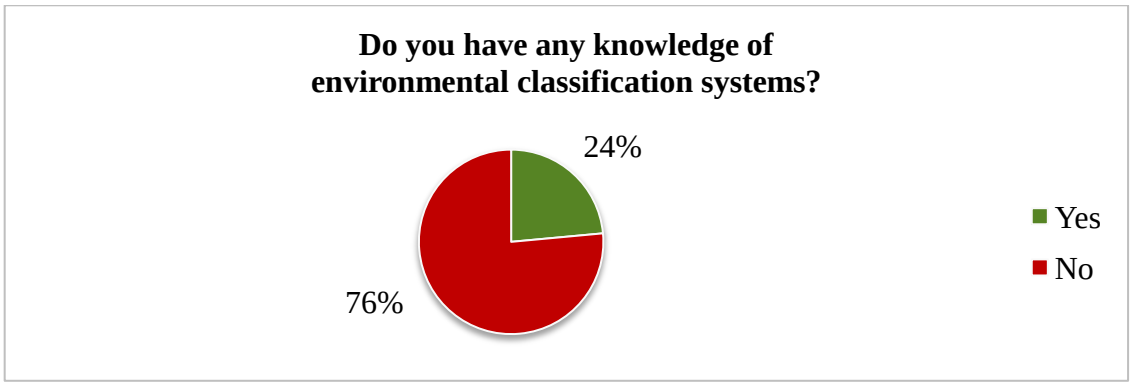

Figure 19 – The knowledge level of environmental classification systems, responding tenants

If the responding tenants had knowledge of the systems, the follow up question asked about specific knowledge of the four different environmental classifications: BREEAM, the ECS, GBP, and LEED, see Figure 20. The findings indicate that LEED and GBP were most known among the responding tenants and that BREEAM and the ECS were the least known.

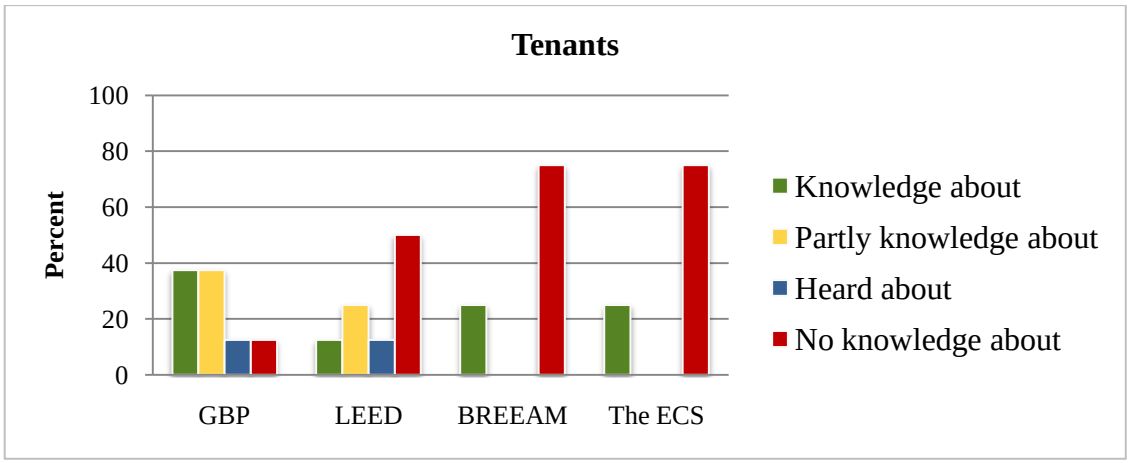

Figure 20 – Knowledge about GBP, LEED, BREEAM, and the ECS, responding tenants

The answers from the respondents from the Real estate Company indicate that all the respondents know of the ECS and GBP, and that BREEAM and LEED were the least known among the systems, see Figure 21.

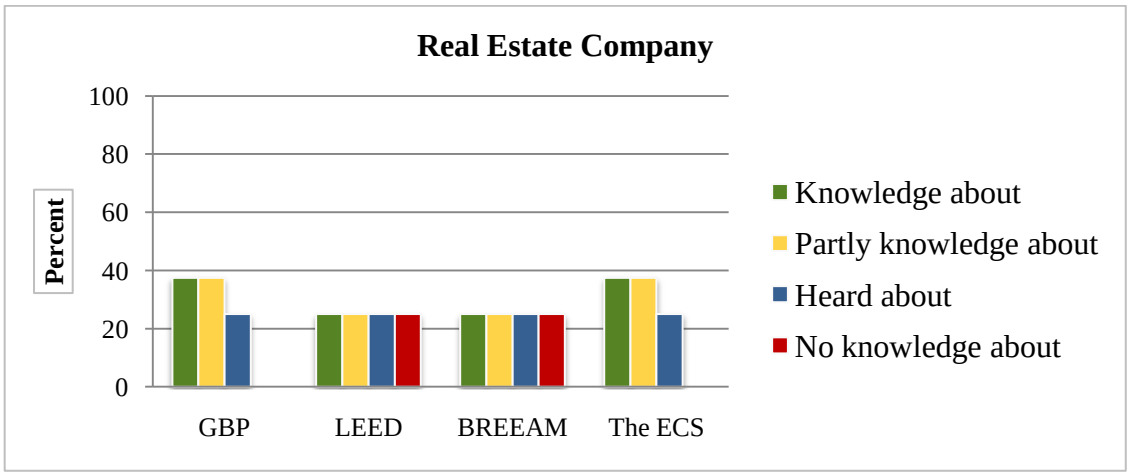

Figure 21 – Knowledge about GBP, LEED, BREEAM, and the ECS, respondents from the Real estate Company

The findings from the question on whether or not the tenants believe that their company can benefit from an environmental certification are shown in Figure 22. It showed that 42 percent of the responding tenants agreed that an environmental certification would benefit their company to some degree. On the other hand, about 32 percent stated that an environmental certification would not benefit their company at present.

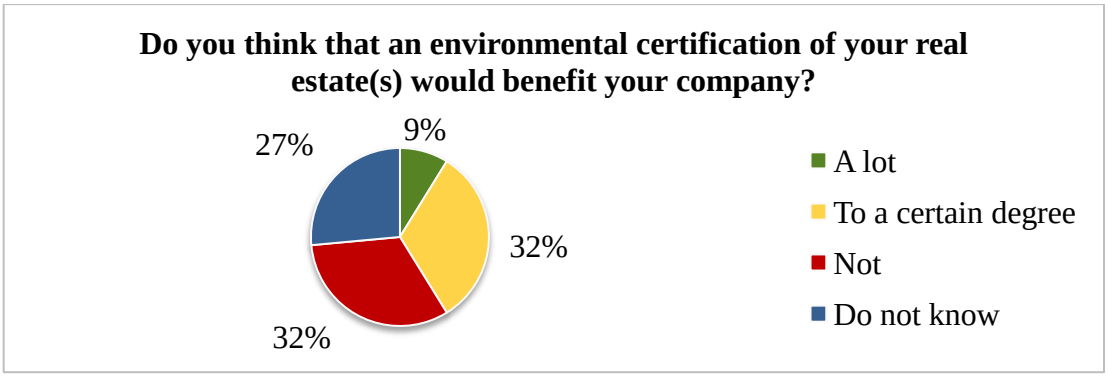

Figure 22 – The perception if environmental certification will benefit their company, responding tenants

A comment made by one responding tenant was that they did not perceive that, on the one hand, they as a company would gain from the certification. On the other hand, the responding tenant expressed that their employees would at the same time appreciate to work in a certified real estate.

One interviewee expressed that an environmental certificate posted in the entrances would probably influence their customers in a positive manner. Other perspectives mentioned by several interviewees were that it would not be a disadvantage for them to be situated in a certified real estate as they wanted to profile themselves with techniques that are energy saving. This was stated by one interviewee as:

> *"It is only positive for us if this building is certified because our company can then have 'green thinking' in every step of our business."*

A final comment from one interviewee expressed a concern regarding the environmental classification systems, and their different rating methods:

> *"If it is easy to receive top score the first time then the system is wrongly designed"*

To summarise, the findings indicate that 76 percent of the responding tenants had no knowledge of environmental classification systems. Among both the group of responding tenants, that had knowledge among the systems, and the respondents from Real estate Company GBP was the most known system, and BREEAM the least known system. The findings also indicate that 42 percent of the responding tenants believed that a certification would benefit their company. Reasons suggested as influential if the company would benefit from a certification depended on the satisfaction level among the tenants' employees.

6 Discussion

Our purpose with this study is to evaluate if labelling existing commercial real estates with environmental classifications will enhance the value for tenants, and ultimately also for the Real estate Company. This chapter will therefore discuss the findings related to the research questions, in accordance to the two-part structure of the thesis. In some cases the discussion will span over the two-part structure, and it is therefore recommended to read the entire text in order to receive the full discussion of both topics.

6.1 Building green

Green buildings have been on the agenda within the construction sector for years, and this has now also started to affect the real estate sector. The aim with green buildings follows the Ecocycle Councils' environmental goals. These four goals involve energy conservation, economising with building materials, fading out hazardous substances, and secure sound indoor environments. This agenda, within the construction and real estate sector concerning green buildings, has lead to a number of questions and one of the main questions is if renovating a building according to green processes enhances the value? However, the value of building green can be debatable from many perspectives – simply because the word value translates differently for individuals and it depends on the context it is placed in.

When transforming a grey building into a green building, one must take into account that the degree of uncertainty is much higher when renovating then when constructing a new building and this is supported by Miller and Buys (2008). Important to remember is that these approaches are difficult to compare and should therefore be dealt with separately.

Green buildings are often said to be more expensive to produce than conventional buildings. This is something that seems to be hard to validate at the moment, but will certainly change in the future since, as Kats (2003) suggests, the majority of the constructed green buildings do not have any numbers on what they would cost if they were constructed as conventional buildings. Without any common definitions of what green buildings are, how can people affirm that they cost more to produce? Green building definitions need to be separately defined depending on in which context it is being used. A universal definition might cause problem for different categories, because, as Stenberg (2006) discusses, there is a need for science to have a heterogeneous approach in order to allow for innovations in the field while society wants a homogeneous approach.

Tenants with different types of contract, e.g. gross and net leases, seem to prioritise green renovations differently. Reed and Wilkinson (2007) suggest that tenants having a gross lease contract may have little or no interest in green renovations since they are not gaining the benefits of the reduced operating costs. Does this suggest that all contracts need to become net leases in order to awaken the tenants in building green and benefits associated with it? This question is hard to give a straight answer to, but one of our interviewees expressed that green renovations should be paid by the one who gains by the saving. This would suggest that the real estate company should pay for the green renovations in buildings with gross leases, and that the tenants should pay in buildings where contracts consists of net leases. In an ideal world this might be appealing, but it would be hard to put in to practice as the real estate company must get the money from somewhere, which usually means that the tenants pay.

Two possible perspectives of validating green renovations are suggested from our findings, firstly the initial price is translated into cost savings in the long run, and secondly, the tenants feel that the renovation will make a great improvement to their working conditions. This is of course in relation to the buildings requirement and demands from the tenants' perspective. Miller and Buys (2008) claim that there is no clear evidence of tenants are willing to pay the extra cost. However, in our findings, many of the interviewees commented that it would be very difficult to give an actual figure, even though many agreed on paying a higher rent. It also showed that some of the interviewees would consider paying between 10-25 percent higher rent if the real estate company could visualise benefits for them. When it becomes more common what green buildings equals, e.g. reduced maintenance costs and lower electricity bills, then this might result in that the real estate companies can take higher rents for these types of buildings. Miller and Buys (2008) also suggest that it could be useful for the real estate companies to use cost-benefit analysis and pay-back calculations to visualise economical benefits for their tenants.

The criterion, that often has been the most influential for tenants, when choosing their offices, according to our findings, has been the geographical location of the office building. This criterion has in many aspects been highly valued for reasons that have nothing to do with considerations of environmental aspects, but most likely as a result of the convenience of the location. Our findings from the questionnaires show that 85 percent of the tenants will take environmental considerations into account when searching for a new office in the future. This is further supported by Miller and Buys (2008) who suggest that sustainability is an emerging consideration, and several tenants might validate the location criteria and take environmental aspects into consideration to a larger extent in the future. Our findings, in both respondent groups, indicated that *better indoor environment* will have the greatest importance among tenants, *lower energy consumption* will be important for both groups and the last two categories, *environmentally friendly materials* and *environmental certification of the real estate*, will have the greatest importance for the Real estate Company. Energy consumption is a criterion that is often discussed in Sweden at present. Reasons for this might be the mandatory energy declaration in Sweden, and this mandatory declaration can, according Pitt *et al.* (2009) be seen as a driver towards sustainable construction. Does this suggest that solutions on environmental problems have to come as regulations in order to a make the questions visible for the society?

There are several researchers who list potential benefits associated with building green, and most of them list the features of green buildings such as energy efficiency, better indoor environment, and renewable and recycled resources. The type of benefits that these features can result in might be a debatable question. Is it possible to see the connections between green building features and economical effects for the parties involved? This is a question that is important to answer. According to Lorenz *et al.* (2007) there are several connections between green building features and economical effects, but some of them are very speculative and some are not directly visual. The most vital criterion regarding any form of renovation, presented in the findings, seems to be the cost. Lorenz *et al.* (2007) suggest a possible link when the feature reduced impact on the environment translates into improved marketability and a reduced risk of litigation caused by Sick-Building Syndromes, see Figure 23.

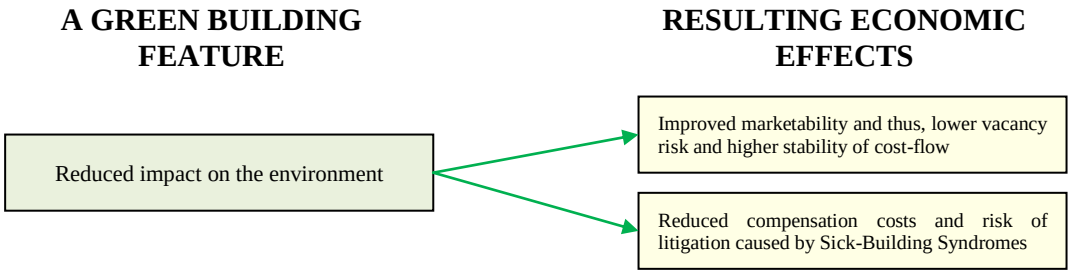

Figure 23 – The link between a green building feature and resulting economic effects (Lorentz et al., 2007)

Both these effects can lead to actual cost savings, but they are rather speculative and therefore uncertain. Another suggestion that is also presented by Lorenz *et al.* (2007) is the link between energy efficiency and reduced operating and maintenance costs. This second link between green building features and costs is more direct which is easier to communicate within the real estate companies and to their tenants, and is therefore a better example.

Our findings indicate that most tenants have noticed an increase in the awareness within the companies of environmentally friendly solutions in their offices. Pitt *et al.* (2009) suggest that the clients', in this case the tenants', awareness is an important driver for sustainable construction, and when the level of awareness increases this can be seen as a possibility for investments in green buildings. Our findings also indicate that there is not a huge demand of environmentally friendly solutions at present, see Figure 24.

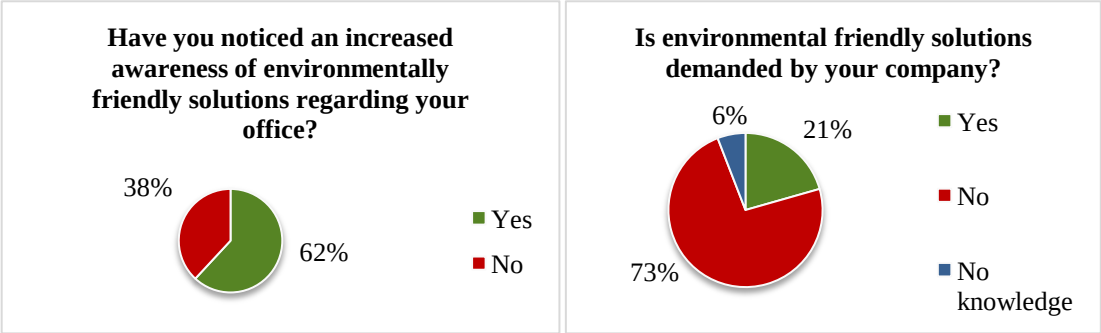

Figure 24 – Comparison between awareness and demand of environmentally friendly solutions among tenants

Why are there, for example, not any demands for environmentally friendly materials in the buildings? This can be seen as a vital part from an environmental point of view, and in our finding there were no demands at all in that matter. The lack of client demand can, according to Pitt *et al.* (2009) be seen as one of the key barriers towards sustainable construction. The question is when this increase in demand on environmentally friendly solutions will appear, and how much it will affect real estate companies. The demand is most likely to develop along with the knowledge of the environmentally friendly solutions and green buildings increases. It is quite speculative discussing how this will affect real estate companies as it comes down to if there exists a demand or not. If a demand of environmentally friendly solutions does not exist, it can be the right decision not to go further and invest in green buildings. On the other hand, if there is a demand in tenants wanting environmentally friendly solutions, which can be a first step towards green buildings, and the real estate

companies cannot supply that to their tenants, this can then be seen as a lost business opportunity.

A tendency within our findings is that the tenants perceive that they will search for buildings with low environmental impact in the future. A reason for this might be that they perceive this as a business opportunity for them and that green issues are discussed in the media today. One possibility can be the link Fuerst and McAllister (2008) express between the benefits of building green and the benefits of marketing. This idea that green has a marketing value is supported by several researchers (Kohler, 1999; Persram and Larsson, 2007; Eichholtz *et al*, 2009). However, this is something we did not get much support of in our finding, since only 27 percent agreed to that they could use green buildings in their marketing. Green buildings is a relatively new concept for tenants, who are not in the construction or the real estate sector – and even for many of the real estate companies themselves. Thus, there are still some questions that need to be answered if more parties will accept a marketing value in green buildings. However, several investors need proof of the qualities in green buildings before any investments are made. Financial incentives can make a change for this reluctance to invest in green buildings, and Pitt *et al.* (2009) suggest that financial incentives can be used as one of the drivers of sustainable construction. At the same time, there is a risk for real estate companies of missing potential new tenants if they do not invest in upgrading their real estates' to green buildings. One possible way of increasing the demand of green buildings could be the importance Reed and Wilkinson (2007) mention that there is a need of emphasising the green aspects in the real estate companies' marketing programs. This will highlight the benefits and hopefully create a market possibility for the tenants as well.

6.2 Environmental classification system

There exists several environmental classification systems in the world at present, and this thesis is limited to present BREEAM, the ECS, GBP, and LEED since they are either established, or under development, on the Swedish market. Their different certifications can be a way of visualising what is good with the different real estates, and eventually lead to potential benefits for both real estate companies and for their tenants. However, the classification systems have the same problem as green buildings have in general: they are still relatively new and unfamiliar for the general public outside the construction and real estate sectors. This was shown in the findings of our questionnaire study. The findings indicate that only 24 percent of the tenants had any knowledge about the systems in general. However, the findings also indicate that approximately 40 percent of the respondents perceived that their company will benefit from being located in a building certified according to environmental classification systems, see Figure 25. There was a large group that did not know if they would benefit from being located in an environmental certified building. This group might have answered differently if they had more knowledge about the classification systems and of green buildings in general.

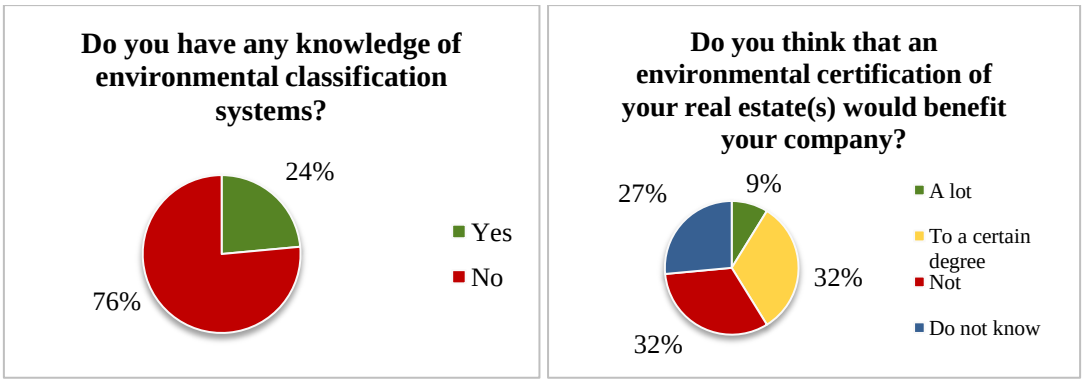

Figure 25 – Comparison between the knowledge level of environmental classification systems and if tenants would benefit of the certification

Is the real estate sector ready for certifying buildings according to environmental classification systems? Or is this something for the future? Tenants who have their operation in environmentally sensitive sectors work regularly with environmental issues and there might be, as Eichholtz *et al.* (2009) mention, a movement within this group towards wanting to be located in a building certified according to environmental classification systems. This together with that the general knowledge may increase about the environmental classification systems might lead to that the marketing value of being located in a certified building will be higher in the future.

When trying to decide upon certifying according to BREEAM, the ECS, GBP, or LEED, it is important to remember that these four have some differences. GBP only certifies for reductions made in the buildings' energy consumption, which makes this system relatively simple and is, therefore, often used in collaboration with another system. BREEAM and LEED are both systems which origin abroad, and they are both used worldwide, while the ECS is developed for and used on the Swedish market. Additionally, the ECS is still relatively new and under development. However, important to consider when choosing between the systems is, according Bonde *et al.* (2009), that they are based on the building standards and regulations in the different origin countries.

When comparing the four systems one apparent difference is the age of the systems. BREEAM is the oldest from 1990, and then LEED: 1998, GreenBuilding: 2004, and finally the ECS from 2008. How does the age affect the system? The age cannot be seen as a negative feature here since it would probably suggest that a lot of the early errors, or flaws, have been revised, and knowledge have been gained from the development of the system. When comparing BREEAM, the ECS, and LEED, in accordance to their updating process, there are some differences. BREEAM and LEED are continuously updating their systems, whereas BREEAM is updated annually and LEED is updated depending on the USGBC. The ECS, as it is the youngest, have stated that they will gain knowledge from their early years and that they will develop the system further with these experiences. Is there then a best updating process? There are both positive and negative features with updating the systems often or seldom. A system that is updated, for example, every tenth year might become out of date since it have not followed the regulations, or trends regarding green buildings. On the one hand, if the updating process is annually then it can be difficult for the users to keep up with all the minor changes within the system. On the other hand, a positive feature of updating often is that the system follows the regulations and trends that are present. The answer to the question if there is a best

updating process can, therefore, be seen as personal and depends on which preferences one value the most.

The green building concept is continuously developed, and there is a need for the systems to keep up with this development. Accordingly, the validity period in some of the systems can be questionable. The validity period in both BREEAM and GreenBuilding level 2 is until further notice, the ECS has a validity period of 10 years, and in LEED it is only LEED-EB that is required to re-certifying every 1-5 years. If the concepts, regulations, standards etc. regarding green buildings are updated regularly, how can the building keep the certification even if it is not considered green any longer? The systems did not provide us with an answer on this question, and therefore, we had to contact the responsible parties to be able to receive an answer. All correspondence resulted in the previously stated validity periods, and resulting in that the question is still unanswered.

Three of the systems certify buildings according to a number of categories. The main difference between these three is that the ECS focuses only on the actual building, and that BREEAM and LEED focus on the building as well as its surroundings. The last two systems are broader since they have a holistic perspective instead of focusing on one point or object. It is therefore important for real estate companies to consider a system that suits their purpose best.

The grading within the systems differs, and this makes them harder to compare. There are differences in the number of rating levels, see Figure 26, but is a higher number of levels better? If there are more levels, this makes a comparison between buildings certified with the particular environmental classification system easier. However, as mentioned earlier it is difficult to compare them to each other as building standards and regulations in the different origin countries affect the rating levels.

	BREEAM	The ECS	GBP	LEED
Ratings **(lowest first)**	1. Pass 2. Good 3. Very good 4. Excellent 5. Outstanding	1. D 2. C 3. B 4. A	Certified	1. Certified 2. Silver 3. Gold 4. Platinum

Figure 26 – The different rating levels

A comparison between BREEAM and LEED, mentioned both by one of our interviewees and by Saunders (2008), is that it is easier to receive a top grade in LEED than in, for example, BREEAM. Receiving a top grade is something that can be positive from a marketing perspective, but there is no evidence that a top grade equals sustainability since the subject of environmental classification systems is relatively new. However, receiving a top grade should not be the reason for choosing or not choosing a system.

All the environmental classification systems are associated with costs in the certification process, except GBP since it is free of charge. The costs are, in general, related to registration fees, review fees, certification fees etc. The figures are not stated in the thesis since these are often changed, and that each system has its own type of fees. Out of the four compared systems the costs associated with a certification are highest for the systems BREEAM and LEED, and the reason for this might be that they are more comprehensive than the ECS. What does this tell? Is it value for money? It is difficult to conclude if a higher cost for a system is gaining a higher

value then another system that is cheaper. The environmental classification systems are often considered as incentives for companies to create green buildings, but the additional costs (for the certification) can make some reluctant to pay. Therefore, some excellent green buildings may not be visualised in the market as buildings with certification.

An additionally important thing to consider before choosing between these systems is as Rivera (2009, pp. 5) states:

> *"If potential renters/buyers/customers do not recognise the 'brand' of the certification rating achieved, then any investments have not been wisely made"*

The "brand" of the certification rating achieved is one important thing to consider for the real estate companies. It could be harder to market a building rated, for example, BREEAM Excellent, LEED Gold, or GBP partner to a tenant that does not understand the value of the brand. It is, therefore, important for the real estate companies to communicate the meaning of the ratings to their tenants. Is there a possibility for real estate companies to specialise in certifying their buildings according to an environmental classification system? The brands BMW and Skoda, mentioned in chapter 5, are examples of widely known brands, and the question is if the real estate sector can adopt this type of branding to their industry. Persram and Larsson (2007) suggest that tenants brand value is higher if the leased real estate meets green standards. If specialising in one particular area this could mean that that real estate companies can market their real estates on a higher level than their competitors. To speculate, there might even be tenants that choose to be located in a real estate owned by this real estate company just because of the green profile they have established. Taking these thoughts of the brand value to the findings from the questionnaires, this would mean that GBP and LEED is the choice that could be recommended for the real estate companies as the tenants knowledge of these was the highest. However, linking back to the low level of knowledge of the tenants, about the environmental classification systems in general, this might not be such a wise decision since it can be difficult to validate an environmental classification system if the tenants do not know what it is.

7 Conclusion

The research questions that we have stated are quite difficult to answer since it is complicated to answer open questions in an explicit way. Our conclusions for this Master's thesis will be presented in the order of the research questions.

- **Does renovation of commercial real estates according to green processes enhance the value?**

There is a need to continue the discussion about the benefits associated with building green and environmental classification systems in order to enhance the value. As the knowledge level of potential benefits is low, the real estate companies and their tenants need to enhance their knowledge in the matter to be able to acknowledge that a renovation according to green processes can enhance the value for both parties. The discussion and debate of validating green building has mainly been focused within the construction and the real estate sector and people outside these sectors are not aware of the benefits. The lack of awareness comes hand in hand with the lack of knowledge, and when the knowledge level increases there will certainly be more common with tenants preferring green buildings and acknowledge their benefits. However, in order to make green buildings more common, there is a need to change the attitude of that green buildings cost more. The focus should be on the life cycle costs of a building and what the benefits of building green add to the equation.

There is also a possibility of economical gains for the real estate companies if they renovate their commercial real estates according to green processes and if they market their buildings as environmentally friendly.

Finally, the most important perspective for the real estate companies is that a satisfied tenant is beneficial. If the tenants are satisfied this will be perceived as an enhanced value, and this in turn will lead to a higher value for real estate companies.

- **Does labelling of commercial real estates according to an/several environmental classification system(s) enhance the value of the commercial real estates?**
    - **If it does, are there any system(s) that (may) result in higher value for both the Real estate Company and the tenants?**

Environmental classification systems are a quite new phenomenon in Sweden, and the major systems present on the market today needs to be further investigated in order to conclude which one might lead to a higher value for tenants and the real estate companies. In our opinion, there are differences between the systems in how they enhance the value; there are those that are better from a holistic perspective, and there are those that are better from a marketing perspective. BREEAM and LEED have a more holistic view of sustainability and there is a need of this in order to reduce the real estate's carbon footprint. However, they need to be more adopted before they can be fully used. The big construction companies are mainly involved in the development of the systems, and in order to achieve higher value of these systems the real estate companies need to be involved in this process. Meanwhile, the systems that can be seen as the best choice for real estate companies today are those that have names that connect with the words like *"green"* and *"sustainable"* etc. One example is GreenBuilding (GBP) that is more relatable from a marketing perspective than for example LEED. All these conclusions can be summarized in the fact that the general level of knowledge in the different systems is too low to acknowledge the actual value

of the different systems and if they would result in a higher value for both the Real estate Company and the tenants.

To summarise the conclusions, the value of building green and certifying real estates according to environmental classifications systems depends on both individual preferences and the level of knowledge of the stakeholders involved. It is most likely that, as the level of knowledge in this subject increases, the perceived value will increase accordingly. Green building is on the agenda today, and this has started to affect the real estate and construction sectors in a wider perspective than before. From a sustainability point of view the most important agenda, for real estate companies, is to upgrade their real estates according to green processes, and maybe not to certify them according to environmental classification systems. The systems can, on the other hand, act as a tool for the real estate companies to market their green work towards tenants and the public.

7.1 Recommendations

Our first recommendation to the Real estate Company is to approach the subject of green processes and green building by defining what these concepts means for them. It is then important to work according to these definitions when renovating their real estates. The level of success depends on how the company choose to market these improvements and make them visible for their tenants in order to be able to enhance the value for their tenants. It is also important to establish a marketing plan that involves green thinking.

The second recommendation, if viable, is to choose an environmental classification system that is fully developed in Sweden. Our advice is, therefore, if the real estate company choose to certify according to the environmental classification systems, start with GBP. The recommendation is then to choose a system that suits their purpose best, either from a sustainable perspective or a marketing perspective.

7.2 Reflections on the research process and recommended further studies

The concept of this Master's thesis was given by the Real estate Company that wanted an investigation on possible solution or guidance to improve an unattractive building in order to make it more attractive for both tenants and themselves. The original idea was to conduct a case study of one of the Real estate Company's buildings. However, in order to investigate the opinions of the Real estate Company's tenants we then developed this idea further.

Something that we would have made differently during our thesis work was to rewrite some of the questions in questionnaire study. The questions should instead be formulated in a way so that the respondents had to take sides with or against the statements. The questions should also be rewritten so that there were no *do not know* alternative present. Our research questions were not entirely developed when we conducted our interview and questionnaire studies and this made us asking questions that afterwards can be seen as of no use to us.

One of our main conclusions of the thesis is that the subjects of green building and environmental classification systems need to be discussed and analysed further. This conclusion has developed from a number of questions that we feel needs to be addressed. The main questions we recommend as further studies are:

- Examining how tenants located in a building certified according to an environmental classification system values and perceives this certification.
- Net lease and gross lease contracts affect the perception tenants have of green buildings. Can the different forms of leases affect real estate development in general? Is there a best lease for sustainable development?
- The environmental classification systems are updated regularly. How does that affect buildings that receive certifications that are valid until further notice? Can the validity period affect the environmental classification systems negatively?
- BREEAM, the ECS, GBP, and LEED all exist on the Swedish market. Is there a need for them all? (How does the existence of several systems affect us in Sweden? Or, is there a need of one national environmental classification system?)

8 References

8.1 Electronic references

Association HQE (2010), http://www.assohqe.org, (Retrieved: 100427)

BEAM society (2010), http://www.hk-beam.org.hk, (Retrieved: 100427)

BRE Global Ltd. (2009), http://www.breeam.org, (Retrieved: 100204)

Build Green (2005), http://www.buildgreen.co.nz, (Retrieved: 100422)

Building-living dialogue (2010), http://www.byggabodialogen.se, (Retrieved: 100412)

Byggsertifisering (2010), http://www.byggsertifisering.no, (Retrieved: 100427)

Casbee (2010), http://www.ibec.or.jp/CASBEE, (Retrieved: 100427)

Ceequal (2010), http://www.ceequal.com, (Retrieved: 100427)

DGNB (2010), http://www.dgnb.de, (Retrieved: 100427)

EC3 Global (2010), http://www.ec3global.com, (Retrieved: 100427)

EcoConsulting (2010), http://ecoconsulting.net (Retrieved: 100212)

Eichholtz, P, Kok, N., and Quigley, J.M. (2009), *Why Do Companies Rent Green? Real Estate and Corporate Social Responsibility*, Available at: http://www.ucei.berkeley.edu (Retrieved 100309)

Energy Star (2010), http://www.energystar.org, (Retrieved: 100427)

Escale (2010) http://international.cstb.fr, (Retrieved: 100427)

Swedish Property federation (2010), www.fastighetsägarna.se (Retrieved 100212)

Fuerst, F. and McAllister, P. (2008), *Green Noise or Green Value?, Measuring the Effects of Environmental Certification on Office Property Values*, Available at: http://papers.ssrn.com (Retrieved: 100309)

GBC 2000 (2010), http://www.iisbe.org, (Retrieved: 100427)

GBCI (2008), http://www.gbci.org (Retrieved: 100212)

Global Green Building (2010), http://www.usgreenbuilding.com (Retrieved 100426)

GreenBuilding (2010), http://www.eu-greenbuilding.org, (Retrieved: 100212)

Green Building Council Australia (GBCA) (2010), http://www.gbca.org.au, (Retrieved: 100427)

GreenCalc (2010) http://www.greencalc.com, (Retrieved: 100427)

Green REsource Council (GREC) (2009), http://www.greenresourcecouncil.org/ (Retrieved: 100421)

The Ecocycle Council (2010), *The environmental programme 2010*, Available at http://www.kretsloppsradet.se, (Retrieved: 100426)

Langley, A, Hopkinson, L., and Stevenson, V. (2008), *Green Leases: an opportunity to develop a sustainable approach for Tenanted Commercial Buildings in the UK.*, Presented at IEECB Focus 2008, April 10-11 in Frankfurt am Main, Germany. Available at: http://re.jrc.ec.europa.eu/energyefficiency/events.htm, (Retrieved: 100309)

Langdon, D. (2007), *The Cost & Benefit of Achieving Green Buildings*. Available at: http://www.davislangdon.us (Retrieved: 100217)

Langdon, D. (2004), *Examining the Cost of Green*, Available at: http://www.davislangdon.com (Retrieved: 100217)

Miller, N., Spivey, J., and Florance, A. (2008), *Does Green Pay Off?* Available at: http://www.usgbc.org (Retrieved: 100217)

Morrison, P. and Langdon, D. (2007), *What Does Green Really Cost?*, Pension Real Estate Association Quarterly. Available at: http://www.dladamson.com (Retrieved: 100217)

Nelson, A. (2007), The Greening of U.S. Investment Real Estate - Market Fundamentals, Prospects and Opportunities, *RREEF Research*, No. 57. Available at: https://www.rreef.com, (Retrieved: 100309)

Pierce Eislen (2010), http://www.pi-ei.com, (Retrieved 100426)

PWC (2010), http://www.pwc.com (Retrieved: 100506)

Reed, G. and Wilkinson, S. (2007), *Sustainability and the value of office buildings – will the market pay for green buildings?* Available at: http://www.asres2007.umac.mo (Retrieved: 100309)

Rivera, A. (2009), *International Applications of Building Certification Methods: A Comparison of BREEAM and LEED*. Presented at: PLEA2009 - 26th Conference on Passive and Low Energy Architecture, Quebec City, Canada, 22-24 June 2009, Available at: http://www.plea2009.arc.ulaval.ca (Retrieved: 100309)

Saunders, T. (2008), *A discussion document comparing international environmental assessment methods for buildings*, BRE mars 2008, Available at: http://www.dgbc.nl (Retrieved: 100217)

Storey, J. B. (2007), *Overcoming the barriers to improving the sustainability of existing commercial office buildings*, Available at: http://www.irbdirekt.de (Retrieved: 100309)

The Brundtland report (1987), Available at: http://www.worldinbalance.net/pdf/1987-brundtland.pdf, (Retrieved: 100507)

The U.S. Environmental protection agency (2010) http://www.epa.gov, United States of America, (Retrieved: 100126)

The UN (2010) http://www.un.org (Retrieved: 100309)

USGBC (2010), http://www.usgbc.org, (Retrieved: 100108)

Window & Door (2010), http://www.windowanddoor.com, (Retrieved 100426)

8.2 Literature references

Anonymous (2003), International Green Building Developments, *Building Design & Construction*, pp. 18-19

Bartlett, E. and Howard, N. (2000), Informing the decision makers on the cost and value of green building, *Building Research & Information*, Vol. 28, No. 5-6, pp. 315-324

Biblow, C. (2009), "Going Green" In Construction Offers Environmental Benefits - and Significant Financial Savings, *Real Estate Finance*, Vol. 26, No. 3 pp. 13-15

Bonde, M., Lind, H. and Lundström, S. (2009), *Hur värderas energieffektiva och miljöanpassade kommersiella fastigheter?*, Institutionen för Fastigheter och Byggande, Avdelningen för Bygg- och fastighetsekonomi, KTH Stockholm 2009. No. 50

Bradley Guy, G., Kibert, C., and Sendzimir J. (2002), *Construction ecology: nature as the basis for green buildings*, Spon Press, London

Brandon, P. and Lombardi, P. (2005), *Evaluating sustainable development – in the built environment*, Blackwell Science Ltd, India

Bunz, K., Henze, G., and Tiller D. (2006), Survey of Sustainable Building Design Practices in North America, Europe and Asia, *Journal of Architectural engineering*, Vol. 12, No. 1, pp. 33-62

Cassidy, E. (ed.) (2003), Green Buildings Research White Paper, *Building Design & Construction*

Ding, C. (2007), Sustainable construction – The role of environmental assessment tools, *Journal of Environmental Management*, Vol. 86, No. 3, pp. 451-464

Fuerst, F. (2009), Building momentum: An analysis of investment trends in LEED and Energy Star-certified properties, *Journal of Retail & Leisure Property*, Vol.8, No.4, pp. 285-297

FASTIGHETSvärlden (2009), Special: Gröna fastigheter, Vol. 24, No. 3, pp. 25-41

Gowri, K. (2004), Green Building Rating Systems: An Overview, *ASHRAE Journal*, Vol. 46, No. 11, pp. 56-59

Holmes, J. and Hudson, G. (2001), The application of BREEAM in corporate real estate: A case study in the design and marketing of a city centre office development, *Journal of Corporate Real Estate*, Vol. 5, No. 1, pp. 66-78

Holmes, J. and Hudson, G. (2000), *The Cutting Edge 2000 – an evaluation of the objectives of the BREEAM scheme for offices: a local study*, RICS, research foundation,

Jansa, A. and Johansson, G. (2009), *Miljöklassad byggnad: Befintlig byggnad*, Karlskrona, Sweden

Kats, G. (2003a), *The costs and financial benefits of Green Buildings*, California's Sustainable Building Task Force

Kats, G. (2003b), *Green Building Costs and Financial Benefits*, Massachusetts Technology Collaborative

Kibert, C. (2005), *Sustainable Construction – Green Building design and delivery*, John Wiley & Sons, Inc., Hoboken

Kohler, N. (1999), The relevance of Green Building Challenge: an observer's perspective, *Building Research & Information*, Vol. 27, No. 4, pp. 309-320

Kozlowski, D. (2003), Green gains: Where sustainable design stands now, *Building Operating Management*, Vol. 50, No. 7, pp. 26-32

Kvale, S. (1997), *Den kvalitativa forskningsintervjun*, Studentlitteratur, Lund

Lokalnytt (2010), Tema: Gröna fastigheter, Vol. 13, No. 3, pp. 20-45

Lorenz, D. and Lützkendorf, T. (2008), Sustainability in property valuation: theory and practice, *Journal of Property Investment & Finance*, Vol. 26 No. 6, pp. 482-521

Lorenz, D., Trück, S., and Lützkendorf., T. (2007), Exploring the relationship between the sustainability of construction and market value - Theoretical basics and initial empirical results from the residential property sector, *Property Management*, Vol. 25, No. 2, pp. 119-149

Mansfield, J. (2009a), Sustainable refurbishment: the potential of the legacy stock in the UK commercial real estate sector, *Structural Survey*, Vol. 27, No.4, pp.274-286

Mansfield, J. (2009b), Sustainable refurbishment: policy direction and support in the UK, *Structural Survey*, Vol. 27, No. 2, pp. 148-161

Mickaitytė, A., Zavadskas, E., Kaklauskas, A., and Tupėnaitė, L. (2008), The concept model of sustainable buildings refurbishment, *Journal of Strategic Management*, Vol. 12, No.1, pp.53-68

Miller, E. and Buys, L. (2008), Retrofitting commercial office buildings for sustainability: tenants' perspectives, *Journal of Property Investment & Finance*, Vol. 26, No. 6, pp. 552-561

Nalewaik, A. and Venters, V. (2009), Cost Benefits of Building Green, *Cost Engineering*, Vol. 51, No 1, pp. 28-34

Persram, S. and Larsson, N. (2007), *Marketing Green Buildings to Owners of Leased Properties*, Prepared for the Canada Green Building Council

Pitt, M., Tucker, M., Riley, M., and Longden, J. (2009), Towards sustainable construction: promotion and best practices, *Construction Innovation*, Vol. 9, No. 2, pp. 201-224

Qualk, J. D. and McCown, P. (2009), Busting the Myth That Green Costs More Green, *Strategic Planning for Energy and the Environment*, Vol. 28, No 4, pp. 36 – 48

RICS, (2005), Green value – green buildings, growing assets, *Royal Institution of Chartered Surveyors*, page 3

Seo, S. (2002), *International review of environmental assessment tools and databases*, CRC for Construction Innovation, Brisbane

Silverman, D. (2006), *Interpreting qualitative data: methods for analyzing talk, text, and interaction.* The Aden Press, Oxford.

Stenberg, A.-C. (2006), *The Social Construction of Green Building -Diachronic and Synchronic Perspectives*, Thesis for the degree of doctor of philosophy, Building Economics and Management, Department of Civil and Environmental Engineering, Chalmers University of Technology, Göteborg.

Teorell, J. and Svensson, T. (2007), *"Att fråga och att svara" samhällsvetenskaplig metod,* Liber AB, Malmö.

Van der Schaaf, K. and Sandgärde, M. (2008), *Hyresgästers miljökrav vid val av ny lokal*, Stockholm, Kungliga tekniska högskolan, examensarbete 451

Wiley, J., Benefield, D., and Johnson, K. (2008), Green Design and the Market for Commercial Office Space, *Journal of Real Estate Finance and Economics*, DOI: 10.1007/s11146-008-9142-2

Yin, R. (1994), *"Case Study Research Design and Methods"*, second edition, Applied Social Research Methods Series, Vol. 5

Yin, R. (2009), *"Case Study Research Design and Methods"*, fourth edition, Applied Social Research Methods Series, Vol. 5

Yudelson, J. (2008), *The Green Revolution*, Islandpress, London

Appendix A: The questionnaires

Vi är tre studenter på Mastersprogrammet *Design and Construction Project Management* vid Chalmers tekniska högskola. Denna enkätundersökning är en del av vårt examensarbete på programmet, vilket vi genomför i samarbete med er hyresvärd, Platzer. Denna undersökning syftar till att få en överblick av de behov, önskemål och krav som finns hos Platzers hyresgäster avseende ”grön” renovering och uppfräschning av Platzers fastigheter. Svaren från enkäten behandlas naturligtvis **anonymt.**

Var vänlig och sätt ett X i rutan för ditt svar på varje fråga och kommentera/precisera gärna i tabellrutan som följer där det frågas efter det. Var inte orolig för platsbrist i rutorna – de får gärna bli större än de är i ursprunglig layout. Anser Du att flera alternativ passar på frågan så är det möjligt att kryssa i dessa.

När enkäten är besvarad skickas den med e-post till xxx så snart som möjligt, dock senast den **31 mars 2010**.

TACK FÖR DIN MEDVERKAN!

Man	
Kvinna	

Ålder	
– 20	
20-30	
30-40	
40-50	
50-60	
60-70	
70–	

Antal anställda på denna arbetsplats	

Befattning	

Verksamhet

1. **Anser Du att ni, som företag, kan använda er av miljövänliga och energieffektiva fastigheter som del av er marknadsföring gentemot era kunder eller mot allmänheten i stort?**

	Allmänhet	Kunder
Ja		
Nej		
Vet ej		

a. Om Nej: Beror det på att Ert företag inte finner det relevant, eller att Platzers fastighet inte ger Er den möjligheten, eller båda?

	Ja	Nej
Ej relevant		
Inte möjligheten		
Båda		

Kommentera gärna:	

2. **Har Du under de senaste åren märkt ett ökat intresse inom företaget (t.ex. i nyhetsbrev, på personalmöten etc.) för miljöbesparande åtgärder på era lokaler?**

Ja	
Nej	
Vet ej	

a. Om Ja: Vilken typ av åtgärder har efterfrågats?

	Ja	Nej
Energianvändning		
Materialval		
Solavskärmning		
Temperatur, vinter		
Temperatur, sommar		
Belysning		

Kommentera gärna:	

3. Ställer Ert företag idag krav på Platzer angående miljöbesparande åtgärder?

Ja	
Nej	
Vet ej	

a. Om Ja: Inom vilka områden har kraven omfattat?

	Ja	Nej
Energianvändning		
Materialval		
Solavskärmning		
Temperatur, vinter		
Temperatur, sommar		
Belysning		

b. Om Ja: Upplever Ert företag att ni fått era krav tillgodosedda?

Till stor del	Till viss del	Inte alls	Vet ej

Kommentera gärna:	

4. Vem anser Du skall stå för kostnaderna av eventuella större renoveringar eller mindre renoveringar, för att reducera miljöpåverkan av fastigheten?

	Större renoveringar	**Mindre renoveringar**
Platzer		
Hyresgästen		
Platzer och Hyresgästen		

a. Om Du anser parterna skall dela på kostnaderna för miljöförbättrande åtgärder, vad anser Du är en rimlig kostnadsfördelning?

	Större renoveringar	**Mindre renoveringar**
Platzer 10% - Hyresgästen 90%		
Platzer 20% - Hyresgästen 80%		
Platzer 30% - Hyresgästen 70%		
Platzer 40% - Hyresgästen 60%		
Platzer 50% - Hyresgästen 50%		
Platzer 60% - Hyresgästen 40%		
Platzer 70% - Hyresgästen 30%		
Platzer 80% - Hyresgästen 20%		
Platzer 90% - Hyresgästen 10%		

Framtiden

5. I ett fem- till tioårsperspektiv, för vem har nedanstående områden störst betydelse:

	Hyresgäst	Hyresvärd
Lägre energiförbrukning		
Miljövänligare material i lokalen		
Bättre inomhusmiljö		
Miljöklassification av fastigheten		

6. Tror Du att hyresgäster kommer att prioritera byggnader med låg miljöbelastning när de söker ny lokal?

Ja	Till viss del	Nej	Vet ej

Kommentera gärna:	

7. Tror Du att det kommer existera bidrag till byggnader med låg miljöbelastning på Göteborgs kommersiella fastighetsmarknad i framtiden?

Stämmer helt	Stämmer delvis	Stämmer ej	Vet ej

Miljöklassningssystem

8. Känner du till Miljöklassningssystem av fastigheter?

Ja	
Nej	
Vet ej	

a. Om Ja: Hur väl känner Du till följande miljöklassningssystem av fastigheter?

	Känner till	Känner delvis till	Hört talas om	Känner inte alls till
GreenBuilding				
LEED				
BREEAM				
Miljöklassad byggnad				

Känner du till något annat system?	

9. Anser Du att en miljöklassificering av er(a) fastighet(er) skulle gynna ert företag?

Mycket	Till viss del	Nej	Vet ej

Kommentera gärna:	

10. Övriga kommentarer

Vi är tre studenter på Mastersprogrammet *Design and Construction Project Management* vid Chalmers tekniska högskola. Denna enkätundersökning är en del av vårt examensarbete på programmet och syftar till att få en överblick av de behov, önskemål och krav som finns hos Platzers hyresgäster avseende ”grön” renovering och uppfräschning av Platzers fastigheter. Svaren från enkäten behandlas naturligtvis **anonymt.**

Var vänlig och sätt ett X i rutan för ditt svar på varje fråga och kommentera/precisera gärna i tabellrutan som följer där det frågas efter det. Var inte orolig för platsbrist i rutorna – de får gärna bli större än de är i ursprunglig layout. Anser Du att flera alternativ passar på frågan så är det möjligt att kryssa i dessa.

När enkäten är besvarad skickas den med e-post till xxx så snart som möjligt, dock senast den **31 mars 2010**.

TACK FÖR DIN MEDVERKAN!

Man	
Kvinna	

Ålder	
– 20	
20-30	
30-40	
40-50	
50-60	
60-70	
70–	

Antal anställda på denna arbetsplats	

Befattning	

Verksamhet

11. Anser Du att ni, som företag, kan använda er av miljövänliga och energieffektiva fastigheter som del av er marknadsföring gentemot era kunder eller mot allmänheten i stort?

	Allmänhet	Kunder
Ja		
Nej		
Vet ej		

a. Om Nej: Beror det på att Ert företag inte finner det relevant, eller att Platzers fastighet inte ger Er den möjligheten, eller båda?

	Ja	Nej
Ej relevant		
Inte möjligheten		
Båda		

Kommentera gärna:	

12. Har Du under de senaste åren märkt ett ökat intresse inom företaget (t.ex. i nyhetsbrev, på personalmöten etc.) för miljöbesparande åtgärder på era lokaler?

Ja	
Nej	
Vet ej	

b. Om Ja: Vilken typ av åtgärder har efterfrågats?

	Ja	Nej
Energianvändning		
Materialval		
Solavskärmning		
Temperatur, vinter		
Temperatur, sommar		
Belysning		

Kommentera gärna:	

13. Ställs det idag krav på Platzer angående miljöbesparande åtgärder?

Ja	
Nej	
Vet ej	

c. Om Ja: Inom vilka områden har kraven omfattat?

	Ja	Nej
Energianvändning		
Materialval		
Solavskärmning		
Temperatur, vinter		
Temperatur, sommar		
Belysning		

Kommentera gärna:	

14. Vem anser Du skall stå för kostnaderna av eventuella större renoveringar eller mindre renoveringar, för att reducera miljöpåverkan av fastigheten?

	Större renoveringar	**Mindre renoveringar**
Platzer		
Hyresgästen		
Platzer och Hyresgästen		

b. Om Du anser parterna skall dela på kostnaderna för miljöförbättrande åtgärder, vad anser Du är en rimlig kostnadsfördelning?

	Större renoveringar	**Mindre renoveringar**
Platzer 10% - Hyresgästen 90%		
Platzer 20% - Hyresgästen 80%		
Platzer 30% - Hyresgästen 70%		
Platzer 40% - Hyresgästen 60%		
Platzer 50% - Hyresgästen 50%		
Platzer 60% - Hyresgästen 40%		
Platzer 70% - Hyresgästen 30%		
Platzer 80% - Hyresgästen 20%		
Platzer 90% - Hyresgästen 10%		

Framtiden

15. I ett fem- till tioårsperspektiv, för vem har nedanstående områden störst betydelse:

	Hyresgäst	Hyresvärd
Lägre energiförbrukning		
Miljövänligare material i lokalen		
Bättre inomhusmiljö		
Miljöklassification av fastigheten		

16. Tror Du att hyresgäster kommer att prioritera byggnader med låg miljöbelastning när de söker ny lokal?

Ja	Till viss del	Nej	Vet ej

Kommentera gärna:	

17. Tror Du att det kommer existera bidrag till byggnader med låg miljöbelastning på Göteborgs kommersiella fastighetsmarknad i framtiden?

Stämmer helt	Stämmer delvis	Stämmer ej	Vet ej

Miljöklassningssystem

18. Känner du till Miljöklassningssystem av fastigheter?

Ja	
Nej	
Vet ej	

b. Om Ja: Hur väl känner Du till följande miljöklassningssystem av fastigheter?

	Känner till	Känner delvis till	Hört talas om	Känner inte alls till
GreenBuilding				
LEED				
BREEAM				
Miljöklassad byggnad				

Känner du till något annat system?	

19. Anser Du att en miljöklassificering av er(a) fastighet(er) skulle gynna ert företag?

Mycket	Till viss del	Nej	Vet ej

Kommentera gärna:	

20. Övriga kommentarer
