LEEDing the Way Towards a Sustainable Built Environment

Case Lintulahti

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Abstract

This paper intends to offer insights into the internationally recognized LEED Green Building Rating System by taking a closer look at the short- and long-term upsides and downsides of the system in a Finnish construction project, case Lintulahti. This qualitative research has been based on a research model and the primary data has been collected by conducting interviews with industry professionals involved in the project. A great deal of academic literature claims that the benefits of green building exceed its costs. The empirical findings in this paper imply that this claim is valid even for the case study and that LEED can be applied in a Finnish project. However, several challenges related to the implementation exist.
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1 Introduction

This first chapter provides the reader an introduction to the research topic, discusses the problem related to it and presents relevant previous research. It ends with a definition of the purpose of this study and the research questions.

“The built environment has a profound impact on our natural environment, economy, health, and productivity.” (USGBC 2009a)

Green has become the new black, a trend that seems to have entered all economies and industries, including the construction sector. However, green construction is one of the factors that actually do have a vast impact on the environment due to two major facts: buildings stand for more than 40 per cent of both the global energy consumption (WBCSD 2009a) and the greenhouse gas emissions into the atmosphere (World GBC 2009). Thus, the way in which buildings are constructed and maintained plays a significant role in the energy and climate change debates and therefore, green construction can be expected to gain even more foothold in the near future.

“To be able to deal with the upcoming environmental challenges, businesses can choose from a short-term risk reduction strategy to a long-term repositioning solution. By taking the lead in producing energy-efficient\(^1\) and green solutions, a company can reap many advantages and take on an important role of environmental stewardship on the market. Building sector is in this context particularly lucrative due to the energy savings potential.” (Myllynpää & Oscarsson 2009)

In order to make it easier and more attractive for construction companies to participate in green construction projects and achieve the benefits associated with going green, it is of great importance to have adequate tools for assessing, reporting and communicating environmental performance. However, at present there are so many different rating systems that many companies think it requires too much time and effort to find the most adequate one and thus, they choose to go on with

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\(^1\) See section 2.1 for further information.
business as usual. LEED\textsuperscript{2} Green Building Rating System™ was developed as an answer to this problem with the aim to provide building owners and operators a framework with practical and measurable solutions for designing, constructing and maintaining green buildings.

1.1 Previous research

As noted, it seems that there are no extensive previous studies on green buildings or the LEED system in Finland. However, a lot of research exists in other countries, mainly in the United States. As the developer of LEED, the U.S. Green Building Council has published a great deal of reports and research on both green buildings and LEED certificate, which mainly discuss the benefits of “going green”.

The market for green building is growing rapidly. A ranking list put together by the Engineering News-Record (ENR) shows that the “Top 100 Green Contractors generated $38.69 billion in 2008 from projects that either were registered or certified with a major third-party environmental standards or ratings group, a 69.9% increase from last year” (Tulacz 2009).

According to Katz (2008), who is a communications coordinator for the United States Green Building Council (USGBC), buildings that are certified under LEED have less operational costs and use less energy and water. This claim is in accordance with studies such as Murdock (2006) and Lockwood (2006) as well as with the findings in a survey (Turner report 2008), in which the focus was on the benefits and costs of green buildings, obstacles to green construction and the role of LEED in the participated companies. The survey shows that green buildings have gone from being only a marketing tool to a means for saving on operating costs and improving companies’ financial performance. Further on, it states that green buildings also provide “an environment that fosters healthier, more productive workers”. Murdock (2006) puts great emphasis on these employee productivity improvements, which “account for almost 80 percent [of the estimated financial benefits], largely because improving indoor environmental quality leads to fewer worker sick days”.

\footnote{\textsuperscript{2} Leadership in Energy and Environmental Design.}
Further benefits, as well as the costs and challenges of green building and LEED certification, are identified in scientific articles by Garde (2009), Lockwood (2006), Murdock (2006), Nalewaik & Venters (2009), and Yudelson (2007) among others. Also, several (relatively) impartial reports on green building exist (see e.g. BDC 2003). According to Lockwood (2006), constructing a building according to a basic LEED certification costs only 0.8 percent more than constructing a standard building. Furthermore, he argues that “green” materials, technology and alike have become cheaper and that these cost in some cases even less than their standard counterparts (Lockwood 2006). According to Kats (2003b), the average extra cost of building green is $3.00 to -$5.00 per square foot (ft²) - ten times less than the financial benefits that a green building project can generate.

Nevertheless, there are a number of challenges related to green building and LEED. Among the most significant obstacles are lack of understanding, knowledge and motivation (WBCSD 2009b). Some argue that there is not enough data available to be able to assure the potential future benefits as well as to determine the exact costs of going green. Also, the way in which many construction companies build is rather speculative and includes only a short investment horizon. (Murdock 2006)

1.2 Problem definition

The author has recently written a Bachelor thesis3 in which the different drivers and goals in an environmentally sustainable building project were discussed. During the research process for that paper, a few interesting issues arose, which are the starting point of this study. First, the outcomes of “green” construction projects seem to be a topic worth taking a closer look at and second, an overwhelming number of different scoring systems and frameworks for managing environmental issues in construction projects exist today. This makes it hard, if not impossible, to compare and benchmark different green building projects. In addition, many of the existing rating systems are developed on a national level, which can make it hard for them to become applicable globally.

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3 “Towards a Sustainable Built Environment – Case Silverdal” (Myllynpää & Oscarsson, 2009)
Many construction industry professionals believe that LEED has the most potential for taking over the market globally and becoming the overall sustainability framework in the construction industry (e.g. Andelin 2009; Kekki 2009). Therefore, the aim of this paper is to study the short- and long-term upsides and downsides of the green building certification system LEED in a Finnish construction project.

LEED is of U.S. origin and has recently reached Finland, Sweden and Norway (Skanska 2009a). The system has apparently not been extensively studied in Finland before, which makes this study interesting. This paper has been conducted with the help of a research model constructed by the author, a review of previous research in the area and a case study of a LEED project at Skanska Finland. This is the Lintulahti office building in Helsinki, which has received a LEED precertification first of its kind in Finland.

1.3 Research purpose and questions

With this study the author wishes to offer insights into the internationally recognized green building certification system LEED. This paper aims to answer the key questions of:

What are the short- and long-term upsides and downsides of LEED Green Building Rating System (in general and in a Finnish construction project, case Lintulahti)?

Is the LEED Green Building Rating System applicable in a Finnish construction project (case Lintulahti)?
2 Background

In the following chapter issues that are important in the context of green building are shortly discussed in order to give the reader the needed background knowledge.

2.1 Sustainable development

According to the 1987 Report of the World Commission on Environment and Development - commonly known as the Brundtland Report - sustainable development is development that "meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987). Although this definition has received criticism, it is the one that is referred to in majority of sustainability literature (Lützkendorf & Lorenz 2005).

Furthermore, the Brundtland Report states: "living standards are sustainable only if consumption standards everywhere have regard for long-term sustainability. Yet many of us live beyond the world's ecological means, for instance in our patterns of energy use" (WCED 1987). Today, over 20 years after publication of the report, this statement is still very valid and the world is facing issues that can be expected to change our environment radically. Among the most important issues are the upcoming energy crisis and the changes in the earth’s climate. Energy crisis refers to the world’s dependency on finite non-renewable energy resources, such as oil. The supply of these resources is decreasing and the renewable sources of energy are yet not developed and large enough to replace the non-renewable energy sources. This in turn implies that the energy prices will increase in the future (Energy Crisis 2009).

The expression climate change refers to the phenomenon of raising temperatures on the globe, which is to a great extent caused by CO2 accumulations in the atmosphere (UNFCCC 2009). Nobody knows exactly what effects these temperature changes will have, but some estimates include rising sea levels, floods and drought, disrupted ecosystems, and environmental refugees (Kuisma 2009). These changes
will cause threats for the natural environment, people and societies. On the other hand, they can also create opportunities for innovative businesses (UNFCCC 2009).

### 2.2 Environmental Issues in Business

Most business operations affect the environment significantly, both in a positive and a negative way. In the Nordic countries environmental issues were introduced in the corporate context already during the 1970s (see e.g. Grafström et al. 2008). However, back then the environmental work in companies concentrated mostly on the risks and not the opportunities (Wenblad 2001).

In the 1990s this way of thinking started to give way for new approaches and companies began to consider the environment as a vital part of the corporate strategies (Vithessonthi 2009). This was due to two main reasons: first, the market demand was increasing and second, governments were planning to tighten the regulations in order to protect the environment. Hence, companies started to take voluntary initiatives to respond to these demands and to avoid new regulations. The need to rethink strategy with an eye on environmental issues and regulatory constraints is now a part of the corporate imperatives (Wenblad 2001).
3 Green Building

This chapter presents the concept of green building as well as some of the most important reasons for why it makes sense to construct green buildings.

Resource- and energy-consuming industries, including the construction sector, face great challenges when planning the future of their operations. Construction industry is in this context particularly lucrative since it has great potential for saving energy and using resources more effectively (Finndomo 2009). Among the most important facts for the construction sector to consider are that buildings account for more than 40 percent of both the primary energy used globally (WBCSD 2009a) and greenhouse gases (e.g. carbon dioxide, CO₂) that are emitted into the earth’s atmosphere (World GBC 2009). In addition, the energy sources that are primarily used by the growing human population are diminishing. These are the main reasons for why it is of great importance that buildings are built more sustainable.

Environmentally sustainable or “green” building has gained in momentum over the past decade, but it is not new. Already the primitive human generations acknowledged that natural resources should be used cautiously. However, the industrial revolution as well as the technological upheaval changed this philosophy into an unsustainable approach where the nature is deprived and its resources are utilized as efficiently as possible. Along with this transformation and access to cheap fossil fuels, even building practices became more unsustainable. (Ngowi 2001, 28; BDC 2003)

“In the past decades ‘green’ building practices have evolved remarkably and the concept has become much more general and comprehensive. More and more people acknowledge the relations between economic, environmental, and social aspects, and between nature and building practices. The first International Conference on Sustainable Construction was held in Tampa, Florida in 1994. As a result of these proceedings an official definition of the concept was developed; sustainable construction refers to ‘the creation and responsible maintenance of a
healthy built environment based on resource efficient and ecological principles.” (Myllynpää & Oscarsson 2009)

“A green building should have as little effect on nature as possible during its total life cycle. The production should use the least possible amount of material and energy and the total effect on the environment should be measured during all the phases of the building’s construction, lifetime and demolition” (Myllynpää & Oscarsson 2009). Some of the most known types of green building are energy efficient buildings, low energy buildings (these two are often used as synonyms) and passive houses, which is a building type where the existing internal energy can be reused due to minimized heat leakage and good ventilation (ibid.).

3.1 Why Build Green?

Most people know that the ultimate idea of green buildings is to conserve natural resources by e.g. recycling construction waste. Yet, a lot of prejudices have prevailed about the costs of green building, which has for a long time been considered as the costly alternative to standard buildings (see e.g. Lockwood 2006; Turner report 2008). Recent studies have, however, shown that although the first costs in green building projects may be somewhat higher, many of them include a potential fast return on investment (ROI) and life cycle cost savings that are many times higher than the initial investments (Kats 2003). Thus, green building has evolved from being merely a marketing tool to “a means to save on operating costs over the long term” (Tulacz 2009).

These returns and savings can be received because of many more or less certain benefits. The relatively certain and tangible benefits include energy, waste and water cost savings that are received through more efficient operations and can be calculated and monitored rather easily over time. The more uncertain benefits of

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4 Since the definitions of sustainable construction are many and somewhat ambiguous, the term “green building” will from now on be used as an umbrella term for buildings that are built in a more environmentally, economically and socially sustainable manner than conventional buildings today.
green buildings include e.g. productivity and health gains, which are much harder to forecast and calculate. (Kats, 2003)

Due to the reasons presented above, the market for green building is growing rapidly. According to Tulacz (2009), there was a 70% growth for the market in 2008 and the top 100 green contractors received revenues worth 38.60 billion U.S. dollars “from projects that either were registered or certified with a major third-party environmental standards or ratings group”.
4 Green Building Rating Systems

The following chapter includes a short discussion on green building rating systems followed by a more thorough presentation of one of the systems, LEED, as well as reasons for implementing LEED in a construction project.

“In order to achieve the benefits of implementing sustainability strategies, a company needs to assess its environmental performance. To be able to do this, adequate tools are needed and therefore, a number of different scoring systems, reporting frameworks and standards have been developed.” (Myllynpää & Oscarsson 2009).

Construction industry has slowly started to move toward adopting new standards of sustainability in both residential and commercial building projects (see e.g. Lützkendorf & Lorenz 2005; Wenblad 2001). As well as in other industries, there are many different rating systems and standards in the construction industry. The British Building Research Establishment (BRE) was the first organization to develop a green building certification program already in the beginning of 1990. This system is known as BRE's Environmental Assessment Method, BREEAM, and is a voluntary system put together by a number of private companies (Sundkvist et al. 2006, 132). The U.S. equivalent is the Leadership in Energy and Environmental Design (LEED) green building rating system, which will be studied more thoroughly in the following section.

4.1 LEED - a global environmental certification of buildings

LEED (Leadership in Energy and Environmental Design) is an internationally recognized and implemented green building rating system that evaluates buildings’ environmental performance and classifies the projects by awarding points in different areas (Lockwood 2006, 2). LEED was set up as a voluntary and market-driven third-party certification to provide building owners and operators a framework with practical and measurable solutions for designing, constructing and maintaining green buildings. The aim of the system is to improve construction
companies’ environmental performance “across all the metrics that matter most: energy savings, water efficiency, CO₂ emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts.” (USGBC 2009b)

LEED was launched in 1998 by the U.S Green Building Council (USGBC), which is a non-profit organization working to make sustainable solutions available to everyone. The USGBC is dedicated to promoting environmentally responsible building and the awareness on the LEED system. The organization provides not only certification of building projects, but also certification of experts, accreditation, training and practical advice. Its members are companies, contractors, public organizations, universities and other non-profit organizations. According to the USGBC, the system is flexible and can be applied to both commercial as well as residential buildings. At present, the system is in use worldwide and comprises 91 countries, including Finland. United States has a total of about 16,000 registered and about 2,000 LEED-certified projects. In Finland there are twelve registered LEED projects of which two are certified. (Skanska 2009a; USGBC 2009c)

In the beginning, the primary focus of the LEED rating system was for commercial buildings, but today there are several applications of it available (see fig. 1).

![LEED Green Building Rating Systems™](USGBC 2009d)

*Figure 1 LEED Green Building Rating Systems™ (USGBC 2009d). A Building’s Lifecycle consists of the design, construction and operations phase (grey arrow).*
According to the USGBC, LEED considers all the phases throughout the building lifecycle, including design and construction. Companies interested in earning LEED certification for their buildings must first register the project with Green Building Council Institute (GBCI). Every assessment is carried out by an independent organisation that includes a LEED Accredited Professional (AP), who has passed the Professional Accreditation exam and is an expert in green construction and LEED rating system. In order to become certified, a project must first satisfy certain prerequisites before the project team can start to take specific actions to earn credits in the five main areas and the two bonus categories\(^5\). (USGBC 2009e)

All of the different LEED applications include a guideline and a scorecard, the purpose of which is to help the operator to assess the project and meet the requirements. In addition, each one of them is divided into five environmental categories. The credits for these categories are awarded on a 100-point scale and as a new feature in the current version, LEED v3 or LEED 2009, bonus points can be gained from two additional categories. All the points are weighted in order to reflect their potential environmental impacts. Since LEED is being developed and updated on a continuum basis, a number of different versions of the system exist and are being implemented worldwide. The current version, LEED v3, was launched in April 2009.

The different categories (altogether 100 points) in LEED 2009 include:

- **Sustainable Sites (SS);** aims mostly for developing sites, where the need for automobile use can be reduced. The category puts emphasis on the reuse of existing buildings and disturbed sites, as well as on protecting or restoring habitat area and threatened species. The guideline suggests how to manage storm water, minimize light pollution and reduce the so-called urban heat island effect.

- **Water Efficiency (WE);** covers issues such as wastewater treatment and reduction of the use of potable (drinkable) water.

\(^5\) Applies to LEED 2009 for New Construction.
• Energy and Atmosphere (EA); this category provides information on how to use non-polluting forms of energy, reduce ozone depleting materials and limit the amount of energy used (by at least 10 per cent). This largest category is significantly emphasized and recommends installation of on-site renewable energy sources and emphasises the importance of managing CO₂ emissions. Majority of the points are addressed and achieved during the design process and based on an energy model provided by a third party. The category also includes detailed tables and calculations for documenting performance and energy savings.

• Materials and Resources (MR); the overall intention of this category is to reduce consumption of virgin materials. The goals include reusing existing buildings, using only recycled (especially rapidly renewable and regional) materials, and managing construction waste properly.

• Indoor Environmental Quality (IEQ); provides suggestions for better products in order to reduce the legal responsibility of the design team, owners and contractors. The category also includes guidance for ventilation, indoor air quality, pollutant control, materials selection, day lighting and views.

Additional categories:

• Innovation in Design (ID); this category can add a maximum of 6 points to the total score, if the project exceeds the requirements for innovation in design process. For example, a project using at least one LEED Accredited Professional can give it one additional credit.

• Regional Priority (RP); applies to projects that address geographically specific environmental priorities and can add 4 points to the total. However, projects outside the U.S. are not eligible for these credits.
In the latest version of the system, LEED 2009, energy consumption and greenhouse gas emissions reduction have been given more weight, which determine 31 per cent of a building’s total score. In LEED for New Construction the certifications are awarded according to the following scale:

<table>
<thead>
<tr>
<th>Certification</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>CERTIFIED</td>
<td>40-49 points</td>
</tr>
<tr>
<td>SILVER</td>
<td>50-59 points</td>
</tr>
<tr>
<td>GOLD</td>
<td>60-79 points</td>
</tr>
<tr>
<td>PLATINUM</td>
<td>80 points and above</td>
</tr>
</tbody>
</table>

*Source: USGBC 2009e*

Studies show that most of the actual users of LEED find the certification valuable: one-third of the participants in a survey conducted by Turner (2008) felt that LEED is extremely or very valuable, while 52% rated it as somewhat valuable. However, the same study shows that some obstacles to LEED exist; as many as 50% of the participants thought that documentation and cost of the certification present an extremely or very significant obstacle to constructing green buildings.

### 4.2 Why Implement LEED?

Most of the benefits of applying for a LEED certification are similar to the benefits of constructing green buildings in general. According to the USGBC (2009a), the benefits of LEED certified buildings include lower operating costs and increased asset value, less waste sent to landfills, energy and water conservation, and less harmful greenhouse gas emissions. Furthermore, the USGBC (USGBC 2009f) claims that LEED buildings are healthier and safer for occupants and “demonstrate an owner’s commitment to environmental stewardship and social responsibility”. These claims are in accordance with many other studies, including the Turner report (2008), which e.g. states that green buildings provide “an environment that fosters healthier, more productive workers”.

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5 Research Design

The purpose of this chapter is to show what research methods have been used in this study, why certain methods were chosen and choices were made, how data was collected and how the research was designed and operationalized. The chapter also presents a research model as well as criticism towards the chosen sources according to certain criteria.

5.1 Choice of research field and case study object

During the summer of 2009, the author had discussions with a few construction industry professionals and gained knowledge about the business opportunities for environmentally sustainable construction projects. The author’s Bachelor thesis, which was written earlier this year, showed that there are a very large number of different rating systems that can be used for assessing the environmental performance of a construction project, but did not look into the issue more closely. This is why it was decided to research the issue further and write this Master thesis about LEED Green Building Rating System, which is expected to become “the principal and most accepted standard” for green buildings (Biblow 2009). A review of academic literature shows that there is a lot of research about LEED in the U.S. and some other countries, but apparently not much in the Nordic countries or in Finland.

The search for an eligible project started with collecting information on current LEED projects on the webpage of U.S. Green Building Council, where all registered and certified LEED projects can be found. After this the project that best fitted into this study was chosen and the first people involved with it were contacted.

The research was conducted as a single case study of Skanska Finland and the first one of its LEED projects, Lintulahti office building, which has been granted a LEED Gold pre-certificate. Skanska was selected as the case company because of four main reasons. First, Skanska is one of the leading companies in the construction industry in Europe, North America and South America. Second, it has an extensive engagement in environmental issues. Third, Skanska AB was one of the companies
involved in the project that was studied in the author’s Bachelor thesis. Fourth, it is one of the very few companies in the Nordic region that is constructing buildings according to LEED requirements. (Skanska 2009a)

5.2 Choice of method

Due to the explorative and descriptive nature of this study and the fact that the LEED expertise that exists in Finland at the moment is limited (according to Andelin (2009), there are only about 20 LEED Accredited professionals in the country at the moment), qualitative methods were chosen over quantification of the data.

A single-case study was chosen as the research strategy for this paper for several reasons. First, the aim of this paper is to present an in-depth approach to investigating a single instance. Second, a case study is generally considered an appropriate research method for answering research questions formed with “why” and “how” (Yin 2003, 5). When looking at the research question, one cannot see the words “why” or “how”. However, they exist as underlying factors: why did Skanska decide to start implementing LEED in Finland, how has the system been implemented and how has it expected to work in the Finnish context? As Schramm (1971) has put it: “The essence of a case study...is that it tries to illuminate a decision or a set of decisions: why they were taken, how they were implemented, and with what result” (in Yin 2003, 12). Third, according to Yin (2003, 12?), “a case study’s unique strength is its ability to deal with a full variety of evidence – documents, artefacts, interviews and observations”.

5.3 Data collection

The search for relevant secondary data began with collecting articles on the construction business and sustainability in academic journals. The Internet databases, including Business Source Premier (accessible through the Uppsala University library) and Google Scholar, were of great help in the search process. The search for academic literature in these databases was done by using different combinations of keywords, such as sustainability, construction industry, green,
building, benefits and Leadership in Energy and Environmental Design. After finding the first suitable articles, the references and recommendations in them were used for finding more relevant data. In order to get a deeper insight into sustainability within the construction business, background information on LEED, and projects that use the system, the author has also studied different kinds of reports and Internet pages, including those of the U.S. Green Building Council.

The collection of primary data was done in form of interviews with people that have been involved in the implementation process of LEED in case Lintulahti. The strengths of documented information, on which this thesis is largely based on, are that it is stable and can be reviewed repeatedly. Interviews, on the other hand, provide an opportunity for deeper understanding of the topic through well-targeted focus. (Yin 2003, 34-36 & 85-92)

Four interviews were conducted for more thorough understanding of the chosen case. First, Pyry Virtanen, a controller at Skanska Oy, was interviewed on November 6, 2009 in Helsinki. The second interview was conducted on November 24, 2009, with Skanska’s environmental coordinator Mia Andelin, who also held a presentation about LEED at Skanska for the author. An interview with Skanska’s sustainability manager, Kaisa Kekki was held on December 7, 2009 and the last one with Tuomas Suur-Uski, a consultant at Pöyry Buildings who has been involved in the project, on December 8, 2009. The three first interviews were conducted at the headquarters of Skanska Finland in Helsinki and the last one at Pöyry Buildings headquarters in Espoo. All the interviews were conducted in Finnish and later on translated by the author. The two latter ones were also recorded and afterwards transcribed.

The interview questions were relatively low-structured in order to give the respondents a chance to interpret the questions more freely based on their own experiences and values. The aim of designing the questions as rather open was also to create a more free discussion between the interviewer and the respondents and to minimize the risk of the interviewer forgetting to ask about something crucial for understanding the issues with LEED in the case. In addition, the questions were
customized for each respondent. The interview template utilized is included as appendix at the end of this thesis.

5.4 Operationalization

The purpose of operationalization is to make the empirical findings measurable and to make it possible to draw conclusions that are based on empirical data. In addition, operationalization connects the purpose of the research and the research question(s) to the design of the research. (Frimanson 2009)

As noted, a single-case study was chosen as the research strategy and a qualitative approach turned out to be the best alternative for receiving adequate primary data. The collection of the empirical data, the analysis of primary and secondary data as well as the design of the interview questions was loosely based on the theoretical variables in the research model (see fig. 2 below). Variables can consist of several values, which can in turn be words or numbers (Bernard 2003). In this study the values are of both kind: intangible and tangible outcomes of implementing LEED in Finland. However, the analysis of the empirical findings and reporting the results was done by examining the case in-depth rather than by strictly following a few variables.

![Figure 2](https://example.com/figure2.png)

*Figure 2* Research Framework: connection between the short- and long-term upsides and downsides of the LEED green building rating system (adapted from Esty & Winston 2006, modified).
The primary data was collected by conducting interviews with four LEED experts. The respondents were first asked somewhat broader questions concerning the topic in order to receive background information as well as to get an idea of the connection between the interviewer (i.e. the author) and the respondents. The more specific questions were designed so that all the four different parts of the research model were covered. The respondents were asked to determine and evaluate these parts, i.e. the short-term benefits (revenues), the long-term benefits (intangibles), the short-term costs and the long-term challenges related to implementation of the LEED system in the project. The interview respondents were asked specifically about all the four “categories” in the model with the help of relatively simple questions, such as: *What are the revenues that Skanska has received from Lintulahti so far?* (See appendix A)

### 5.5 Source Criticism

The purpose of critically viewing the collected data and research findings is to determine whether they are trustworthy and accurate. The following section describes how the trustworthiness of this study was proven. The sources were more thoroughly assessed according to four criteria that are more appropriate for qualitative research: credibility, contemporary, tendency and dependability criterion.

#### 5.5.1 Credibility

Most of the chosen articles have been derived from Business Source Premier, an online database for academic literature and articles in academic journals. The author has access to the database through Uppsala University’s online system, which requires a password, i.e. this information is not available for everyone and thus, the author trusts that the contents are managed by trustworthy parties. In addition, the articles derived from the Business Source Premier are written in an academic manner by professionals in their areas, a fact that increases their credibility.
Majority of the Internet pages that are used as sources in this thesis are provided by sizeable, well-established organizations. Publishing false information includes major risks for these companies due to the large audiences that these websites have and therefore, it is likely that the companies choose the contents carefully. However, the information that the companies provide is usually written from their point of view and with their interests as a priority and thus, these data must be viewed with a critical mind. For example, it is unlikely that the USGBC would publish articles with rigorous criticism toward LEED. On the other hand, many of the articles provided by the USGBC are peer-reviewed, which implies that the subjectivity is assured by impartial reviews of the articles by experts in the field.

Considering the choice of interview respondents, three out of four of them are working for the case study company, Skanska, and one of the respondents has been assigned by Skanska to work as an external expert in the project. Hence, it is questionable whether their statements are based on information that is most beneficial for Skanska or whether they represent impartial opinions with hard facts. The former alternative can be viewed as more likely since it could cause problems if the employees would criticize the project too much, especially when the building has not been sold yet. In conclusion, there is a possibility that the respondents have a somewhat biased perspective on the project, which in turn can have affected the results of this study. The author had, however, little chance of finding an interview respondent who would be fully impartial because of the scarcity of independent LEED experts in Finland.

5.5.2 Contemporary Criterion

Contemporary criterion implies that the information should not be too old to be classified as current (Wiedersheim-Paul & Eriksson 2001). It is questionable whether all of these articles can be viewed as up-to-date: although majority of them have been published within the last ten years (except the Brundtland Report), the information in some of the articles might already be outdated due to the fast pace in which the market for green building and the LEED system is developing. This further implies that even some of the relatively recent findings might not be valid at present.
5.5.3 Tendency Criterion

The tendency criterion can be used for assessing what personal interest the author of a paper has in the studied subject or question. Tendency can be discerned by the choice of words and expressions and assured by e.g. using two sources with contrary tendency, which can be used for finding a balance between the sources (Wiedersheim-Paul & Eriksson, 2001). In this study the tendency criterion was taken into account by utilizing multiple sources of evidence in the data collection phase.

5.5.4 Dependability Criterion

The dependability criterion clarifies whether the sources are interdependent. (Wiedersheim-Paul & Eriksson, 2001) A source that is based on another source cannot authenticate the information in the original source and thus, priority should be given to primary sources instead of secondary sources. The dependability of the sources was in this study considered by using the original source whenever possible and in cases where it was not possible the original source has been stated so that the reader has the possibility to verify the information.
6 Case Study: Skanska Oy & Lintulahti Office Building

This chapter concentrates on presenting the empirical findings of this study. However, background information on the chosen case study company Skanska and its environmental work is provided before taking a closer look at the case study project Lintulahti.

6.1 About Skanska and Skanska Finland

The history of Skanska dates back to the beginning of 1887 when the company was founded as “Skånska Cementgjuteriet”. The name was changed to Skansa in 1984. Today, Skanska is one of the ten largest construction companies in the world and has construction-related activities and project development operations in some 60 countries in markets such as Europe, USA and Latin America. Skansa Group's parent company, Skanska AB is listed on the Stockholm Stock Exchange, and its turnover in 2008 amounted to nearly EUR 15 billion. Further on, Skanska is a Fortune 500 company, which means that it is among the five hundred largest companies in the world. Skanska provides both construction services and project development of infrastructure, residential buildings and commercial real estates and has ca. 56 000 employees worldwide. (Skanska 2009b; Skanska 2009c)

The first affiliate of Skanska in Finland was established in 1917. Skanska Oy⁶ - the company currently responsible for the operations in Finland and Estonia - was founded in 1994. It has quickly established its position as one of the largest companies in Finland to provide construction and project development services. The combined turnover of the business operations in Finland and Estonia amounted to over EUR 1 billion in 2008. Skanska Oy has about 2 500 employees in Finland. (Skanska 2009a)

⁶ Oy is an abbreviation of “Osakeyhtiö”, which translates to corporation or limited company, Ltd.
6.2 Environmental Management at Skanska

Skanska started to work with environmental issues in the 1970s. First the company’s focus was merely on environmental risks, after which the focus shifted to concern the opportunities with environmental performance. However, after a severe chemical accident in 1997, the company’s management realized that risks and opportunities are equally important for successful environmental management. Thus, in 1998 it was decided that “all units within the Group should introduce EMS (Environmental Management System[7]) within less than two years and have them certified by the end of 2000 according to the ISO 14001[8] standard. (...) The drivers behind these steps were pressures from the market, future legislation and public opinion.” (Wenblad 2001, 159).

Today, in addition to using the different ISO standards, Skanska is a member of several international sustainability initiatives including the World Business Council for Sustainable Development (WBCSD), United Nations Global Compact (UNGC), United Nations Environment Programme (UNEP), EU Corporate Leaders Group on Climate Change (EU CLG) and World Economic Forum (WEF). (Skanska 2009d)

According to Andelin (2009), Skanska is genuinely interested in the welfare of the environment, i.e. the company does not consider environmental issues only because it has to but because the environment really is important to the company. The CEO of Skanska Group, Johan Karlström, is supposed to be personally very excited about environmental issues and has thus set a goal: Skanska must become the leading company in environmental issues in the construction sector. Further on, Andelin tells that Skanska Finland’s CEO Juha Mäki has referred to green building as something that has created the greatest potential that the construction industry has faced since the Second World War. (Andelin 2009)

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[7] EMS refers to a “continuous process in which environmental activities are planned, implemented and followed up” (Wenblad 2001).
[8] ISO 14001 is a standard for environmental performance, which includes requirements for an EMS. It has been developed by the International Organization for Standardization. (ISO 2009)
In a ranking list by the Engineering News-Record (ENR), which is based on revenue from registered sustainable projects, Skanska’s U.S. affiliate has been ranked as the 12th on the list. According to the same list, in 2008 the company’s green revenue was 850.40 million dollars, which represented 13% of the total revenue. (Tulacz, 2009).

6.3 LEED at Skanska

Although the U.S. Green Building Council’s LEED certificate is relatively new, Skanska has already used it in about 70 projects in the United States. In addition, almost 400 employees of the company are LEED Accredited Professionals (AP’s) and the company even has an employee as a member of the Board of the USGBC. Skanska has recently introduced LEED in its construction projects in Europe and at the moment completed LEED buildings exist in Finland and the Czech Republic. The first building that is constructed according to LEED requirements in the Nordic countries is the office building Lintulahti in Helsinki, Finland. Skanska has about 35 AP’s in Europe and five in Finland. In addition, other employees within the company have expertise in the system and can thus contribute to the certification processes. Very recently, there have been initiatives for starting up a Finnish Green Building Council (FGBC) where the sustainability manager of Skanska Finland, Kaisa Kekki, has been an active member in. The organization has recently had a meeting with representatives consisting of many different stakeholder groups (construction companies, decision-makers among others). One of the aims of the organization is to make a decision on what rating system would be most suitable for Finnish conditions but it will still take time before the project will be in action. (Skanska 2009a; Andelin 2009; Kekki 2009)

The decision for starting to use LEED in Skanska’s building projects arose originally from the need to get a third-party verification for the competence that the company has. Inside the company there is a strong believe that it indeed is one of the best in constructing buildings, mainly due to the leading position it has received through working initially in the unique Nordic climate conditions. In addition, in the United States LEED is a requirement for some projects, i.e. the project initiator calls for it from the property developer. Of course, even reasons such as LEED being a good
marketing and communication tool in environmental matters, has played an important role in the decision-making process. (Andelin 2009)

6.4 LEED in Lintulahti project

Lintulahti is an office building constructed by Skanska Oy and has received a LEED precertification first of its kind in Finland. The precertification was granted in 2008 and the construction of the building was completed in spring 2009. (Andelin 2009)

![Picture 1 Lintulahti office building in Helsinki, Finland](image)

The type of certification that was implemented in Lintulahti is called LEED Core and Shell (LEED-CS), in which the maximum amount of credits is 69. Another type, such as the LEED for New Construction (LEED-NC), could have been chosen but Skanska considered LEED-CS to be the best one for this project. Andelin (2009) says that this decision was based on the fact that the Core & Shell system offers the opportunity to apply for a precertification already in the design phase, which in turn provides guidelines about the level at which the final certification will stand. In addition, the precertification can be used for marketing purposes before the building is completed. This opportunity is lacking in LEED-NC, which is otherwise very similar to LEED-CS. The certifications in LEED-CS are awarded as following: certified 23-27 points, silver 28-33, gold 34-44 and platinum 45-61 points. At the time of registration
the current version was LEED 2.0, according to which the building was designed.⁹ (Andelin 2009)

A project can receive a precertification based on the plans that show how the project is designed to fulfil the different LEED requirements. This is done by the AP’s that collect sufficient data and document it, where after the documents are sent to LEED Online for evaluation. The project team of Lintulahti applied for a Gold precertification and after the evaluation the project was indeed granted a Gold and almost a Platinum level precertification. After complementing documentation from the construction phase the level will either be verified or given a chance for improving certain conditions in order to get the verification. For Lintulahti, the final certification decision will come around March 2010. (Andelin 2009)

Lintulahti project is likely to receive a gold status certification with 40 points in the application. The type of certification can in principle be changed into another kind such as LEED for Existing Buildings (LEED-EB) later on. The Lintulahti project has worked kind of as a pilot project for Skanska, i.e. the project has created a chance for the company to test how the implementation of LEED can work in its construction projects in Finland. There have been two AP’s from Skanska and one external AP from Pöyry involved in the project. In addition, other people with expertise in LEED (although not official AP’s) have participated in the certification process. (Andelin 2009; Kekki 2009; Suur-Uski 2009)

In order to increase the environmental efficiency low-emission materials and energy efficient design solutions among other features have been used. Also, the actual users of the building have or will be familiarized with and encouraged to operate the facilities environmentally efficient by e.g. giving recommendations for environmentally efficient devices, waste sorting and energy-saving operations. The site has previously been contaminated land, which has now been refined and put into use. The building is linked with good public transportation services and integrates with the existing urban structure. Since asphalted parking areas generate heat islets that increase the environmental load, the parking spaces are located in an

⁹ See appendix B for further information on LEED-CS.
underground parking garage. Remote cooling is used for cooling down the office spaces and the water “fittings” inside the buildings consume as little water as possible. In addition, low-emission interior materials have been used. Plenty of natural light is let inside the building through the design, which makes it possible to cope with a smaller amount of artificial light than in conventional office buildings. This in turn will save the energy that is normally used for lighting. (Skanska 2009e)

According to Kekki (2009) one of the most important things in the implementation process is that all the people working on the different phases of the process are fully involved and well informed. The actual application process is usually done entirely in the online system and in the order pictured below (fig. 3).

![Figure 3 LEED certification process (USGBC 2009f)](image)

In praxis, the implementation looks very much alike this figure. Kekki (2009) describes the different phases as following:

1. The project team considers whether or not the project meets the prerequisites for the certification and makes the decision based on these considerations. This is done together with the initiator of the project, i.e. the client. In case Lintulahti, however, Skanska owns the building and made the decision in-house.

2. Registration of the project in LEED online, which is done by the AP’s.

3. Decisions concerning the actual implementation, documentation and other preparations for the application.

   a) Planning phase: LEED works as a guideline for the design solutions, which are decided by the project managers, architects and other people involved in the

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10 In case Lintulahti the construction process was in fact well advanced before LEED was introduced for it, which changed the order of the process to some extent (Suur-Uski 2009).
planning. All the relevant data has to be well documented, which is done by the AP’s and then sent forward to LEED Online. A number of the points can be given based on the plans so the application can be submitted already at the planning stage. At this phase the project can be granted a precertification, as in case Lintulahti.

b) Construction phase: the documentation of relevant data, calculations and alike continues. The documentation is done with the help of ready-made templates, which saves time and effort. In this phase it becomes visible, which requirements are the most difficult ones to fulfil and the project team might have to change the plans and eventually find new ways of receiving enough credits for the desired level.

4. The application is submitted online.

5. The USGBC assesses the application in the United States based on the documents.

6. The USGBC either approves the application, decides on the level and grants the certification or gives the project conditions that it has to fulfil within a certain timeframe before it can earn the certification. The level may also drop at this stage.

According to Andelin (2009) and Kekki (2009), the decision on which rating system is being used in a Skanska project depends in principle on the customer. Skanska has used other systems than just LEED abroad and would likely do this in Finland, too, if a customer would demand it. This implies that if a Finnish customer would want a building to be certified under e.g. BREEAM instead, Skanska would probably try to implement that system in the project in question. However, most of the Finnish customers (such as Nokia and Nordea) want to use LEED, which suits the company well since it has the most experience and expertise in it. Andelin (2009) believes that in Finland municipalities and the government will probably not start requiring LEED as is the case in some other countries. Further on, she points out that for whatever reasons the implementation decision is made and no matter which rating system is being used, the most important thing is that a rating system is in fact being used.
After all, using a rating system increases the possibility of environmental issues gaining more attention and publicity, which is in favour of everyone. (Andelin 2009; Kekki 2009)

Since Lintulahti is one of the first LEED projects in Finland and thus cannot be compared to similar projects, it is at present difficult to accurately estimate all the benefits and costs of using the system in the project. The following sections deal with the research variables presented in the research model, i.e. the short-term and more certain up- and downsides as well as the more long-term and less certain up-and downsides of LEED in Lintulahti project from Skanska’s point of view.

6.4.1 Revenues

Andelin (2009) states that some of the most important revenues for Skanska from using LEED in the project are the savings from e.g. more efficient energy use, especially in the somewhat hard economic times of the present. According to her, the building consumes 27% less energy than conventional office buildings. The total savings are, however, not possible to calculate since Skanska has not decided on how long it will own the building, what the life-cycle of the building is or what the actual environmental performance of the building is after the tenants have moved in. Thus, Lintulahti works as a “test field” or a pilot project for Skanska, where the company aims to study and learn from the different outcomes, and not just in the construction but also the maintenance phase\(^{11}\). Kekki (2009) also says that the most important tangible benefits are the reduced operating costs, which is a fact that can be emphasized in the renting or selling phase and will likely raise (or at least enable maintaining) the value of the building. However, it is hard to say whether the increased value of the building is just due to LEED or if other aspects have played a part in it, too. In any case, according to Kekki (2009), the premises will be empty for a shorter period and Skanska can get a higher rental income from Lintulahti since tenants are willing to pay a higher price for certified office spaces (this according to a study). This is mainly due to two reasons; firstly, some companies require that their

\(^{11}\) Usually, construction companies only construct a building (or a housing area), after which it is sold on. This implies that the company does not consider the environmental impact of the maintenance of the building. (Andelin 2009)
premises are certified by LEED, which e.g. enables them to market their operations as more environmentally responsible, and secondly, the tenants are usually the ones that pay the operating costs, which are lower in LEED buildings.

There is naturally no information on the return on investment (ROI) in case Lintulahti yet but Kekki (2009) expects it to “be better” than in conventional buildings because of positive experiences in other projects. For example, in a project where the office spaces of Skanska in the Empire State Building in New York were renovated according to LEED, ROI was achieved in less than five years and the energy savings were 49%.

6.4.2 Intangibles

The less certain, intangible upsides of using LEED include both external and internal benefits for Skanska. First of all, there is the aspect of marketing and brand building, which is a part of the external benefits. According to Andelin (2009), the market value of LEED is high due to the fact that it is easy to use and communicate, and has been in place for a relatively long time. Kekki (2009) points out that marketing a project as LEED certified improves Skanska’s reputation and the company profile, which in turn is likely to lead to more future projects with higher margins. It is usually not enough that a company markets itself as environmentally friendly and thus, third party verification is needed for ensuring that environmental issues are managed well in the company. This can be helpful in discussions between Skanska and its customers and gives an opportunity to call for international investors, including many of the big players that require LEED (e.g. Nokia and Nordea). Furthermore, LEED might help to create a competitive advantage and can also be used for sharing information between the different affiliates within the Group and the diverse departments as well as for benchmarking, i.e. comparing between the different projects inside the company and/or to the projects of other construction companies (e.g. Peab). (Andelin 2009, Kekki 2009)

The internal intangible benefits deal with staff awareness and knowledge about environmental issues. According to Kekki (2009), these skills can be increased by
using a rating system such as LEED. LEED also provides a tool for coping with future requirements and leading the way gradually toward these; the EU has, for example, set a goal of reaching zero-energy in buildings by 2019. Since constructing buildings can take several years, this implies that design decisions concerning energy-efficiency have to be done well in advance. Hence, in principle, LEED makes complying with future regulations easier to handle and decreases the possibility of need for sudden changes. (Kekki 2009)

6.4.3 Costs

The tangible costs of implementing LEED in the project have not been that high since there is a great deal of know-how in using the system inside the Skanska Group. The registration and certification costs of LEED are the same everywhere. However, the project-based costs can vary relatively much. (Kekki 2009)

The amount of the registration and certification fees depends on whether the developer of a building is a member of the USGBC and how large the certified area is. Skanska still has no definitive cost estimates of the Lintulahti project, since the certification process is still pending. However, an indicative cost estimate can be done with the help of existing information on the Green Building Certification Institute’s (GBCI) website combined with data provided by the project coordinator Mia Andelin. Skanska is a member of the USGBC and the gross floor area is around 36,190.6 square feet (ft²) (11,030.9 m²). The fee for a “combined design and construction review” for buildings sized less than 50,000 ft² is a fixed $1,750 for full certification and $2,500 for the precertification. In the beginning of the certification process $450 was paid for registration of the project and in addition, an “expedited fee” of $10,000 for full certification and $5,000 for precertification is added up to the sum. Also, in case of appeals additional certification costs might come about. (GBCI 2009)

According to Kekki (2009), the so-called greening costs that are related to the certification process have, in principle, been even lower in Lintulahti than in Skansa’s U.S. -based projects due to the high base level of construction in Finland.
Andelin (2009) emphasizes the fact that Finland (and many other countries in Europe) is in some aspects above the requirements, for example in matters of public transport (at least in cities). Suur-Uski (2009) is in accordance with these statements and points out that the location of Lintulahti has been very beneficial when talking about the greening costs related to LEED. The building is located very centrally in Helsinki and is near to excellent public transportation links. Hence, the majority of the project-based costs in Lintulahti have arisen from the work that has gone to the documentation: an estimated 10 hours per credit. Since the project is first of its kind at Skanska Finland, consultancy fees and other labour costs stand for the majority of the tangible costs, which can, however, be expected to decrease in the future as the level of know-how and expertise in the system increases. Kekki (2009) further points out that, on the other hand, some of the work (e.g. energy simulations) would have had to be done in any case, i.e. all the work cannot be counted simply as LEED costs.

6.4.4 Challenges

The most challenging categories and requirements in case Lintulahti have been the ones related to energy and materials. Some of the energy standards required by LEED do simply not apply so well in Finland (Kekki 2009). Although the interest in LEED is growing, Andelin (2009) thinks it is still relatively hard to get information on the origin (or e.g. the recycling percentages) of the materials that are used in the construction phase. This is because the suppliers either do not know about the origin or are not able to prove it and thus, cannot ensure that a certain product is environmentally friendly. According to her, the materials category required most work in the Lintulahti project. Figure 4 (below) demonstrates how many points the project is expected to get in each category and hence, shows in which categories the project did perform well and vice versa. The balks represent the total number of points in each category.
Furthermore, Andelin (2009) points out that using local materials is something that Skanska should work on since transports from remote places cause a lot of emissions and in some cases even more costs. However, some of the requirements in LEED makes this very difficult: for example, wood that is used in LEED projects is required to be FSC- certified\(^{12}\), but in Finland this kind of wood is almost impossible to find. Instead, local wood that is certified by other organizations could be used. Skanska has made efforts to get local certifications accepted by the USGBC, but at the moment FSC is the only certification recognized in LEED due to the fact that it is the only one adopted by the NGOs\(^{13}\). (Andelin 2009; Kekki 2009; Suur-Uski 2009)

Other challenging LEED requirements in the Finnish context include e.g. handling rain water and the fact that the “Regional Differences” points are not available in projects outside the U.S.. Also, in the version of LEED that was used in Lintulahti a CO\(^2\) indicator was not included (the current version, however, takes the CO\(^2\) emissions into account). There are some additional demands that are not very applicable to the Finnish conditions (e.g. built-in watering systems), as well as a number of important aspects that are not included in the current system at all (e.g.

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\(^{12}\) FSC stands for Forest Stewardship Council, which is “an independent, non-governmental, not for profit organization established to promote the responsible management of the world’s forests” (FSC 2009)

\(^{13}\) Non-Governmental Organizations
operational time, moisture functions and flexibility for modifications of office spaces). (Andelin 2009; Kekki 2009; Suur-Uski 2009)

Andelin (2009) and Kekki (2009) emphasize that it is relatively easy to achieve a high level of LEED: in principle, in Finland all construction projects could achieve a gold certification by taking only the basic environmental issues into account. They see the issue as a possible challenge since it might lead to problems including the fact that the credibility of the system might suffer. Suur-Uski (2009), on the other hand, points out that Finns are often too modest and pessimistic and should consider this to be an advantage. In any case, it is important to get all the actors (including architects and local actors) involved and increase their level of awareness as well as to improve and further develop policies, communication, education and training about LEED (Kekki 2009).
7 Analysis

The following chapter analyzes the findings of this study by comparing the up- and downsides of LEED according to previous respectively this research. This is done with the help of two matrixes, which are based on the research model (fig. 2) presented in the methods section.

<table>
<thead>
<tr>
<th>LEED/Previous studies</th>
<th>Short-term / More Certain</th>
<th>Long-term / Less Certain</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Upsides</strong></td>
<td><strong>REVENUES</strong></td>
<td><strong>INTANGIBLES</strong></td>
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<td></td>
<td>Green (/LEED) buildings</td>
<td>- Important marketing</td>
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<td>- use less energy and</td>
<td>opportunity (Murdock</td>
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<td>water, which reduces the</td>
<td>2006).</td>
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<td></td>
<td>operational costs (e.g.</td>
<td>- Easier to receive</td>
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<td>Katz 2008).</td>
<td>financing (ref.).</td>
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<td>- provide an environment</td>
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<td>that fosters healthier,</td>
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<td>more productive workers,</td>
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<td>which reduces employee</td>
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<td>absenteeism (e.g. Turner</td>
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<td>companies’ financial</td>
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<td>performance (Turner report</td>
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<td>2008).</td>
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<tr>
<td><strong>Downsides</strong></td>
<td><strong>COSTS</strong></td>
<td><strong>CHALLENGES</strong></td>
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<td></td>
<td>- Basic registration and</td>
<td>- Lack of understanding,</td>
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<td>certification costs</td>
<td>knowledge and motivation</td>
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<td>according to the GBCI</td>
<td>(WBCSD 2009b).</td>
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<td></td>
<td>(2009).</td>
<td>- Not enough data</td>
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<tr>
<td></td>
<td>- Constructing a LEED</td>
<td>available (Murdock 2006)</td>
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<td></td>
<td>building costs 0,8% more</td>
<td>- Many developers build</td>
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<td>compared to a standard</td>
<td>speculatively and include</td>
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<td>building (Lockwood 2006).</td>
<td>only a short investment</td>
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<td></td>
<td>- The average extra cost</td>
<td>horizon (Murdock 2006).</td>
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<td>of building green is $3.00</td>
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<td>to - $5.00 per square</td>
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<td>foot (ft²) (Kats 2003b).</td>
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<td>- Increasing experience</td>
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<td>decreasing costs of</td>
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<td>certification (Kats</td>
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</tbody>
</table>

*Figure 5* Matrix of the short- and long-term up- and downsides for businesses of LEED according to existing research.
<table>
<thead>
<tr>
<th>LEED/ Lintulahti (LL)</th>
<th>Short-term / More Certain</th>
<th>Long-term / Less Certain</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Upsides</strong></td>
<td>REVENUES</td>
<td>INTANGIBLES</td>
</tr>
<tr>
<td></td>
<td>- Reduced construction and operating costs due to savings from e.g. more efficient energy use (consumes 27% less energy)</td>
<td>- LL works as a “test field” and provides lessons for future.</td>
</tr>
<tr>
<td></td>
<td>- Higher rental incomes</td>
<td>- Benefits with increased experience (→ declining costs).</td>
</tr>
<tr>
<td></td>
<td>- Many revenues yet unknown and impossible to calculate.</td>
<td>- <strong>External benefits</strong>: marketing and brand building → improves the company reputation and profile → more future projects with higher margins.</td>
</tr>
<tr>
<td></td>
<td>- Value of the building increases.</td>
<td>- Helpful in discussions between Skanska and its customers.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Gives an opportunity to call for international investors.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- <strong>Internal benefits</strong>: increases staff awareness and knowledge about environmental issues.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Helps staff to cope with future requirements and leads the way gradually toward these. This in turn decreases the possibility of need for sudden changes.</td>
</tr>
<tr>
<td><strong>Downsides</strong></td>
<td>COSTS</td>
<td>CHALLENGES</td>
</tr>
<tr>
<td></td>
<td>- Basic registration and certification costs.</td>
<td>- Most challenging categories: energy and materials (because hard to get certain information etc.)</td>
</tr>
<tr>
<td></td>
<td>- Majority of project-based costs gone to documentation, consultancy fees and other labour costs.</td>
<td>- U.S. -based standards problematic.</td>
</tr>
<tr>
<td></td>
<td>The costs have not been that high because:</td>
<td>- Other specific challenges in the Finnish context: e.g. built-in watering systems.</td>
</tr>
<tr>
<td></td>
<td>- already much know-how in using the system inside the Group.</td>
<td>- **CO² indicator not included in the LEED version used in LL.</td>
</tr>
<tr>
<td></td>
<td>- greening costs possibly even lower than in U.S. projects due to high base level.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- e.g. location of the building very good → no need for organizing alternative ways of transportation.</td>
<td></td>
</tr>
</tbody>
</table>

*Figure 6 Matrix of the short- and long-term up- and downsides for Skanska of implementing LEED in Lintulahti (source: Andelin 2009; Kekki 2009; Suur-Uski 2009).*
Many previous studies have shown that the market for green building is growing rapidly (see e.g. Tulacz 2009). There is a lot of literature on the LEED rating system, the short-term benefits and costs of green building as well as the long-term benefits. However, not much criticism towards the system can be found among these studies. The most essential findings from previous studies on the up- and downsides of building green are presented in the first matrix (fig. 5) above. Majority of the short-term benefits are related to cost savings and health gains of employees. A very important intangible benefit is the marketing opportunity that a certification provides. This can, in a longer time perspective, help building the brand of a company.

Furthermore, the matrix shows that the costs of building green are somewhat higher than those of conventional buildings. However, these extra costs are not very significant (only 0.8% higher compared to conventional buildings). There are also a number of challenges, which call for improvements in the system. This issue is addressed by the fact that LEED is being developed and renewed all the time, which in turn indicates that effort is continuously put on fighting these barriers and making the system more effective. Yet a question arises: how can buildings that have received the same level of a LEED application be compared if they are rated with different versions? Since not much criticism toward green building or the LEED system exist, some additional challenges may prevail in the background. Nevertheless, the most problematic and time-consuming challenge is probably related to the fact that many buildings are today constructed speculatively and with a short investment horizon. In conclusion, when taking a look at the existing research that was studied for this paper, it seems that the upsides of green building indeed outweigh its downsides.

As stated, most of the existing studies on green building and LEED are conducted in the U.S. and do not directly apply to the Finnish conditions. The empirical part of this study (section 6) demonstrates a number of interesting findings, of which the most important ones have been compiled in the second matrix above (fig. 6). It shows what the up- and downsides of the implementation of LEED are (or are expected to be) for Skanska Oy in case Lintulahti. The tangible and intangible benefits are many
and serve as a justification for the LEED implementation decision in the project. These benefits are similar to the findings in existing research. This is partly because some of the assessments that the interview respondents provided were based on the same secondary data as this paper’s theoretical part due to the fact that it is impossible to exactly define the ups and downs of the Lintulahti project yet. Despite this, the interviewed experts had a strong believe that the value of the building will increase due to higher rental incomes and that Skanska will benefit of the system in many additional ways in the long run.

Further on, the matrix demonstrates the short-term, more certain costs and the long-term challenges of the implementation of LEED. The additional LEED related costs have not been that high (e.g. due to existing access to public transportation hubs) and are likely to decrease even more in the future due to increasing know-how in the system. This increased experience is likely to reduce the need for external consultants and the working hours that go to the documentation. However, there are some arduous challenges related to LEED in Finnish use; in case Lintulahti, the most challenging categories were the ones concerning energy and materials, mainly because of the U.S. -based standards. However, as mentioned earlier, the system is improved and renewed continuously and might in the future apt better to Finnish projects.

When weighing the up- and downsides of the implementation of LEED in the case study, it looks like the benefits do exceed the costs. Moreover, all of the experts that were interviewed for this study felt that LEED was suitable for implementation in case Lintulahti. However, each construction project is different and has a diverse set of attributes that affect the implementation decision. Thus, the first phase of the implementation, i.e. considering whether the project will meet the prerequisites (and other requirements) for the certification, should be carefully contemplated before the final decision is made.

It is important that companies within an industry use the same kind of rating system so that their environmental, economic and social performance can easier be compared and evaluated. Thus, it would be good to choose one rating system that
all the actors in the Finnish construction industry would use - or at least know how to use. The first step in this process was taken recently when the Finnish Green Building Council (FGBC) was established just some months ago. The FGBC is not tied to a particular rating system but will consider all of them and try to either decide on e.g. what system is the most applicable in Finland or create a new system that is compatible both locally and globally. Since LEED is the widest known rating system in the world at the moment, it is likely to play a significant part in the future debates of the FGBC.\(^\text{14}\)

\(^{14}\)This according to Kekki (2009), who accounts to the members of the FGBC.
8 Conclusions

This chapter concludes the main findings of the study and provides an answer to the research questions presented in the beginning of this paper.

The findings in this study show that the benefits related to the implementation of LEED are numerous in case Lintulahti. Skanska is expecting the project to provide the company many tangible revenues, such as reduced costs due to savings from e.g. more efficient energy use and higher rental incomes, as well as intangible, less certain benefits, such as marketing and brand building related gains and learning to cope with future changes in the industry. The implementation of LEED in Lintulahti has, however, not been entirely trouble-free. Majority of the challenges have to do with the standards that are used in the system due to the fact that these are U.S. based. Also, some of the requirements do simply not fit in the Finnish circumstances. In conclusion, when comparing the differences it seems that the benefits of implementing LEED in Lintulahti do outweigh the costs and thus, LEED seems to have been applicable in the project. On the other hand, it should be kept in mind that the time span in the project is so long that most of these up- and downsides cannot be declared yet. Whatever the ultimate result in case Lintulahti turns out to be, one thing is for sure: green building provides many benefits that conventional buildings do not and the “party” that in the long run benefits from it the most is our natural environment.
9 Suggestions for future research

The purpose of this last chapter is to shortly present a few suggestions for future research.

Since LEED is so new in Finland and Nordic countries, many research gaps exist. The author wishes that future research would concentrate on thoroughly examining which of the following solutions would be most sufficient in the Finnish context:

A) to implement LEED in the Finnish construction market as it is,
B) to localize LEED for Finland or the Nordic countries as a group, or
C) to develop an entirely new system for the Finnish construction industry.
References

Printed sources:


Myllynpää, N. & Oscarsson, L. (2009). Towards a Sustainable Built Environment. Bachelor thesis for the Department of Business Studies, Uppsala universitet,
Sweden.


**Electronic sources:**


Energy Crisis, retrieved on October 27, 2009, from: www.energycrisis.org


Oral sources:


Virtanen, P., Controller at Skanska Oy. Personal interview, November 6, 2009. Skanska Oy Headquarters, Helsinki, Finland.
Appendices

Appendix A: Interview question template

What LEED certificates does Skanska have in use at the moment? What level of precertification has the Lintulahti office building received? Which version of LEED has been used in the project (LEED-CS 2.0)? What does a precertification mean in practice?

What were the heaviest reasons for introducing LEED (climate change, stakeholder demand, strengthening the brand...)?

Has Skanska done a cost-benefit analysis (CBA) / profitability analysis etc. concerning LEED? How was the decision for implementing LEED in Finland made?

What are the costs so far of using LEED in the project?

What benefits and costs/challenges do you think can come from using LEED? (For example, in development of new construction projects / from the Skanska’s and the customer’s point of view? (Easier to sell certified offices etc.?)

Do you think that the benefits of using LEED are similar to the benefits of green building in general?

How have you estimated the future benefits of using LEED?

What do you think of green building rating tools and LEED personally? Is LEED cost-effective?

How do you think LEED suits for a Finnish construction project? Are there many requirements in LEED that are not suitable for the Finnish conditions?

Do you think LEED is missing something essential (something that is an essential part of the environmental performance of buildings)?

Do you think some of the requirements in LEED are “unnecessary”?

What LEED category is the most difficult to fulfill? What are the most challenging environmental issues?

Do you believe that the demand for LEED-certified buildings will increase significantly in coming years? Why?

Which stakeholders will benefit the most from a LEED certification (the developer (Skanska), customers, etc.)?
Is Skanska using some other green building certificates (BREEAM, Nordic Swan, etc.)?

Do you think that LEED could become the overall green building rating system / general tool for rating green buildings?

How many AP’s (Accredited Professional) does Skanska have in Finland? How many AP’s were used in Lintulahti?
Appendix B: LEED for Core & Shell checklist (version 2)

Source: USGB

### LEED for Core and Shell v2.0
Registered Project Checklist

| Project Name: | | |
| Project Address: | | |

<table>
<thead>
<tr>
<th>Yes</th>
<th>?</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

#### Project Totals (Pre-Certification Estimates)
69 Points

- Certified: 23-27 points
- Silver: 28-33 points
- Gold: 34-44 points
- Platinum: 45-61 points

#### Sustainable Sites
15 Points

<table>
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<th>Credit 1</th>
<th>Credit 2</th>
<th>Credit 3</th>
<th>Credit 4</th>
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<th>Credit 7</th>
<th>Credit 8</th>
<th>Credit 9</th>
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<tbody>
<tr>
<td></td>
<td>Construction Activity Pollution Prevention</td>
<td>Site Selection</td>
<td>Development Density &amp; Community Connectivity</td>
<td>Brownfield Redevelopment</td>
<td>Alternative Transportation, Public Transportation</td>
<td>Alternative Transportation, Bicycle Storage &amp; Changing Rooms</td>
<td>Alternative Transportation, Low-Emitting &amp; Fuel Efficient Vehicles</td>
<td>Alternative Transportation, Parking Capacity</td>
<td>Site Development, Protect or Restore Habitat</td>
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</table>

#### Water Efficiency
5 Points

<table>
<thead>
<tr>
<th>Yes</th>
<th>Credit 1</th>
<th>Credit 2</th>
<th>Credit 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Water Efficient Landscaping, Reduce by 50%</td>
<td>Innovative Wastewater Technologies</td>
<td>Water Use Reduction, 20% Reduction</td>
</tr>
<tr>
<td></td>
<td>Water Efficient Landscaping, No Potable Use or No Irrigation</td>
<td></td>
<td>Water Use Reduction, 30% Reduction</td>
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### LEED for Core and Shell v2.0
Registered Project Checklist

#### Energy & Atmosphere (14 Points)

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<th>Points</th>
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<tr>
<td>Credit 1</td>
<td>Optimize Energy Performance</td>
<td>1 to 8</td>
</tr>
<tr>
<td>Credit 1.1</td>
<td>10.5% New Buildings / 3.5% Existing Building Renovations</td>
<td>1</td>
</tr>
<tr>
<td>Credit 1.2</td>
<td>14% New Buildings / 7% Existing Building Renovations</td>
<td>2</td>
</tr>
<tr>
<td>Credit 1.3</td>
<td>17.5% New Buildings / 10.5% Existing Building Renovations</td>
<td>3</td>
</tr>
<tr>
<td>Credit 1.4</td>
<td>21% New Buildings / 14% Existing Building Renovations</td>
<td>4</td>
</tr>
<tr>
<td>Credit 1.5</td>
<td>24.5% New Buildings / 17.5% Existing Building Renovations</td>
<td>5</td>
</tr>
<tr>
<td>Credit 1.6</td>
<td>28% New Buildings / 21% Existing Building Renovations</td>
<td>6</td>
</tr>
<tr>
<td>Credit 1.7</td>
<td>31.5% New Buildings / 24.5% Existing Building Renovations</td>
<td>7</td>
</tr>
<tr>
<td>Credit 1.8</td>
<td>35% New Buildings / 28% Existing Building Renovations</td>
<td>8</td>
</tr>
</tbody>
</table>

#### Materials & Resources (11 Points)

<table>
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<th>Points</th>
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<tbody>
<tr>
<td>Credit 1.1</td>
<td>Building Reuse, Maintain 25% of Existing Walls, Floors &amp; Roof</td>
<td>1</td>
</tr>
<tr>
<td>Credit 1.2</td>
<td>Building Reuse, Maintain 50% of Existing Walls, Floors &amp; Roof</td>
<td>1</td>
</tr>
<tr>
<td>Credit 1.3</td>
<td>Building Reuse, Maintain 75% of Interior Non-Structural Elements</td>
<td>1</td>
</tr>
<tr>
<td>Credit 2.1</td>
<td>Construction Waste Management, Divert 50% from Disposal</td>
<td>1</td>
</tr>
<tr>
<td>Credit 2.2</td>
<td>Construction Waste Management, Divert 75% from Disposal</td>
<td>1</td>
</tr>
<tr>
<td>Credit 3</td>
<td>Materials Reuse, 1%</td>
<td>1</td>
</tr>
<tr>
<td>Credit 4.1</td>
<td>Recycled Content, 10% (post-consumer + 1/2 pre-consumer)</td>
<td>1</td>
</tr>
<tr>
<td>Credit 4.2</td>
<td>Recycled Content, 20% (post-consumer + 1/2 pre-consumer)</td>
<td>1</td>
</tr>
<tr>
<td>Credit 5.1</td>
<td>Regional Materials, 10% Extracted, Processed &amp; Manufactured</td>
<td>1</td>
</tr>
<tr>
<td>Credit 5.2</td>
<td>Regional Materials, 20% Extracted, Processed &amp; Manufactured</td>
<td>1</td>
</tr>
<tr>
<td>Credit 6</td>
<td>Certified Wood</td>
<td>1</td>
</tr>
</tbody>
</table>
### Indoor Environmental Quality

<table>
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<th>No</th>
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<tbody>
<tr>
<td>11 Points</td>
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</tr>
</tbody>
</table>

**Prereq 1**  
Minimum IAQ Performance  
Required

**Prereq 2**  
Environmental Tobacco Smoke (ETS) Control  
Required

**Credit 1**  
Outdoor Air Delivery Monitoring  
1

**Credit 2**  
Increased Ventilation  
1

**Credit 3**  
Construction IAQ Management Plan, During Construction  
1

**Credit 4.1**  
Low-Emitting Materials, Adhesives & Sealants  
1

**Credit 4.2**  
Low-Emitting Materials, Paints & Coatings  
1

**Credit 4.3**  
Low-Emitting Materials, Carpet Systems  
1

**Credit 4.4**  
Low-Emitting Materials, Composite Wood & Agrifiber Products  
1

**Credit 5**  
Indoor Chemical & Pollutant Source Control  
1

**Credit 6**  
Controllability of Systems, Thermal Comfort  
1

**Credit 7**  
Thermal Comfort, Design  
1

**Credit 8.1**  
Daylight & Views, Daylight 75% of Spaces  
1

**Credit 8.2**  
Daylight & Views, Views for 90% of Spaces  
1

*Note for EQc4.1-4.4: Project teams will receive 1 point for achievement of 2 credits, 2 points for achievement of 3 credits, or 3 points for achievement of 4 credits among EQc4.1, EQc4.2, EQc4.3 and EQc4.4.*

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### LEED for Core and Shell v2.0

#### Registered Project Checklist

<table>
<thead>
<tr>
<th>Yes</th>
<th>?</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 Points</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Credit 1.1**  
Innovation in Design:  
1

**Credit 1.2**  
Innovation in Design:  
1

**Credit 1.3**  
Innovation in Design:  
1

**Credit 1.4**  
Innovation in Design:  
1

**Credit 2**  
LEED Accredited Professional  
1