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BUILDING PERFORMANCE OF THE GREEN CERTIFIED BUILDINGS: A CASE STUDY IN TURKEY AND IN THE NETHERLANDS FOR EVALUATING GREEN BUILDING CERTIFICATION PRACTICES

M.Sc. THESIS

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YEŞİL SERTİFİKALI BİNALARIN BİNA PERFORMANSI: YEŞİL BİNA SERTİFİKALARINI DEĞERLENDİRMEK İÇİN TÜRKİYE'DE VE HOLLANDA'DA ÖRNEK BİNA İNCELEMESİ

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To my teacher Prof. Yılmaz, my mom, my brother and my friend Orhun,

FOREWORD

Day by day, the global building market is developed through green building phylosophies and becomes more environmental friendly. At least this is the first opinion that people have about the building market, as every day the number of the buildings defined as certified or registered "green building" increases. However, the green building certification issue brings some doubts about the buildings' green performance, which are considerably important. Looking from a broader perspective, it is understood that green building certifications can be key issue in the green development of the building market and they can influence it positively or negatively. Because of that the quality of green building certifications and their assessment process are very significant in green buildng market. Also the results of them, in that case "the certification scores" should satisfy people in the market and gain their trust. With this point of view the building performance of green certified buildings are analyzed criticizing in this research. Besides, green assessment is evaluated in respects of certification process and consideration of local characteristics of countries.

The research studies were started at Istanbul Technical University (ITU) in Turkey and continued in Eindhoven University of Technology (TU/e) in the Netherlands in coorperation with ITU. I thank to every one who helped me in these research studies, my thesis advisors Prof. Dr. A. Zerrin Yılmaz, Prof. Dr. Ir. Jan Hensen and Dr. Daniel Costola; the researcher in the Building Physics and Services Unit at TU/e Bruno Lee; the researchers and my friends at ITU Neşe Ganiç, Ece Kalaycıoğlu, Gözde Gali and Alpay Akgüç. Besides I thank to my family and my friend Orhun Süzer for their support during this thesis period.

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ABBREVIATIONS

App : Appendix
ASHRAE : American Society of Heating, Refrigerating and Air Conditioning Engineers
BPS-Tool : Building performance simulation tool
BRE : Building Research Establishment
BREEAM : BRE Environmental Assessment Method
CAGBC : Canada Green Building Council
CASBEE : Comprehensive Assessment System for Built Environment Efficiency
DGBN : Dutch Green Building Council
DOE : U.S. Department of Energy
EPA : U.S. Environmental Protection Agency
GBC : Green building certification
GBCI : Green Building Certification Institute
IBPSA : International Building Performance Simulation Association
IEA : International Energy Agency
IGBA : Indian Green Building Association
LEED : Leadership in Energy and Environmental Design
LEED-CS : Leadership in Energy and Environmental Design for Core and Shell
NL : the Netherlands
UKGBC : U.K. Green Building Council
UNEP : United Nations Environment Programm
USGBC : U.S. Green Building Council
TR : Turkey

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BUILDING PERFORMANCE OF THE GREEN CERTIFIED BUILDINGS: A CASE STUDY IN TURKEY AND IN THE NETHERLANDS FOR EVALUATING GREEN BUILDING CERTIFICATION PRACTICES

SUMMARY

In the late of the 20th century, the phenomenon “green” came into people’s lives and today green development prevails among in every area as well as in the building market through green building certifications. Green buildings minimize the influence of buildings to environment and provide better working and living spaces. These green performances are very significant, as today worldwide the buildings are responsible from 30 - 40% of the total energy consumption and greenhouse emissions. Certification systems appraise a building's green performance and affirm its green building status through frameworks and targets to achieve a green building. However, there are several criticisms regarding to insufficient performance of green certified buildings.

The main purpose of the research is to analyze green building certification practices and clarify the green building and the green building certifications issues in the market. In the research a case study building is used in analyzes with building performance simulation tools and also assessed in the Netherlands’ building market as well as in the Turkish one. The green building certification score and credits are reviewed critically. Besides interviews and questionnaires are made with the stakeholders and their opinions regarding to the green building certifications are considered.

Based on the critics about green certified buildings and green building certifications an interview/questionnaire survey is prepared and applied in the Turkish and Dutch building market. In this survey, which can be characterized as a pre-research, totally 18 questions are asked to 20 stakeholders from different areas in market, which are architecture, construction, real estate, consultant and academician. The results can be gathered under three main headline such as insufficient green building certification practices, more performance expectations from the green certified buildings and the difference in the Turkish and the Dutch green building market, which refers to pessimistic aspects in Turkey and optimistic aspects in the Netherlands affected by the adapted green building certifications.

Case study analyses through building performance simulation tools and critical reviews against certification credits play an important role in the research. Achieved credits by the case study building are criticized in three parts considering local characteristics, construction phase and certification phase. Those credits have an influence as almost 60% to the total certification score and the most important ones are in the certifications phase like energy efficiency and daylight credits. In the research energy efficiency and daylight amount of the case study building is reassessed by energy and daylight modeling. The results of the both simulations are considerably less than the results in the green building certification score of the building. The energy efficiency is achieved as 6% in the research, however,

according to the building's certification report it is 32% considering energy demands. Likely to this situation, the building can have 3% daylight according to the research, however, in the green building certification it is stated that building can have 96% daylight. In both situations the differences are so apparent, that the importance of control in the certification phase is pointed out.

Local characteristics are very important in the green building assessment and because of that several credits, which are achieved by the case study building, are criticized in the research. Those credits deals with site selection, bicycle facilities, low-emitted vehicles, recyclable storage and tobacco smoke control. All in all they can affect the total score as around 18%. Because of the different characteristics of Turkey in comparison to the country in which the certification is prepared, achieving some credits like the ones mentioned above becomes very simple. So a certified building might not have sufficient performance, although its green building certification score is very good.

The last critic against the certification score of the case study building refers to the construction phase of the building. In this part generally the credits about applications in construction phase like waste management, precautions for indoor air quality and environment protection and commissioning. These credits have considerable influence on total score; however, the assessment methods in the green building certification leave the control and applications of these credits to the knowledge and conscious of construction companies. This situation might lead important problems in the operational period of the building and less performance than expected.

The estimation and analyze of the case study building in the Netherlands support other studies in the research and influence the results. The energy and daylight models, which are simulated according to the Netherlands' conditions, give results which are slightly more than the ones in Turkey, but still very low than the ones in the case study building's certification score. Besides the criticized credits of the building are compared with similar credits in BREEAM-NL, which is an adapted green building certification for the Netherlands. Based on this comparison it is understood that adapted green assessment and consideration of local characteristics are very necessary.

To conclude all the surveys and analyzes in the research, three main results are achieved. First of all it is noticed that green certified buildings might not have sufficient performance though a good certification score. Secondly it is accepted that it is very possible having several problems in the green building certification and they might influence buildings' green performance. As the last result it is pointed out that consideration of local characteristics in assessment is very important and necessary. These results can be classified as the main problems in the green building market and some solutions can be recommended to solve them. The main recommendations are proper control system, more knowledge and conscious and adapted/local green building certification system.

YEŞİL SERTİFİKALI BİNALARIN BİNA PERFORMANSI: YEŞİL BİNA SERTİFİKALARINI DEĞERLENDİRMEK İÇİN TÜRKİYE'DE VE HOLLANDA'DA ÖRNEK BİNA İNCELEMESİ

ÖZET

20. yüzyılın sonlarında hayatımıza giren "yeşil" fenomeni her alanda gün geçtikçe yaygınlaştığı gibi inşaat sektöründe de kendisini oldukça göstermiştir. Yeşil bina sertifikaları bu fenomenin ticari bir ürünü olarak inşaat piyasasında kullanılmaya başlanmıştır. Yeşil binalar inşaat ve kullanım dönemindeki performanslarıyla çevreye olan zararlı etkilerini azaltırken kullanıcılarına da daha sağlıklı ve verimli bir ortam sağlayabilir. Dünyadaki toplam enerji harcaması ve sera gazı salımının ortalama %30 – 40'ından binaların sorumlu olduğu göz önünde bulundurulduğunda yeşil binaların sağladığı bu yararlar oldukça önemli olduğu görülür. Yeşil bina sertifikaları ise binaların yeşil performanslarını değerlendirir ve belli kurallar ve hedefler yoluyla daha yeşil binalara ulaşılmasına yardımcı olur. Ancak yeşil sertifikaları binalara yönelik performans eksikliğine dair eleştiriler bulunmaktadır.

Araştırmanın temel amacı yeşil bina sertifikası uygulamalarını analiz etmek ve sektördeki yeşil bina ve yeşil sertifikalı bina konularına açıklık getirmektir. Araştırmada kullanılan örnek bina çalışmasından bina performans programlarıyla yapılan analizlerde ve Hollanda ve Türkiye inşaat piyasalarındaki değerlendirmelerde yararlanılmıştır. Bu bağlamda binanın elde ettiği yeşil bina sertifika kredileri eleştirel bir bakış açısıyla yeniden gözden geçirilmiştir. Bunun yanında inşaat sektöründe çalışanlar yapılan röportaj ve anketlerle onların yeşil bina sertifikalarına yönelik düşünceleri de gön önünde bulundurulmuştur.

Yeşil sertifikalı binalar ve yeşil bina sertifikalarına yönelik yapılan eleştirilerden yola çıkılarak röportaj ve anketler hazırlanmış ve hazırlanan anketler Türkiye ve Hollanda inşaat piyasasında çeşitli alanlarda görev alanlara uygulanmıştır. Bir ön araştırma olarak nitelenebilecek bu çalışmada toplamda 18 soru hazırlanmış ve 20 kişi bu çalışmaya katılmıştır. Katılımcılar mimari büro, inşaat şirketi, emlak ve yatırım firması, yeşil bina danışmanlığı ve akademisyenlik olarak 5 farklı alanda çalışmaktadır. Çalışmanın sonuçları 3 ana başlık altında toplanabilir. Bunlar yeşil bina sertifikası uygulamalarındaki yetersizlik, yeşil sertifikalı binaların performans olarak beklentilerin altında kalması ve yeşil bina sertifikalarına yaklaşımdaki Türkiye ve Hollanda pazarlarında büyük farklılıklar olması. Bu farklılıklar Türkiye pazarında yeşil sertifikalı binalara yönelik güvensizlik ve yeşil bina marketine yönelik kötümser bir bakış açısı varken, Hollanda'da yeşil bina sertifikalarının eleştirilere rağmen faydaları göz önünde bulundurularak iyimser bir bakışı olmasıdır. Bu durumun ortaya çıkmasında Hollanda'da kullanılan adapte edilmiş yeşil bina sertifikası etkin rol oynamaktadır.

Bina performans simülasyon programları ve yeşil bina sertifikasından elde edilen kredilerin yeniden değerlendirilmesiyle örnek bina üzerinde yapılan analizlerin araştırmadaki rolü büyüktür. Araştırmadaki örnek binanın yeşil bina sertifikasından

elde ettiği krediler üç ana başlık altında incelenmiştir. Bunlar yerel koşullar, inşaat süreci ve sertifika sürecidir. Araştırmanın bu bölümünde değerlendirilen kredilerin tüm sertifika skoruna yansıması %60 oranındadır. Bunlardan en önemlisi sertifika sürecinde problem yaşanan kredilerdir, enerji etkinliği ve günışığı oranı gibi. Araştırmada bina performans simülasyon programları yoluyla örnek binanın enerji etkinliği ve günışığı miktarı üzerine incelemeler yapılmıştır. Her iki simülasyon sonucuna göre binanın sertifikada gösterilenden daha fazla enerji harcadığı ve daha az günışığı elde ettiği görülmüştür. Binanın aldığı sertifikaya göre enerji etkinliği %32 olmasına rağmen araştırmada bu oran %6 olarak elde edilmiştir. Benzer şekilde %96 oranında günışığı aldığı ifade edilen sertifika sonucuna kıyasla oldukça düşük oranda günışığı aldığı, %3, araştırmada ortaya çıkmıştır. Her iki durumdaki bu belirgin fark sertifika sürecinde kontrol faktörünün önemini vurgulamaktadır.

Yerel koşullar yeşil bina değerlendirilmelerinde önem taşımaktadır, bu nedenle örnek binanın yeşil bina sertifikasından elde ettiği bazı krediler bu bağlamda yeniden incelenmiştir. İncelenen krediler arazi seçimi, bisiklet donatıları, az salınım yapan araçlar,geri dönüşümlü atıkların toplanması ve sigara dumanı kontrolüdür. Bu krediler toplamda genel skoru %18 etkileyebilirler. Yeşil bina sertifikasyonları temel olarak ortaya çıktıkları ülkenin karakteristiklerini ve kurallarını göz önünde bulundururlar. Ancak her ülkenin olduğu gibi Türkiye'nin de kendi karakteristikleri ve dinamikleri vardır. Yeşil bina değerlendirilmesinde bunları dikkate alınmaması sonucu bazı kriterler oldukça kolay elde edilebilir hale gelebilmektedir. Bu durum sertifikadan aldıkları yüksek puanlara rağmen yeterli performans gösteremeyen binaların ortaya çıkmasına neden olmaktadır.

Son olarak yeşil bina sertifikalarının inşaat sürecindeki uygulamaları eleştirel bir bakış açısıyla incelenmiştir. Bu konudaki krediler inşaat sürecinde atık kontrolü, çevreye verilen önem, iç hava kalitesine yönelik önlemler ve sistemleri devreye alınmasındaki uygulamalardır. Bu kredilerde elde edilen puanların binanın toplam skorunu önemli ölçüde etkileyebilmesine rağmen, sertifika sistemleri bu kredilerin kontrolünü ve uygulamasını inşaat şirketlerinin bilgisine ve bilincine bırakmaktadır. Bu süreçte bilinçli veya bilinçsiz olarak doğru yapılmayan uygulamalar yetersiz kontrol sayesinde binaya bu kredilerden puan kazandırabilmektedir. Sonuç olarak sertifika sahibi olan binalar beklenen performansı gösteremezken binanın kullanım döneminde de sorunlar ortaya çıkabilmektedir.

Örnek binanın Hollanda'da yeniden değerlendirilmesi ve analiz edilmesi araştırmadaki çalışmaları desteklemiş ve sonuçları etkilemiştir. Hollanda'daki koşullara göre yapılan enerji ve günışığı simülasyonları Türkiye'lere kıyasla çok az farkla daha iyi sonuçlar verirken, bunlar yine binanın sertifikada elde ettiğinden büyük oranda farklıdır. Bunun yanında araştırmada incelenen sertifikasyon kredileri Hollanda koşullarında, burada kullanılan BREEAM-NL yeşil bina sertifikasındaki benzer kredilerle karşılaştırılmıştır. Bu çalışma bir ülkenin koşullarına göre adapte edilen yeşil bina sertifikalarini kullanmanın daha sağlıklı sonuçlar verdiğini göstermiştir.

1. INTRODUCTION

In the late of the 20th century, the phenomenon “green” came into people’s lives. Since from that it spread to whole world and today, green development prevails among in every area. There are so many productions in market endowed with green labels like environmental friendly, sustainable, energy efficient etc. So these terms become very common day by day. The situation in the building market is also similar. The only difference is that here the labels are the green building certifications. At first green building movement appeared in the market. After that, people made acquainted with the green certified buildings. Following it becomes a little complicated because of these different terms, but looking very similar.

It is known that in the capitalist system, which rules almost whole world today, all labels of the all consumer goods are for selling purpose only. However, people are also more aware of the earth’s requirements. Protecting natural sources, reducing fossil fuels, encouraging renewable energy sources, decreasing waste production, energy and water consumption and greenhouse gases emission have more importance now in the building market in comparison to 50 years ago. Hereby the green development tries to proceed in the middle of these two sides. Because of that, in the green building practices there are always the same questions appeared in minds: Is this the green of the environment or the money?

1.1 Purpose of Thesis

The main purpose of the thesis is to analyze and clarify the green building and the green building certifications issues in the building market. Specifying the main problems in the market regarding to these issues and trying to produce proper solutions to the problems is one of the main purposes of the research. In the following parts, the purpose of the thesis is explained presenting with background informations. These parts deal with situation of the built environment, green buildings and green certified buildings.

1.1.1 Situation of the built environment

The increasing world population has been making the built environment wider and bigger day by day. All the buildings around us are responsible for most of the energy, water, recourse consumption, CO2 emissions and waste production in the world. The researches show that CO2 emissions in developed countries grew more than 20% in 60 years and the global warming danger as well (Nelson et al, 2010). A 5° Celsius rise in global temperature, which has 50% possibility, causes a 10% loss in global economic output (UKGBC, 2012)

Worldwide the buildings consume 40% of the total energy; the U.S., Russia and the European countries have also similar rates as shown in the **Figure 1.1** (IEA, 2008). According to the report of DOE (2012), the U.S. Department of Energy, buildings are the reason of 72% of total electricity consumption and 38.9% of total energy consumption in the U.S. and 46.3% of that rate belongs to commercial buildings. With this high emission rate, the U.S. buildings forge ahead the total emissions of all other countries, except China (Kinzey et al, 2002). The situation is not different in Europe; 42% of the Europe's total energy is consumed and 35% of the total greenhouse gas emissions are produced by the built environment (Nelson et al, 2010).

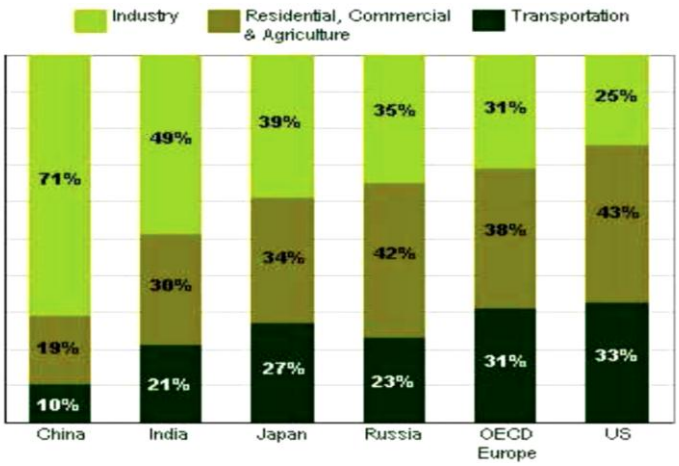

Figure 1.1 : Global energy demand in 2005 (IEA, 2008).

About water and resource, consumption and waste production there are big numbers for the built environment. The UNEP, the United Nations Environment Programme, (2012) states that buildings are responsible for the approximately 20% of global water usage and 3 billion tones used raw materials annually. In the U.S., the buildings contribute 13% of the total water consumption (USGS, 1995). The

municipal solid waste production of the U.S. built environment is 254 million tons in 2007 (EPA, 2008).

1.1.2 Green building definition

The world is now more sensitive and conscious about environment than in time past. The phenomenon "green" asserted it in many sectors and it continues to influence them increasingly. In this respect various terms are used in the building market like "green", "environmental friendly" or "sustainable" buildings which actually do not mean the same thing.

According to the Office of the Federal Environmental Executive green building is a method which increases the energy, water and materials efficiency of buildings and their sites and which reduces the their influence on health and environment with better site, design, construction, operation, maintenance and removal processes in whole building lifecycle (Webb, C. M., 2005). Green building refers to "the practice of creating structures and using practices that are environmentally responsible and resource-efficient throughout a building's life-cycle from sitting to design, construction, operation, maintenance, renovation and deconstruction." (EPA, 2008).

On the other hand, the term "sustainability" has a stronger meaning listed in the **Table 1.1**. Utkutuğ (2011) describes sustainable building and environment as more comprehensive and more challenging aim which is not easy to be achieved, but comprises "integrated and certain solutions" for the common future on earth. It is also characterized as a building, which "integrates building materials and methods that promote environmental quality, economic vitality, and social benefits through the design, construction and operation of the built environment." (Asset Management and Public Works, 2007).

Table 1.1 : Scope of the "green" terms (Nelson et al, 2010).

Concept/ Term	Functionality	Energy efficient	Resource intensity		Env. Compati-bility	Health	Socio-cultural aspects	Life cycle costs
Low energy buildings		+	(+)	(+)	(+)			
Low emis. buildings		(+)	(+)	+	(+)			

Green buildings		+	+	+	+	(+)	
High perf. buildings	+	+	(+)		(+)		
Sustain. buildings	+	+	+	+	+	+	+

1.1.3 Effects of green building

Green buildings influence all the people and everything in the world through interactions with environment. EPA (2008) expresses the effects of green buildings in three categories: Energy, water and resource efficiency, improvement in user health and productivity, and reducing waste, pollution and environmental defilement. Green buildings use major resources like energy, water, materials and land more efficiently. Providing more daylight and better air quality in living and working environment green buildings improve health, comfort and productivity of people. Besides green buildings, contribute some financial benefits by dint of these effects and lower costs in operational and maintenance period of building (Kats, 2003).

Efficiently energy usage and reduction CO2 emissions are the interdependent issues and one of the most important advantages of green buildings. Green buildings can be 30-50% energy efficient and make 35-40% less CO2 emissions (UNEP, 2012 and Anzalone et al, 2007). The improvement depends on how much "green" the building is, for example the reduction rate can reach 80-90% with good practice (Browning, 1992). Zhang and Cooke (n.d.) mention that energy efficiency in buildings will result as 1.6 Gt CO2 emissions in 2020 and 7 Gt in 2050. Besides the emissions of another important greenhouse gases like SOx and NOx are reduced depending on energy efficiency (Barnett and Browning, 2007).

Green buildings are essential for the efficient usage of water, which gains more importance considering depletion of water resources. Water consumption may be reduced with water efficient appliances and fixtures, consciously usage behaviors, responsible irrigation and water-reuse methods. With the green movement in buildings, 30-50% savings in water usage can be provided (UNEP, 2012 and Anzalone et al., 2007). According to the report of GSA Public Building Service (2011) through a 10% efficiently water consumption leads to the 2 trillion gallons of water saving in a year. Separately the building sector is getting more conscious about

their saving of water. The research from McGraw Hill Construction (**Figure 1.2**) presents that the interest against water efficiency is increasing in comparison the situation in 2009 (Bernstein, 2011).

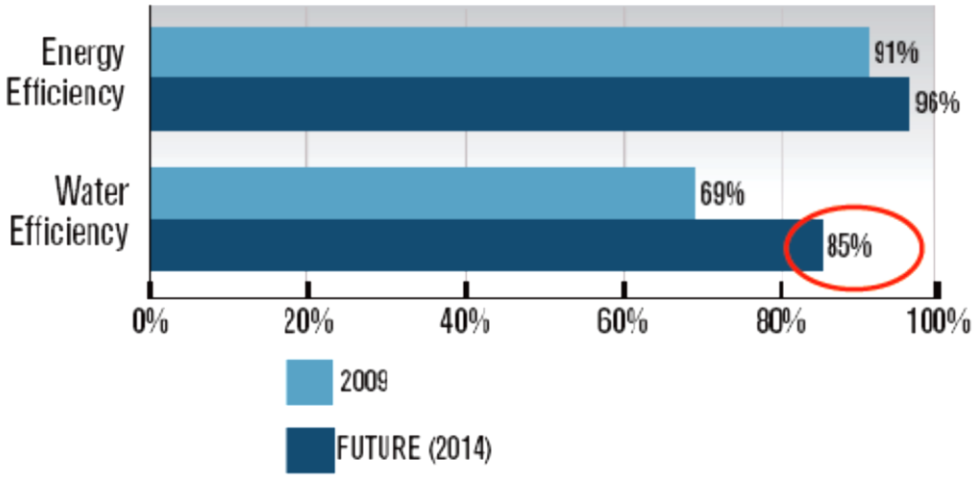

Figure 1.2 : Rapidly growing importance of water efficiency (Bernstein, 2011).

Waste management and encouraging "recycled" and "recyclable" material usage is another significant aspect in green movement. Also choosing responsible materials, which are produced close to construction site, and reusing building elements / materials provides remarkable resource efficiency. In green buildings there may be 50-90% less waste production (UNEP, 2012 and Anzalone et al., 2007) and since 2009 the awareness about waste management is increasing 20% (Bernstein, 2011). In addition to that, Barnett and Browning (2007) mention that the buildings designed and sited wrongly, damage environment and habitat. They say, "Green projects, on the other hand, can restore and enhance natural habitats, preserving valuable landscapes while adding to the marketable amenities of the project."

Green buildings influence people who live and work in that building providing better interior spaces with more daylight, interior air quality, acoustical and thermal comfort. Kats (2003) states with that in qualified workplaces people can work with less stress and can concentrate better on their responsibilities. He says, "Green buildings are designed to be healthier and more enjoyable working environments". There are some studies, which show that worker productivity is increased by 6% to 15% or more in green buildings. So the payback time of investments becomes shorter visibly (Barnett and Browning, 2007). The same situation obtains also for green built hospitals and schools. The McGraw Hill Construction's research states that in green

hospitals, patients feel more comfortable and release earlier, and there is 20% cost saving (Bernsterin, 2011). Students are educated in green school buildings; they are 20-26% faster and better than before (USGBC, n.d.).

Efficient strategies and better indoor environment provide financial benefits through increasing health and productivity benefits in comparison with traditional buildings. Also less operational / maintenance costs and higher building value play an essential role in these financial benefits (**Table 1.2**). The research of GSA Public Building Service (2011) shows that GSA's green buildings have 28% less energy cost, 12% less maintenance cost and 19% less operational costs. Kats (2003) points out that the total financial benefits in green buildings may achieve over ten times of mean initial costs needed for a green building. In addition to that, green buildings become more valuable by 7.5% and rent ratio of green buildings is 3% more than other buildings (Bowman and Wills, 2008).

Table 1.2 : Financial benefits of green buildings (Kats, 2003).

Category	Saving (per square foot) (based on 20-year net present value)
Energy savings	$ 5,8
Emission savings	$ 1,2
Water savings	$ 0,5
Operations and maintenance savings	$ 8,5
Productivity and health benefits	$ 36,9 - $ 55,3
Subtotal	$ 52,9 - $ 71,3
Average extra cost of building green	-$ 3 - -$ 5
Total 20-year net benefit	**$ 50 - $ 65**

1.1.4 Conflict between green buildings and green certified buildings

Green building and green certified building issues make people confused because of their similar look of these expressions. Therefore, their wrong usage causes often many misunderstanding. Green buildings are defined in the previous part as the buildings, which are more efficiency, more comfort and less damage to environment. On the other hand, green certified buildings are the buildings classified as "green" according to frameworks of green building certification. However, there are several critics about insufficient performance in green certified buildings. It is stated that LEED green building certification system looks like providing energy efficiency in

buildings in the U.S., but actually some certified buildings are not energy efficient (Gifford, 2009). This might be a big problem about the green building certification practices in the market. Because green certified buildings are marketed as "energy efficient" and they gain economical value with these certifications. But if they are not energy efficient as it is claimed, then green certified buildings might not decrease operational costs and also might not be environmental friendly any more.

In addition, some aspects in the market point out that the green building certifications' capacity is not sufficient for providing a very green building. Fenner et al. (2008) state that the green building certifications can't offer sustainability, but they can try to minimize unsustainability and that social and economic factors are generally missing in the green building certifications. In line with this opinion, the green building certification practices can be developed through the feedbacks from the market.

1.1.5 Problem Definition

In consideration of built environment situation, green buildings' effects and conflicts between green buildings and green certified buildings the definition of the problem in the research is that if the green certified buildings provide enough building performance and if there are problems in the green building certification practices.

1.2 Research Questions

Through the research, the two main research questions are fallowed. One of them is related with green certified buildings and it is "Do the green certified buildings provide enough performance to the building users?". The second one is about green building practices and it is "What are the problems in the green building certification practices?".

1.3 Methodology of the Research

As it is shown below schematically, the research studies proceed in two ways: green certified building and green building certifications. In the line of the green certified buildings, a case study building is examined through the building performance simulations, critical assessment of the green building certification score and the evaluation of the building in the Netherlands. In the other way, the literary researches

about the green building certifications, critics and benefits of them and adaptation of the green building certifications. As the common survey for the both research line there is interviews and questionnaires with experts from the market in Turkey and in the Netherlands. In the end all the results and in formations are gathered together for analysis, discussions and conclusions.

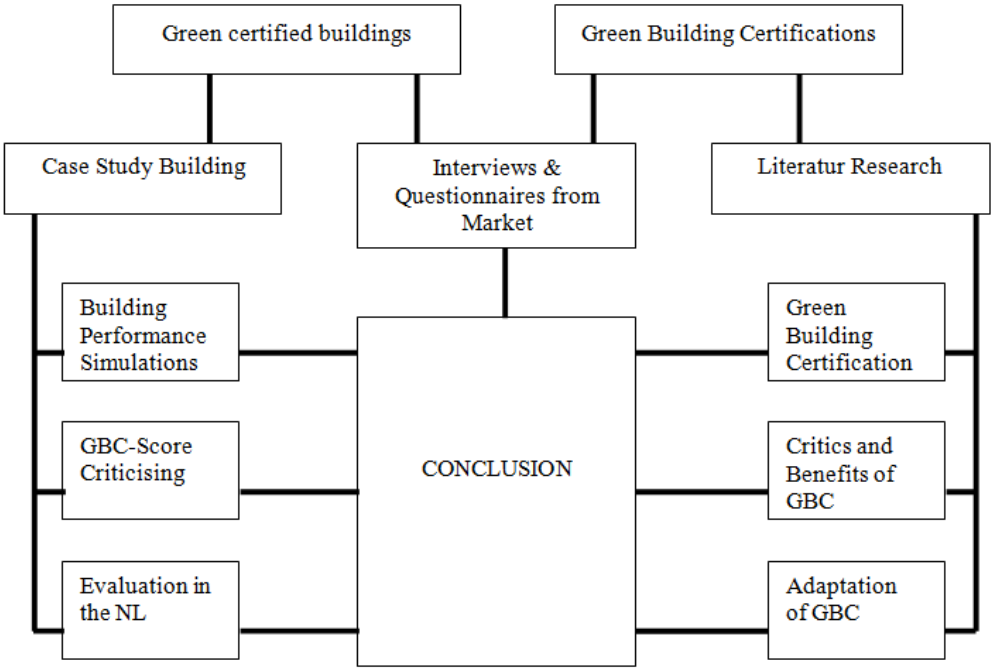

Figure 1.3 : Methodology of the research.

1.4 Outline of the Research

The research consists six main chapters:

In the first chapter purpose of the thesis, definition of problem, research questions and methodology are defined. Explaining the purpose of the thesis the built environment situation, definition of green buildings and their effects and the conflicts between green buildings and green certified buildings are mentioned.

In the second chapter, it deals with the literature research about the green building certifications, the critics and benefits of them and the adaptation issue of the green building certifications.

In the third chapter, there is the survey with the stakeholders from the market through the interviews and questionnaires about the green building certifications.

In the fourth chapter the case study building's architectural and technical properties, its green building certification score, analyzes through building performance simulation tools and the critical study about the green building certification points of the case study building are explained.

In the fifth chapter, the case study building is estimated and analyzed in the Netherlands. The criticized green building certification credits are compared with the adapted green building certification of the Netherlands.

The sixth chapter is the last one and in this chapter, all the research studies are gathered and concluded.

2. GREEN BUILDING CERTIFICATION

Green building certifications lead to building projects for green performance and affirm their green building status. Vandervelde and Waters (2010) point out that the green building certifications consist frameworks to develop and assess buildings' green performance. They also state that green building certifications affect demand and recognition in the market positively. Ideally beginning from the design phase of the building these green building certifications are followed performing requirements in the frameworks as much as possible. In the end of whole certification process, the building qualifies a green building certification score depending its performance. The green building certification score is like the building's green performance identity in the market and informs investors, users and tenants.

Through the world various green building certifications have been using since the end of 20th century. The **Figure 2.1** shows the time line of the green building certification using mostly. The green building certifications, which are developed by different foundations and in different countries, have differences in their assessment method and progress, although they all have similar aims about evaluating and increasing green performance (McManus, 2010).

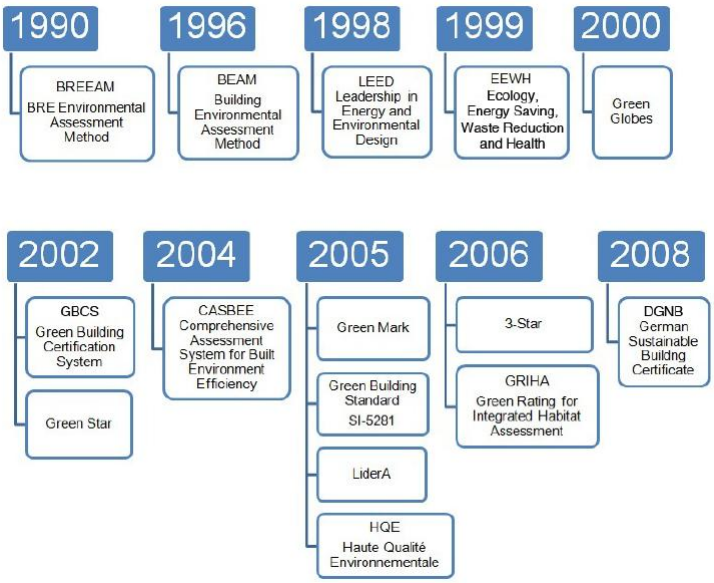

Figure 2.1 : Green building certification timeline (Portalatin, et al., 2010).

2.1 LEED (Leadership in Energy and Environmental Design)

The “Leadership in Energy and Environmental Design” certificate is the dominant green building certification in the U.S. market, but also one of most prevalent and preferred green building certification in the sector worldwide. It is developed by USGBC, the U.S. Green Building Council, and beginning from 2008 by GBCI, the Green Building Certification Institute (GBCI, 2012). LEED defines the sustainable building requirements and the point of view about green buildings for people in the building sector (Yudelson, 2008).

2.1.1 Background

The U.S. Green Building Council (USGBC) is a non-profit trade organization, which leads buildings and communities change in a green way. Rick Fedrizzi, David Gottfried and Mike Italiano established this organization in 1993. Since that, it grew so much, that 77 chapters, 13,000 members organization and 181,000 LEED professional became a part of USGBC (USGBC, 2012). The Green Building Certification Institute (GBCI) is a third-party organization about green building certifications. It supervises professional credentialing green certification programs independently. GBCI was founded in 2008 as a part of USGBC’s LEED certification for management of certifications and professional identifications (GBCI, 2012).

LEED is a certification product of USGBC for green building market. It is created first in 1998 as a pilot project program, LEED Version 1.0. Through changes and developments, new LEED versions ensued: LEED Version 2.0 in 2000, LEED Version 2.1 in 2002 and LEED Version 2.2 in 2005 (USGBC, 2011). The current LEED certification, LEED Version 3.0 was launched in 2009 (USGBC, n.d.). According to the statement of USGBC the next version of LEED, LEED Version 4.0, will be presented to the market in 2013 (USGBC, 2012).

LEED is growing in its home market, the U.S., strongly and it is expending many countries as well (Nelson et al., 2010). Since 1998, 13,000 buildings from 144 different countries all over the world are certified with LEED and almost 26,000 buildings are registered for the green building certification (USGBC, 2012). Although it is not the first green building certification system in the world market, right now LEED is one the most requested green building certification in the world.

2.1.2 Assessment method

All LEED certification systems assess buildings according to the credits in five specific environmental areas:

1. Sustainable Sites

2. Water Efficiency

3. Energy and Atmosphere

4. Materials and Resources

5. Indoor Environmental Quality

There are several bonus credits, which are included in these two categories of Innovation in Design and Regional Priority (USGBC, 2011). The other additional credit categories: Smart Location & Linkage, Neighborhood Pattern & Design, Green Infrastructure & Buildings in LEED for Neighborhood Development and Location & Linkage, Awareness & Education in LEED for Homes (USGBC, 2012).

The simple point system in LEED defines certification score depending on the performance about credits. Each credit has only one static value as minimum one point and there is no negative value in the system (McManus, 2010). The "prerequisite" credits in LEED provide minimum standards and it is necessary to succeed those credits in order to have certification. Maximum a hundred points are able be awarded maximum from the 5 essential LEED categories; in addition to that there may be plus six points from Innovation in Design and four points from Regional Priority. The awarding of LEED certification is leveled in four classes (USGBC, 2011):

- Certified : 40–49 points
- Silver : 50–59 points
- Gold : 60–79 points
- Platinum : 80 points and above

Behind the relationship between credits and points of LEED certificate there are impact categories, which refer to all influences of a building in its lifecycle like greenhouse gas emissions, resource usage, pollution, indoor environment conditions. In LEED Version 3.0, the credit weightings based on impact categories were defined by U.S. Environmental Protection Agency's TRACI1, which helps to evaluate the

impacts in lifecycle assessment, industrial ecology, process design and pollution prevention. The weightings defined by the National Institute of Standards and Technology (NIST) are also considered in LEED Version 3.0 (Schmidt, 2012).

Different types of LEED certification programs exist in order to assess properly various type of building. There eight certification systems under the title of LEED, which are: LEED for Core & Shell, LEED for New Construction, LEED for Schools, LEED for Neighborhood Development, LEED for Retail, LEED for Healthcare, LEED for Homes, and LEED for Commercial Interiors (USGBC, 2011). The proportion of LEED certified buildings based on certification type is presented in the **Figure 2.2**, which shows that at most of the certified buildings LEED for New Construction is used for a green building assessment.

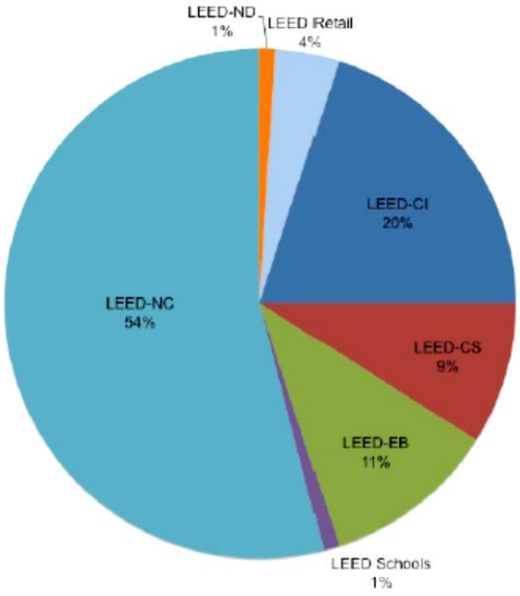

Figure 2.2 : Usage proportions of LEED green building certification types (Portalatin et al., 2010).

2.1.3 Certification process

The certification process of LEED consists of five essential steps, which are listed below (USGBC, 2012):

1. Defining the rating system type and preparing the application for the certification process
2. Registering the process with the fee which is 900€ / 1200€
3. Proffering the certification application with the review fee which varies depending on building type and area

4. Waiting for the application review which may take different time for each building type
5. Receiving the certification decision

After the registration with the GBCI, the USGBC helps the users about the certification tools, documents and information. Nowadays it is all done online at the website of the USGBC. For the final LEED certification, score of a building it has to be waited generally several months after the project finish (McLellan III, 2011). The GBCI is authoritative in all certificate applications and accreditation program for LEED Green Associates (LEED GA) and LEED Accredited Professionals (LEED AP). LEED GA's work in nontechnical areas like marketing, but LEED AP's are the technical professionals and help people during LEED process. Working with a LEED AP in this process is not compulsory, but it can be beneficial (Portalatin et al., 2010).

2.1.4 LEED-CS (LEED Core &Shell)

LEED for Core & Shell is a type of LEED certification, which is defined as a green building rating system for providing sustainable building criteria for uncertain developments and "core & shell" buildings. The including building elements in the term core and shell are the base building elements, like the structure, envelope, stairwells, elevators, bathrooms and utility spaces and also central electro-mechanical systems, such as HVAC. The LEED-CS considers that owner and tenant responsibility about buildings' certain element can be different in every country's market (USGBC, n.d.). The individual spaces, which belong to tenant, will be built and controlled separately after the completion of building core. The LEED-CS has some special standpoints such as default occupancy counts and energy modeling guidelines (USGBC, 2012). One of biggest benefit of the LEED-CS is pre-registration opportunity because of the strong marketing strategy for developers and buyers (Mohamed et al., n.d.).

LEED 2009 for Core & Shell Development Project Checklist (USGBC, 2011):

Sustainable Sites / 28 Possible Points

□ SSp.1 Construction Activity Pollution Prevention / Required
□ SSc.1 Site Selection / 1 Point
□ SSc.2 Development Density and Community Connectivity / 5 Points
□ SSc.3 Brownfield Redevelopment / 1 Point

□ SSc.4.1 Alternative Transportation: Public Transportation Access / 6 Points

□ SSc.4.2 Alternative Transportation: Bicycle Storage and Changing Rooms / 2 Points

□ SSc.4.3 Alternative Transportation: Low - Emitting and Fuel-Efficient Vehicles / 3 Points

□ SSc.4.4 Alternative Transportation: Parking Capacity / 2 Points

□ SSc.5.1 Site Development: Protect or Restore Habitat / 1 Point

□ SSc.5.2 Site Development: Maximize Open Space / 1 Point

□ SSc.6.1 Stormwater Design: Quantity Control / 1 Point

□ SSc.6.2 Stormwater Design: Quality Control / 1 Point

□ SSc.7.1 Heat Island Effect: Nonroof / 1 Point

□ SSc.7.2 Heat Island Effect: Roof / 1 Point

□ SSc.8 Light Pollution Reduction / 1 Point

□ SSc.9 Tenant Design and Construction Guidelines / 1 Point

Water Efficiency / 10 Possible Points

□ WEp.1 Water Use Reduction / Required

□ WEc.1 Water Efficient Landscaping / 2-4 Points

□ WEc.2 Innovative Wastewater Technologies / 2 Points

□ WEc.3 Water Use Reduction / 2-4 Points

Energy and Atmosphere / 37 Possible Points

□ EAp.1 Fundamental Commissioning of Building Energy Systems / Required

□ EAp.2 Minimum Energy Performance / Required

□ EAp.3 Fundamental Refrigerant Management / Required

□ EAc.1 Optimize Energy Performance / 3–21 Points

□ EAc.2 On-site Renewable Energy / 4 Points

□ EAc.3 Enhanced Commissioning / 2 Points

□ EAc.4 Enhanced Refrigerant Management / 2 Points

□ EAc.5.1 Measurement and Verification: Base Building / 3 Points

□ EAc.5.2 Measurement and Verification: Tenant Submetering / 3 Points

□ EAc.6 Green Power / 2 Points

Materials and Resources / 13 Possible Points

□ MRp.1 Storage and Collection of Recyclables / Required

 MRc.1 Building Reuse: Maintain Existing Walls, Floors and Roof / 1-5 Points

 MRc.2 Construction Waste Management / 1-2 Points

 MRc.3 Materials Reuse / 1 Point

 MRc.4 Recycled Content / 1-2 Points

 MRc.5 Regional Materials / 1-2 Points

 MRc.6 Certified Wood / 1 Point

Indoor Environmental Quality / 12 Possible Points

 IEp.1 Minimum Indoor Air Quality Performance / Required

 IEp.2 Environmental Tobacco Smoke (ETS) Control / Required

 IEc.1 Outdoor Air Delivery Monitoring / 1 Point

 IEc.2 Increased Ventilation / 1 Point

 IEc.3 Construction Indoor Air Quality Management Plan: During Construction / 1 Point

 IEc.4.1 Low-Emitting Materials: Adhesives and Sealants / 1 Point

 IEc.4.2 Low-Emitting Materials: Paints and Coatings / 1 Point

 IEc.4.3 Low-Emitting Materials: Flooring Systems / 1 Point

 IEc.4.4 Low-Emitting Materials: Composite Wood and Agrifiber Products / 1 Point

 IEc.5 Indoor Chemical and Pollutant Source Control / 1 Point

 IEc.6 Controllability of Systems: Thermal Comfort / 1 Point

 IEc.7 Thermal Comfort: Design / 1 Point

 IEc.8.1 Daylight and Views: Daylight / 1 Point

 IEc.8.2 Daylight and Views: Views / 1 Point

Innovation in Design / 6 Possible Points

 IDc.1 Innovation in Design / 1-5 Points

 IDc.2 LEED Accredited Professional / 1 Point

Regional Priority / 4 Possible Points

 IDc.1 Regional Priority / 1-4 Points

Totally, there are one hundred base points, also six points possible from Innovation in Design and four points from Regional Priority.

2.2 BREEAM (Building Research Establishment's Environmental Assessment Method)

BREEAM is a voluntary green building rating tool developed by Buiding Reserch Establishment (BRE) in the United Kingdom. It's one of the most widely used green building certification in all over the world. BRE (2008) defines the mission of this certification as determining the sustainable design standards for better buildings and measuring buildings' green performance. BREEAM aims to reduce the buildings influence to the world, to present a believeable green building certification and to encourage market about the green buildings (BRE, 2008).

2.2.1 Background

The Buiding Research Establishment (BRE) is an independent and objective research center, which provides consultancy, testing and training services in building market and it leads government, industry and business about sustainability. BRE also is the founding member of the U.K. Green Building Council. In 1921 this organization was founded with the name of "Building Research Station" funding by British government. It had its current name "Building Research Establishment" in 1972 and it was privatized in 1997 (BRE, 2012 and Nelson, et al., 2010).

In 1990 BRE launched the BREEAM green building certification for the new non-domestic buildings in the U. K. As BREEAM was getting widespread and known internationally, it was gathered under the BRE Global in 2006, which is another association in BRE. Also one more association named BRE Trust was founded between BRE and BRE Global. Now BRE, BRE Global and BRE Trust work together under the BRE Group (BRE, 2012).

BREEAM is the one of most common green building certifications. Globally there are more than 16.000 BREEAM certified projects, which mean more than 200.000 buildings and 115.000 of them in the U. K. More than 40.000 projects registered for BREEAM. The number of certified projects doubled between 2008 – 2012 (BRE, 2012 and BRE Global, 2008). For the usage of this certification in other countries various BREEAM Schemes were created including BREEAM Europe, BREEAM Gulf and BREEAM International Bespoke (Barlow, n.d.).

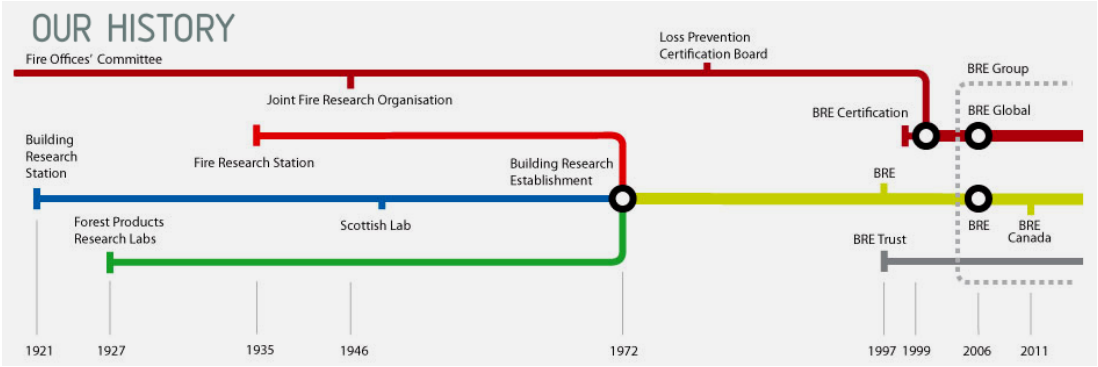

Figure 2.3 : History of the BRE Group (BRE, 2012).

2.2.2 Assessment method

BREEAM green building certification measure green performance of buildings thorugh 9 environmental categories listed below:

1. Management
2. Health and Wellbeing
3. Energy
4. Transport
5. Water
6. Materials
7. Waste
8. Land Use and Ecology
9. Pollution

Like in LEED, credits in the various environmental categories of BREEAM correspond to some points. As addition to these points, innovation credits, minimum BREEAM standards and environmental weightings. BREEAM stipulates some minimum standards in the assessment of buildings like the prerequisite credits in LEED. These standards should be achieved in order to be eligible to be certified (BRE Global, 2008). The percentages given in the **Table 2.1** are multiplied with the points, which are achieved from categories.

Table 2.1 : Exemplary level requirements of BREEAM (BRE Global, 2008).

Exemplary Level Requirements	
MAN 2	Considerate Construction
HEA 1	Daylighting
HEA 14	Office Space (BREEAM Retail & Industrial)
ENE 1	Reduction of CO2 Emissions

ENE 5	Low or Zero Carbon Technologies
WAT 2	Water Meter
MAT 1	Material Specification
MAT 5	Responsible Sourcing of Materials
WST 1	Construction Site Waste Management

BREEAM ratings are determined by achieving a set percentage of the benchmark points. Buildings must achieve at least 30% of the benchmark to qualify. The ratings are determined as follows:

- Unclassified Below 30% of Benchmark
- Pass 30%- 45% of Benchmark
- Good 45%- 55% of Benchmark
- Very Good 55%-70% of Benchmark
- Excellent Above 70% - 85% of Benchmark
- Outstanding Above 85% - 100% of Benchmark

In the **Figure 2.4 – 2.5** a calculation example of BREEAM score is presented. On the first columns, there are assessment categories. On every line their points and weightings are written. The multiplication results of points and weightings are summed and the total percentage gives the BREEAM score.

Minimum Standards for BREEAM 'Very Good' rating	Achieved?
Man 1 - Commissioning	✓
Hea 4 - High frequency lighting	✓
Hea 12 - Microbial contamination	✓
Ene 2 Sub-metering of substantial energy uses	✓
Wat 1 - Water consumption	✓
Wat 2 - Water meter	✓
LE 4 - Mitigating ecological impact	✓

Figure 2.4 : BREEAM score calculation example (BRE Global, 2008).

BREEAM Section	Credits Achieved	Credits Available	% of Credits Achieved	Section Weighting	Section score
Management	7	10	70%	0.12	8.40%
Health & Wellbeing	11	14	79%	0.15	11.79%
Energy	10	21	48%	0.19	9.05%
Transport	5	10	50%	0.08	4.00%
Water	4	6	67%	0.06	4.00%
Materials	6	12	50%	0.125	6.25%
Waste	3	7	43%	0.075	3.21%
Land Use & Ecology	4	10	40%	0.10	4.00%
Pollution	5	12	42%	0.10	4.17%
			Total Score		**54.87%**
			Innovation credits achieved		**1**
			FINAL BREEAM Score		**55.87%**
			BREEAM Rating		**VERY GOOD**

Figure 2.5 : BREEAM score calculation example (BRE Global, 2008).

2.2.3 Certification process

The BREEAM assessment process begins with registration and completion of the necessary documents by the design team. The project is then reviewed by a BREEAM assessor. The assessment report is filed and then reviewed by a member of the BREEAM team. Upon successful completion, certification is issued. BREEAM Accredited Assessors are trained and licensed by BRE to carry out formal assessment reviews and prepare assessment reports for submission to BRE for certification.

The BREEAM scheme can be used to assess and rate the environmental impacts arising from a newly constructed building development (including external site areas), and its ongoing operation, at the following life cycle stages: Design Stage (DS – leading to an Interim BREEAM certified rating) and Post-Construction Stage (PCS – leading to a Final BREEAM certified rating). The certified BREEAM rating at the

design stage is labeled as ‘interim’ because it does not represent the building’s final, new construction BREEAM performance. The interim DS assessment will therefore be completed and certified at the scheme design or detailed design stages.

The Post-Construction Stage assessment and BREEAM rating confirms the final ‘as-built’ performance of the building at the new construction stage of the life cycle. A final PCS assessment is completed and certified after practical completion of the building works. There are two approaches to assessment at the post-construction stage: A post-construction review of an interim design-stage assessment and a post - construction assessment.

2.3 Other Green Building Certifications

Although LEED and BREEAM are the most prevalent green building certifications, there are other various green building certifications worldwide. Some of them are explained following in order to show different assessment aspect to the green performance.

2.3.1 Greenstar

The Green Building Council of Australia is founded in 2002 and launched Green Star in 2003. Green Star, like BREEAM, is also focused on building life-cycle impacts. Green Star currently has almost 600 certified projects and 500 registered projects. Most of them are office projects (GBCA, 2012).

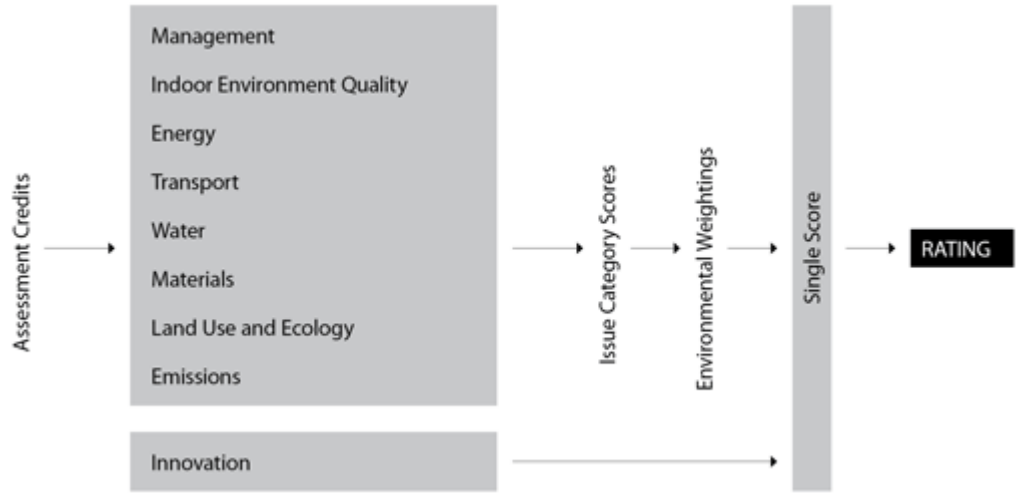

Figure 2.6 : Greenstar assessment process (GBCA, 2012)

Green Star is broken down into the following categories: management, indoor environmental quality, energy, transport, water, materials, land use and ecology, emissions and innovation (GBCA, 2012). These environmental categories have specific weightings and credits with points. Like in BREEAM, the total Greenstar certification result is calculated through points and weightings (**Figure 2.6**). The overall Greenstar ratings are defined as 4 star / Best Practice (45 – 59 points), 5 star / Australian Excellence (60 – 74 points) and 6 star / World Leader (75+ points).

2.3.2 CASBEE

CASBEE (Comprehensive Assessment System for Building Environmental Efficiency) is a relatively new system developed for the Japanese market. The system requires documentation of quantifiable sustainable design achievements, which are assessed by trained, first-class architects, which have passed the CASBEE assessor examination. Major modifications are expected to be made to the system every year.

CASBEE was developed in Japan, beginning in 2001. The family of assessment tools is based on the building's life cycle: pre-design, new construction, existing buildings, and renovation. In the **Figure 2.7** these assessment tools are explained schematically in building life cycle. Besides various types of this certification system are produced for specific conditions; these are detached houses, temporary construction, brief versions, local government versions, heat island effect and cities (IBEC, 2012).

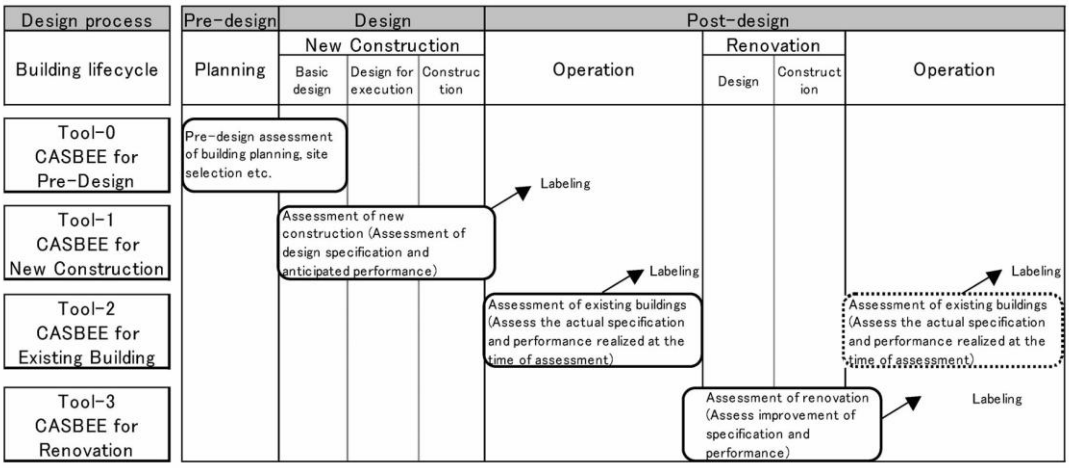

Figure 2.7 : Building lifecycle and four assessment tools of CASBEE (IBEC, 2012).

CASBEE uses a new approach in green performance assessment considering built environment quality and built environment load separately. Through the integration of these two factors, CASBEE creates the concept of "Eco-efficiency"(IBEC, 2012).

Development of this term is shown in the **Figure 2.8**. The assessment result, which is determined through points and calculations, are analyzed on the BEE diagram in order to see building's status (**Figure 2.9**). BEE means "Built environment efficiency", which is the eco-efficiency concept of CASBEE, and it is calculated through the division of built environment quality and built environment load.

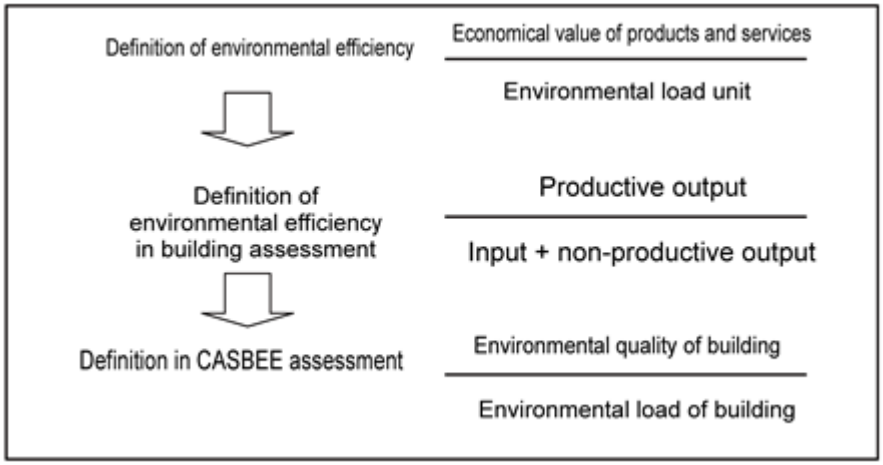

Figure 2.8 : Development of Eco-eficiency concept (IBEC, 2012).

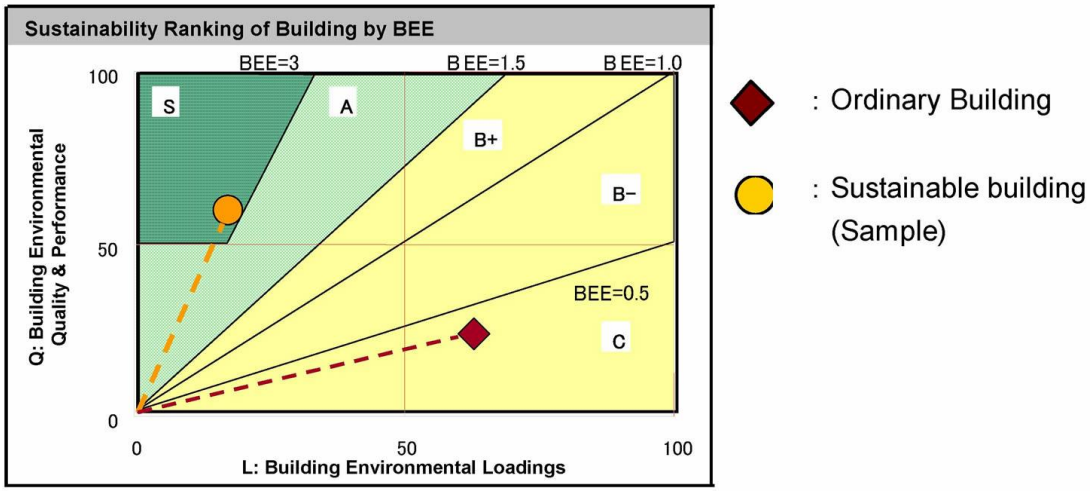

Figure 2.9 : CASBEE rating evaluation (IBEC, 2012).

2.3.3 DGBN

DGBN (Deutsche Gesellschaft für Nachhaltiges Bauen) is a green building certification based on Germany and the name of the German Sustainable Building Council (DGNB – Deutsche Gesellschaft für Nachhaltiges Bauen e.V.), which was founded in 2007 (DGNB, 2012). Two years later green building certification was launched in 2009. Today there fifteen different schemes of DGNB for specific issues and they are able to be used in Germany and internationally (DGNB, 2012).

The German system DGNB considers sustainability so widely in many aspects. Among others, the system considers cost issues, value stability, functionality and also the commissioning of the building. From the **Figure 2.10** and **2.11**, which show the assessment credits and categories of DGNB, it is understood how deeply and widely much this green building certification makes green assessment. Among these credits and categories, there are the ones, which are not considered generally by other green building certifications. Such as life cycle assessment, costs, socio-cultural issues, functionality, process, etc.

Figure 2.10 : DGNB green assessment criteria.

Figure 2.11 : DGNB green assessment criteria.

2.4 Praises and Criticisms About the Green Building Certifications

There are many views about the green building certifications in the market, which can be characterized as negative and positive thoughts. In this part of the research, these thoughts are explained for leading the further analysis in the research.

2.4.1 Praises about the green building certifications

Literature references show that the green building certifications have many positive effects to the green building market. These positive aspects are explained in four paragraphs as being a systematical green building assessment tools, developing the

green building market, making easier to manage the green building process and informing building users.

First of all the green building certifications are systematically prepared assessment tools to create greener buildings and to measure buildings' green performance. The main advantage of these certification systems is providing acceptable models to define and obtain high performance and green buildings (Elisa Campbell Consulting, 2006). For this systematical method different environmental categories consisting credits with specific assessment approach and points. Reed et al. (2009) states that the set of credits and categories create a design guide to lead the building process in design, construction and management periods more sustainable.

The second important benefit of the green building certifications is that they make the building market increase in more sustainable way and help to define and improve the minimum green level in the market. The green building certifications raise awareness about sustainability and support better green building certification practices in the market (Reed et al., 2009). Besides these certifications help to develop the market standards in a green approach. Cole et al. (n.d.) define the green building certifications as an industry standard for improvement in the building market.

Another advantage about using green building certifications is increase of the teamwork and integrated approach in building process. Credits in the green building certifications related with different building phases lead the building professionals to work cooperatively. Besides the green building certifications supposed to be followed from the very beginning of the building process and if it is achieved, it means an important step for an integrated building process. Cole et al (n.d.) mention that the green building certification systems support the dialogue and teamwork through for example "greater communication and interaction between members of the design team and various sectors with the building industry".

As the last benefit of the green building certification, it can be considered that they inform building owners, users and tenants about the green performance of the buildings. People can take advantage of the green building certifications to verify the green building (Fenner and Ryce, 2008). As knowing about the performance of the building such as energy efficiency, indoor environmental quality etc. might be very

helpful for evaluating operational cost and situation of the building, the score of the green certified building gains more importance.

2.4.2 Criticisms about the green building certifications

Beside benefits, there are many critics in the literary references about the green building certifications, which are gathered briefly in four main parts: insufficient performance of the green certified buildings, problems in the methodology of the green building certifications, not enough considering the local conditions in the green building assessment and difficulties in the integrated approach.

The first and the biggest critic about the green building certifications deal with the green performance and energy efficiency of the certified buildings. This is a very important issue in the green building market, as the green performance and energy efficiency are the main results of a green certified building. When the building cannot provide such a performance and energy efficiency as it is claimed in the building score, then the green building certifications turn to a misleading for building owners, users and tenants. Newsham et al. (2009) point out that 28-35% of LEED certified buildings consume more energy the similar non-certified buildings. In addition, they mention "the post occupancy evaluations (POEs) need to be undertaken to measure the buildings' performance" in the green building certifications.

The second critic regarding to the green building certifications is about their assessment method based on credits and points. The points given to the credits are arguable and through this, the green building certification process might turn to a point-chasing and awarding game. Say and Wood (2008) state that some credits in the green building certifications do not have the same effect and benefit, but they have the same point. Besides, they point out the point-chasing methodology saying, "Point- chasing occurs, where the building team works to achieve the greatest number of points possible at an affordable cost rather than looking at which methods would have the greatest environmental benefit". Besides the term "LEED brain" is mentioned as scoring points and not considering green building design (Reed et al., 2009).

The green building certifications are criticized also about the assessment in different countries with different local conditions. It has been argued that the green building

certifications do not consider local properties and conditions of different countries in the assessment. Sev and Canbay (n.d.) clarify that to achieve an influential and acceptable green assessment the credits and their methods in the green building certifications should be defined depending to local climatic, geographical and natural source capacity; and local economic and social conditions. The green building certifications are characterized as "not universal" and it is mentioned that they do not consider local climate and cultural difference in subjects like these "construction materials and technology, thermal comfort levels, water availability and electricity demands" (Say and Wood, 2008).

The last criticism about the green building certifications is difficulties in the integrated approach in the application. Although an integrated building process is very beneficial and important in the building process and in the green assessment process, there might be mistakes and problems in the applications in the countries in which the integrated approach is not common. Fenner and Ryce state that a better green building certification practice is possible with an integrated approach, but the current certification systems do not encourage enough this approach in the green assessment process.

2.5 Adaptation of Green Building Certifications

The demand for the green building certifications is increasing dependently to the development of green movement in the building market. However, the number of these green building certifications, which are acceptable and widespread in world green building market, is considerably less than the countries, in which green building movement distinguishes. In order to measure and control the sustainability of a project many countries have been using mostly these two common green building certificates, LEED and BREEAM, which are based on UK and US. Today lots of green building market of various countries understands the importance and necessity of an assessment considering local context, so they try to develop a local green buildings certification specific to that country or an adapted versions of LEED or BREEAM.

To control the environmental and energy effects of buildings many green building certifications are evolved until today. LEED and BREEAM are the ones that are used most common worldwide. Both green building certifications have several adapted

versions for different countries. The reasons for creating country specific green building certifications are such as that climate differences affect weightings, cooling strategy, energy consumption and renewable energy source type in a rating system and that substructure differences impact on recyclable waste capacity and "capacity to cycle to and from buildings"

2.5.1 Adaptation of LEED

LEED is a US-based green building certification tool; however, there are LEED registered buildings in 135 different countries – among these Canada, Brazil, Mexico and India (USGBC, 2012). More than 50% of area of total LEED registered buildings is from the projects outside the United States LEED is improved as a green building certification by three methods and adaptation is considered as one of them. Canada and India are the most important examples for the adaptation of LEED:

- LEED Canada : As an adaptation of LEED, the Canadian green building certification LEED Canada was developed tailored for climate conditions, construction applications and regulations of Canada. Canada Green Building Council was founded in 2002 and after that through a comprehensive adaptation process the new green building rating system is introduced to the Canadian market. In this process, stakeholders and experts from various sectors are participated in as well as CAGBC members (CAGBC, 2012).

Table 2.2 : LEED Canada for New Construction with certification numbers (CAGBC, 2012).

Rating level	Number
Certified	55
Silver	128
Gold	188
Platinum	19
TOTAL	390

- LEED India: The inception of the Indian Green Building Council was in 2001 and the IGBC became significant in the Indian building industry providing a leadership forum and a unique, integrating force. Following the council's foundation in 2001, the necessity of a determinant system for green buildings is realized by the IGBC. The LEED rating for the CII-Godrej GBC building at Hyderabad makes a great move in green building market in India. In order to have a suitable green building certification according to the country conditions

the LEED India Core Committee was set up by the IGBC. There are also architects, realtors, building owners and industry representatives included in this committee. In October 2006 the first LEED India rating program as LEED India Version 1.0, was launched during the Green Building Congress Conference. This rating system is now called the LEED India Green Building Rating System for New Construction and Major Renovations or LEED India NC (IGBC, 2012).

2.5.2 Adaptation of BREEAM

BREEAM is used generally in Europe; however, until today this green building rating tool certified many buildings from all over the world. Now BREEAM has adapted versions in various countries like the Netherlands, Spain, Norway, Sweden and in many countries it is translated for specific conditions of those countries. Aubree (n.d.) mentions the advantages of BREEAM adaptation as consistency and comparability with other BREEAM certified buildings, opportunity of using national baseline and standards, cost effective assessment through local conditions, methods ad practices.

The local green building rating system based on BREEAM can be developed from new in three ways: adapting the BREEAM UK, European or International Schemes to the local conditions, making interpretation of the BREEAM Core Technical Standard for the local conditions or using the local Scheme, which is already in existence. The Netherlands and Norway can be considered as best examples for BREEAM adaptation:

- BREEAM-NL: The Dutch Green Building Council (DGBC) was founded in 2008 in the Netherlands aiming a measurable and developed sustainability in the building industry measurable by developing with one rating system throughout the Netherlands. Following this the building industry made first move because of the need of advertising about the sustainability level and building assessment in an accepted way worldwide. Regarding the request of the industry the DGBC searched for a green building rating model, which is able to be compared international scale, which can be adapted to the local conditions and standards like climate, building regulations. They also wanted an open and transparent certification balancing price and quality. After this process BREEAM was chosen to be the local green building crating tool in the Netherlands. In September 2009,

the council formally approved BREEAM-NL 2010 Version 1.0 for new buildings for individual offices, schools, shops, industrial buildings and major renovation projects (DGBN, 2012). In BREEAM-NL the credit weightings are mainly unchanged, the points of Health & Wellbeing were reorganized and there are some changes to criteria to reflect Dutch legislation and regulations (Aubree, n.d.).

- BREEAM-NOR: BREEAM-NOR was developed by the Norwegian Green Building Council which was founded in 2010 on license from BRE Global. The council consists 120 members and most of them are producers of materials and consultancy and construction companies. In addition, there are some municipalities and housing organizations representing the consumer side in the council. In 2011 the Norwegian Green Building Certification BREEAM-NOR was launched to provide a comprehensive assessment in green building industry. In BREEAM-NOR the weighting is changed only a little, water and pollution weightings are reduced, and transport and materials weightings are increased. The mandatory credits are shifted; water and site ecology have less mandatory credits, and moisture control, materials, and indoor air quality have more credits (Heine, 2011). One of the important differences between LEED and BREEAM is internationally assessment. Starrs (2010) mentions that BREEAM is more adaptable to local contexts and more advantageous than LEED concerning this issue. He says “LEED, however, has not been created with this level of adaptability and it is not run that way.”.

3. INTERVIEWS AND QUESTIONNAIRES WITH STAKEHOLDERS FROM THE TURKISH AND DUTCH BUILDING MARKET

The third chapter of the research deals with a survey that goes through a critical review from the stakeholders in the Turkish and Dutch building market. Green building certifications and their roles in the market are analyzed in the survey. For this survey, a questionnaire is prepared and interviews are planned based on the questionnaire.

As stated in the first and second chapters of the research, there are doubts about the performance of green certified buildings, especially about LEED and BREEAM, although the existence of their advantages is accepted for a green future in construction sector. Literary researches and observations from the building sector indicate that "green performance" and cost efficiency of green certified buildings are questionable. On the other hand, these certifications enrich buildings value economically as a label of green. This situation sometimes creates a delusion and failure to satisfy building owners, users and tenants. Thus, the assessment method and processes of green building certifications are criticized in many aspects, the compatibility of local conditions as well. Besides, the opinions about choosing the most acceptable green building certification vary in three point of views: using the common green building certifications like LEED, BREEAM, adapting these certifications to local conditions or having a local green building certification system. In order to analyze and clarify the thoughts from the building sector related to the issues mentioned above the survey is put in progress in the Turkish and Dutch market.

The details of the survey are explained in the following parts as methodology, and results. As an important information the interviews which were made with stakeholders are presented in the appendix as a filled out questionnaire form.

3.1 Methodology

The survey with stakeholders from the Turkish and Dutch building market is implemented through interviews and questionnaires, which are prepared considering critics about the green building certifications. The questions addressed in the interviews and the questionnaires are validated by researcher with help of the research team of university. As the subject of the research is related with green certified buildings in Turkey and in the Netherlands, the questionnaires and the interviews are constituted according to the both country. Therefore, there are two questionnaire samples and two interview samples based on these questionnaires.

Content of the questionnaires comprises five parts and an explanation in the beginning about the goal of the survey. In total, there are eighteen questions excluding inductor part; three of them are open questions, two of them are multiple choice, there is one rating scale question and the rest of them are single choice questions.

First part of the questionnaires is introductory part about the person who joins the survey and the foundation / company that he/she works. The questions asked in the first part are:

- Name
- Title
- E-mail
- Department
- Green experience : Green buildings / Green building certifications (LEED, BREEAM, etc.) / Other
- Company name
- Company size : 1-10 / 10-50 / 50-100 / over 100 employees
- Industry : Architecture / Engineering / Management / Consultancy / Real Estate / Academic / Other

In the second part is “Green Buildings and Green Certified Buildings”, and here the attitudes of the stakeholders regarding to these terms and their judgments to green performance criteria are defined through the questions and a rating scale. In this part, there are two open questions: green buildings and green certified buildings. The

Figure 3.1 show the rating scale with green performance assessment criteria like energy efficiency, waste reduction, etc and selections for their importance levels.

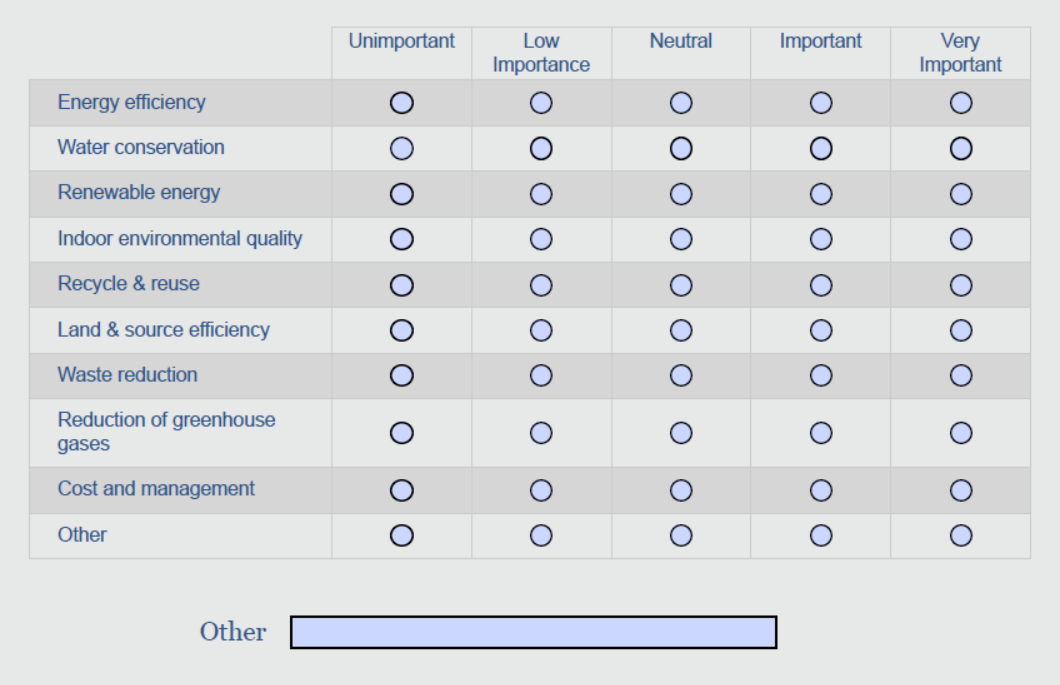

Figure 3.1 : Rating scale about the green performance assessment.

The third part in the questionnaire, Credibility of Green Building Certifications, involves single choice questions with "Yes-No-I don't know". This part questions green building assessment methods and their effects in the market. These are the questions in the third part:

- Do you think the award of green building certifications can ensure good green building performance?
- Do you think that the green building certifications are easily understandable and applicable?
- In your opinion, does the green building certification method based on credits & points provide a proper assessment for buildings?
- Do you think that the "point-chasing" mentality in green building certifications might hinder the green building design and construction performance?
- Do you think that green building certifications reduce costs in operational period of buildings?
- Do the green building certifications affect buildings' price?

- Do you think green buildings are economically more desirable than traditional buildings?
- Do you think that the green building label might be misleading for building users and tenants?
- In your opinion, do “green buildings” and “green certified buildings” refer to the same thing.

There are two multiple-choice questions in the fourth part, Green Building Certification Process, and these questions analyzed thoughts about problems in the process and the reasons of them. The questions are presented with their answer selections.

- In which building processes do you think that some problems might occur about green building certifications? : Design / Construction / Usage / Maintenance / Documentation (green building certification) / Other
- In your opinion, what are the reasons of these problems? : Lack of knowledge / Less green-building-conscious / Disinterest / Difficulties about certification / Difficulties in application / Costs / Lack of control / Insufficiency in certification / Other

The fifth part is named “Green Building Certification in the Market” and it addresses the questions about situation in the market. In addition, it expects some recommendation from stakeholders. The questions are presented following:

- Do you consider the green building certification practices in Turkey / the Netherlands good enough?
- Considering the Turkish / Dutch construction market, which type of green building assessment will be more beneficial for better green building performance? : Local green building certification / Common green building certifications (like LEED, BREEAM) / Adapted green building certifications (like from LEED, BREEAM)
- Do you have any recommendations for better green building certification practices in Turkey / the Netherlands?

The survey is applied in two ways to the experts from Turkey and the Netherlands: as a questionnaire or an interview. For the questionnaires, first it gets contact with the experts and sends the questionnaires. For the interviews, it has a talk with the experts

considering the questions in the questionnaire. This conversations are not recorded, because of that the results of the interviews are presented in a questionnaire form. Totally 20 stakeholders from both countries joined to this survey and 50% percent of the survey is applied through interviews.

3.2 Results and Comparison

As the parts of the questionnaire, the results can be analyzed in five parts following. The stakeholders participated in the survey are from different areas in the building market. According to the results, they work mostly in construction and real estate companies. The **Figure 3.2** shows the range of working areas in the research.

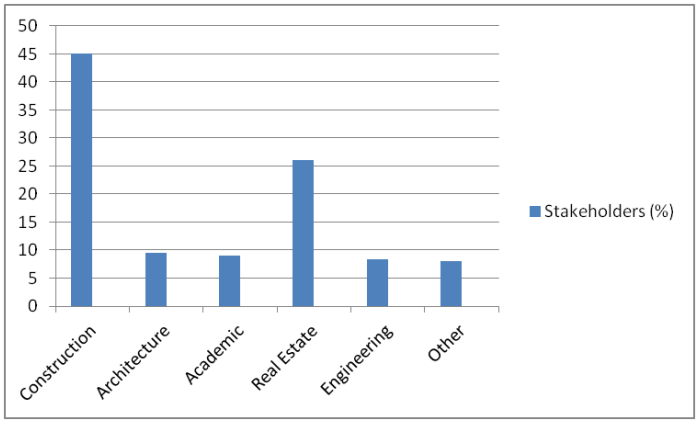

Figure 3.2 : Working areas of the stakeholders participated in the survey.

The first, introductory, part shows that generally 80% of the stakeholders have green building experiences. Also 85% of them worked before about green building certifications. Except these some experts experienced passive and zero-energy buildings, building energy modeling and building performance analyzing. The **Figure 3.3** presents the rates of green experiences in the Turkish and Dutch building market. The results point out that "green building" concept is more preferred or experienced than green building certifications in Turkey. In opposite way, green building certifications are more practiced than green buildings in the Netherlands.

The second part has results about green building and green certified buildings. General opinions about green building are very positive. The stakeholders from Turkey and the Netherlands define it as something beneficial for people and environment, but also an aim, which is difficult to achieve. For green building definition, these expressions are used mostly: beneficial, advantageous, ecological,

cost efficient, protecting environment, energy efficient, comfortable, and sustainable. However, the most interesting outcome from this question is that there are many definitions like "really green". About the green certified buildings, two main opinions prevail; although one side doesn't satisfy and trust the green building performance of green certified buildings, another side thinks that green certified buildings "add value" and "increase conscious" in the market. Especially stakeholders from Turkey define green certified buildings as buildings trying to be green, but cannot be totally. The results of the rating scale about green assessment criteria are presented in the **Figure 3.4** with total points and the points from Turkish and Dutch stakeholders. To achieve an obvious comparison between these criteria, the comments in the rating scale "very important – important – neutral – low important – unimportant" are valued with points from four to zero.

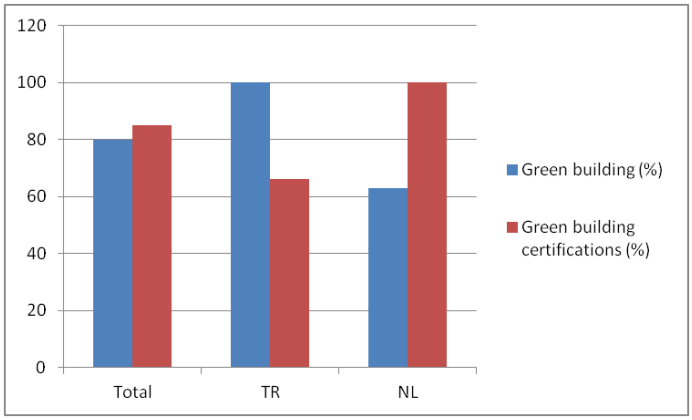

Figure 3.3 : Green experience in the building market.

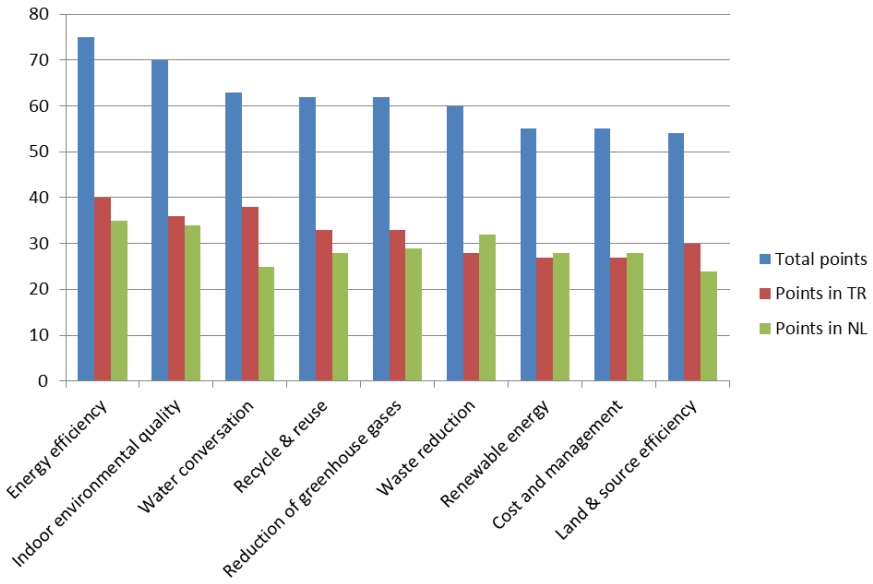

Figure 3.4 : Ordering of green assessment criteria in percentage.

In the third part there are questions regarding to the green building certifications and their assessments. In the **Figure 3.5,** the percentages of the answers are presented. According to the answers to these questions, the stakeholders attended to the survey think that;

- the award of green building certifications can't ensure good green building performance (Question 1),
- the green building certifications aren't easily understandable and applicable (Question 2),
- the green building certification method based on credits & points provides a proper assessment for buildings (Question 3),
- the "point-chasing" mentality in green building certifications might hinder the green building design and construction performance (Question 4),
- the green building certifications reduce costs in operational period of buildings (Question 5),
- the green building certifications affect buildings' price (Question 6),
- green buildings are economically more desirable than traditional buildings (Question 7),
- the green building label might be misleading for building users and tenants (Question 8),
- "Green buildings" and "green certified buildings" do not refer to the same thing (Question 9).

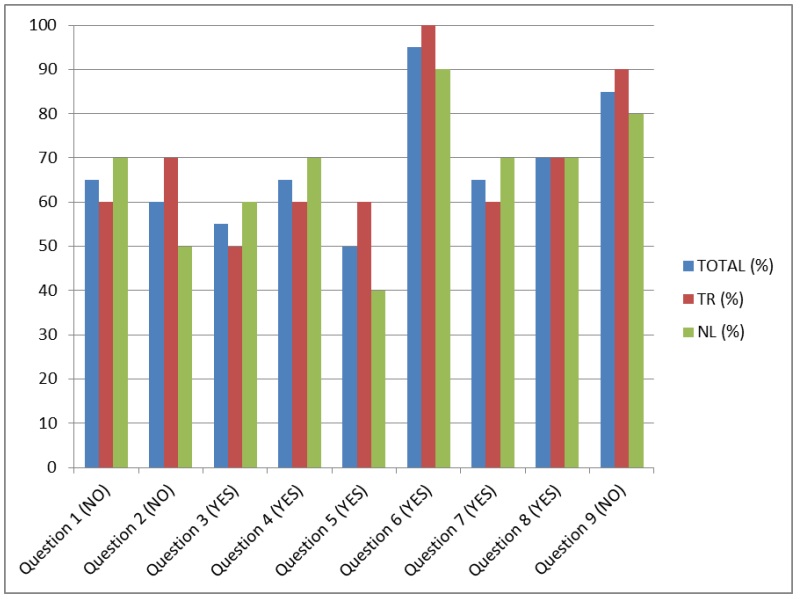

Figure 3.5 : Answer percentages in the third part.

The fourth part results dealing with the problems in the green building certification process and their reasons. The answers of the two questions in this part are presented in the **Figure 3.6** and **Figure 3.7**. From the graphs, it is clearly seen that usage and construction phases are seen as the processes with problems about green building certification. On the same graph, it is also interesting that big differences appear about maintenance and design answers between Turkey and the Netherlands. As the reasons of the problems, the most preferred answers are lack of knowledge and costs. Also, lack of control and disinterest answers are chosen by many stakeholders.

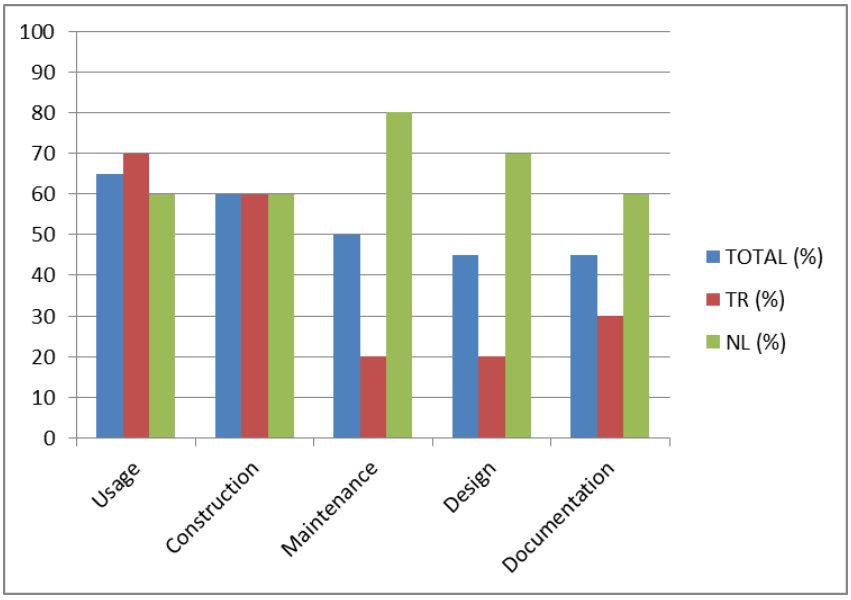

Figure 3.6 : Answer percentages regarding to the process with GBC problems.

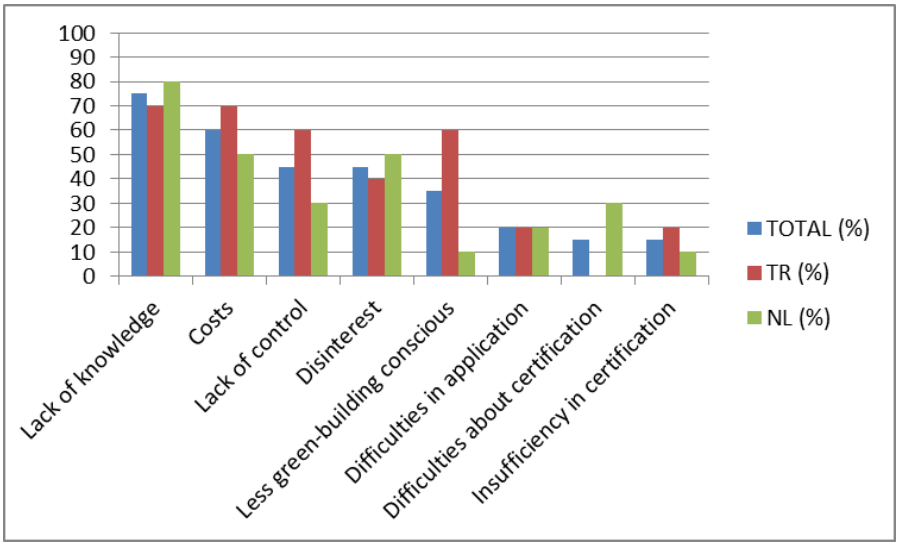

Figure 3.7 : Answer percentages regarding to the reasons for the GBC problems.

The green building certifications in market is analyzed in the fifth part and results show that 70% of the stakeholders think that the green building certification practices are not good enough in their countries. This is even 100% in the Turkish market. About the certification method, 40% of the stakeholders from Turkey prefer a local green building certification, and 40% of them want an adapted green building certification based on LEED or BREEAM. They recommend "more detailed" and "appropriate to local conditions" green building certification for Turkey. In the Dutch market, 40% percent of the stakeholders think that green building certification is good enough. They recommend "more well-known", "less cost" and "easier application" for the green building certification in the Netherlands. The **Figure 3.8** shows the opinions about the green building certification practice in both countries answers to the question "Do you consider the GBC practices in your country good enough?"

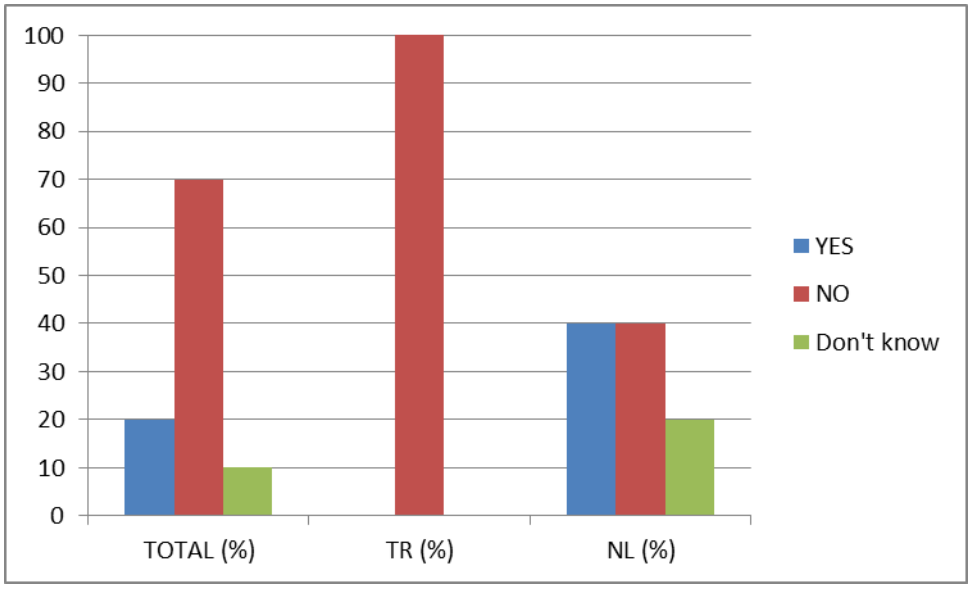

Figure 3.8 : Answer percentages regarding to the GBC practices.

The results of the interviews and questionnaires with experts bring so many issues into question. These issues have parallels with the critics about green building certifications.

The very high rates about green building and green building certification practices indicate that green buildings and green building certifications become very common in the market. There are so many people work on green buildings, green building certifications and green certified buildings. Although they are from different areas

from the building sector, the same “green” interest brings them together in a green building market. This situation is the result of green building certifications, but also the reason for them to become widespread.

In the definitions coming from the experts it can be seen that all the green term are mixed such as environmental friendly, sustainable, ecological. However, they do not refer to the same thing; people in the market think that green building are something beneficial to environment. Because of that they often use terms like “really green building” in order to mention how a green building supposed to be. They keep the green certified buildings apart from this term, as if there is an adjective “green” in front of the certified buildings, but they believe that these buildings are not “really green buildings”. There are two approaches as the reasons of that situation: critical approach and constructive approach.

The critical approach has a mistrustful attitude intended for the green building certifications. Many people from the market, especially from Turkey’s market, do not satisfy from green building practices. It arises from displeasure about assessment performance or method of the green building certifications. The survey points out that people from the market are aware of the positive effect of green building certifications to buildings’ price, but they don’t believe that the same effect appear in the operational costs of buildings. Therefore, they mention this situation as a misleading of green building certifications to building owners, users and tenants.

The second approach is more positive about the future of green building certifications and market. People from this approach emphasize the benefits of the green building certification system to environment, building sector and users. Although they know about the parts, which are not practiced correctly, in general picture they believe that advantages of the green building certifications are more than these incorrect parts. In their opinion, the green building certifications influence the building sector in a good way and the problems about the green building certifications help to the development for better assessment.

The rating scale shows that energy efficiency and reduction of water consumption are the most important issues in green building assessment according to the market experts. These terms are used very much in the building sector nowadays, as the energy sources from fossil fuel and water sources are increasing day-by-day and less

energy and water consumption become more important. This is one of the reasons for getting those results. In addition, it can be an interaction and high pointed or prerequisite credits in the green building certification can increase the importance of energy and water efficiency. In addition, the building market understands the value of indoor environment quality according to the results. This is important, because this issue is not directly related with reducing operational costs. This is about user comfort, health and satisfaction. Another important thing is that issues like recycle, renewable energy, greenhouse gasses are considered in the Netherlands more than in Turkey. This shows the development level of the Turkey's green building market.

The experts from the markets think that problems in the green building certification processes mostly happen in usage and construction period of the building. The idea behind is that a building can be design properly considering green approaches, but in the real applications and real usage problems might occur. Many of the experts justify this situation with lack of knowledge and costs. These results are acceptable also in real life. Building owners, users or tenants might give up some green application because of high costs or because they do not know the importance and advantages of that application. Same in the construction site, construction and investment companies might change some green properties of building considering high costs and there might be many mistakes and wrong applications arising from lack of knowledge. This can be also one of the reasons for not trusting to the green building certifications. People know that the buildings with the same mistakes and wrong applications can be certified, so they cannot define these buildings as green buildings. Therefore, as it is showed in the results of this survey, green certified buildings do not refer to green buildings according to the majority of the experts.

The biggest difference between the green building market in Turkey and in the Netherlands is that displeasure about the green building certification practices in the market. Not all the experts, who join to the survey from Turkey, are satisfied about the green building certification practices in Turkey. On the contrary, majority of the experts from the Netherlands characterize the situation as good enough. This picture is similar to the approaches against to the green building certifications. The critical approach part is represented by Turkish market, and the constructive approach by the Dutch market.

4. CASE STUDY AS A GREEN CERTIFIED BUILDING AND ANALYSES TO EVALUATE BUILDING PERFORMANCE OF GREEN CERTIFIED BUILDINGS

In the fourth chapter of the research, a case study building is used in the analyzes as a green certified building example and the critical studies about this example through building performance simulation tools and green building certifications are explained in detail. By using a case study building in the research, it aims to investigate the building performance of green certified buildings through this green certified building example. The parts of the fourth chapter are information about case study building, building performance simulations and critical review to the green building certification score.

4.1 General Information About the Case Study Building

As the case study building, a typical office building with a green building certification is used. It is accepted that the case study building is in a very dense area of Istanbul as it is seen from the **Figure 4.1**.

Figure 4.1 : Area example for the case study building.

The case study building in the research is an eight-storey office building. However, there are four belowground floors, eight aboveground floors, also a ground floors and a mezzanine floor. The building is placed on the area through East-West axis with 8° rotation. Shape of the building is rectangle, which can be described narrow and long. There are several high buildings surrounding the case study building and the distance between the case study building and the other buildings on north and south is around 12 meters. In the **Figure 4.2** the case study building is presented in plan view. This is a plan of a normal floor used as office space. The rectangular shape of the building plan has 14 meter length and 62 meter width. On the floor plan it can be seen elevators, stairs, sanitary spaces, technical rooms and a big office area with an interior garden.

The structure of the case study building is a reinforced concrete coloumn – beam system. The facade of the building consists of a glazed curtain wall around office spaces on the floors; the core parts like stairs, sanitary spaces and technical rooms are closed with reinforced concrete walls. Matel shading elements and vegetation cover all the building facade as a shading system. On every floor there are interior gardens refers to a semi-exterior zone in the building, as they are protected from whole exterior wheather conditions with glazed facades, but still they have an air stream through open sides.

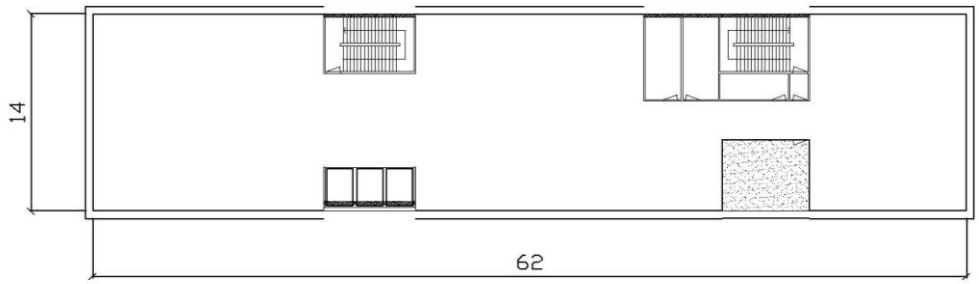

Figure 4.2 : Plan view of the case study building.

The space distribution of the case study building is generally same on above-ground floors. On these floors there are one big office area and the service spaces as the core of the building. There are two stairs in the building, one of them is for daily usage, one of them is for emergency. These stairs are continuous from the fourth basement to the terrace. The spaces on the basement floors are mostly car park, technical areas

and storage spaces. Unlike this on the first basement there are some office spaces, even some of them have daylight.

4.2 Building Performance Simulation

Building performance simulation refers to evaluating buildings' demands and consumptions, also analyzing performance of buildings regarding to daylight, indoor air quality, user comfort etc. Crawley (2008) defines BPS-tools as the programs, which can estimate buildings' reaction depending to the internal and external conditions. He states that these tools are used generally for design or renovation of a new building, but also about prediction for building's heating and cooling system, energy and new energy system estimation, nowadays they are used with integrated design approach. The usage purpose of building performance simulation tools in this research is to measure energy consumption and building performance of the case study building and then to compare the results with the ones made in the green building certification process.

As it is explained in the further subparts, the building performance simulations made in the research are energy demand and consumption analyze, daylighting analyze and user comfort analyze of the case study building. For these calculations various building performance simulation tools are used which are Energy Plus, Design Builder and Open Studio with Sketch Up interface.

4.2.1 Energy modeling

Building Energy Modeling (Building Energy Simulation or Dynamic Thermal Simulation) is defined by IBPSA (The International Building Performance Simulation Association, 2012) as a tool analysing the heat transfer and energy flows of buildings using annual run and weather data of the buildings' location. Generally it is used for to evaluate the energy demand and consumption of a building modeling heating, cooling, ventilation and lighting systems in the building. Also green energy systems can be modeled and so energy modeling can inform to make decisions.

4.2.1.1 BPS-tools and calculation of energy efficiency

The BPS-tools, which are used for energy modeling in the research like Design Builder and Energy Plus, calculate the energy consumption of the case study building

modeled in the programs. Using these tools, a proposed and a reference building are modeled and their annually energy consumptions are simulated.

Proposed building model refers to the model of the case study building, this means the model of actual building. Reference building is a version of the case study building, which is represented according to the baseline conditions in the standards. To calculate building's energy efficiency, energy consumption of the actual building, proposed building, is compared with energy consumption of reference building. This is simplified energy efficiency calculation method of the green building certifications.

For building energy simulation, first of all the building should be modeled geometrically to the simulation program. Building dimensions should be correct, but the interior partitions should be placed depending to the thermal conditions of the spaces. Generally, it overlaps with the building's actual plan drawings, however, some different situations might be exist. Shading system of the building and other shadowing elements around the building like other buildings, big trees etc. are also very important, as it affects the solar radiation transmittance. In addition, building place and rotation should be defined properly in the simulation program.

Else from building's physical properties modelled in a computational simulation tool there are some other preferences that play a significant role in energy calculations. These are materials, constructions of building elements, schedules, internal gains and HVAC system of the building. In the definition of materials the required data about a material is mostly thermal conductivity (λ), density (q), specific heat capacity (c) and for glasses solar heat gain coefficient (SHGC) and visible transmittance (tvis). Constructions are modeled in the program using these materials according to the actual building's constructions. Schedules are one of most important issues in the building energy simulation tools, cause they define fractions, working hours, set points etc. for every system in the building model. Internal gains refer to building users, lighting elements or electrical equipments, which have a heat flow with the building through radiation. That's why it is very important to define the internal gain, schedule and number of these elements in order to achieve correct results.

As the HVAC system of the building, the "Ideal Loads Air System" is used for the case study building in the simulation tools. The Ideal Loads Asir System method in

the tools refers to an ideal system, which supplies air to provide thermal and ventilation requirements of the zones. Energy consumption of the system is not considered; only the energy demand of the building for heating, cooling and ventilation is calculated (University of Illinois et al., 2011).

After entering all the data about the building to the simulation tool the weather data of the building's location is added to the program and the simulation preferences about results are defined, the simulation is run. The energy simulation tools can give so many different results about building performance, however, in the green building certifications the needed results are about annually energy consumptions and the cost of this consumption.

4.2.1.2 Energy modelling of the proposed and the reference building

Proposed building means the actual building, which is modeled in the building energy simulation tool. In the proposed building model all the data about the building should be realistic or just like in the application projects if it is not built yet.

The proposed model in the research is prepared according to the building properties, which are explained in the previous part about the case study building. For the internal gains, cooling loads from people, lighting and equipments are defined properly in the building model similarly to an office building. These internal gains come mainly from the office spaces. The number of occupants on each office floor is accepted as sixty. The internal gains per square meter are 12 W/m² for lighting and 11 W/m² for equipments in the office areas. The infiltration of the spaces, which have operable windows or doors, is entered as 0,5 ach to the building model. As the HVAC system of the building, the set-point temperatures are the main elements of the Ideal Loads Air System in the energy modeling. The defined set-point temperatures are for offices 22C for heating and 24C for cooling. In the sanitary spaces there is no cooling, but heating system works until 20C. Similarly, in the main technical rooms only cooling system works and the set-point temperature is 24C. The working hours are from 08:00 to 19:30 during the weekdays, so the operating hours of the mechanical system are from 07:00 to 20:30 during the weekdays.

The reference building model of the case study building is prepared in the research according to the ANSI/ASHRAE/IESNA Standard 90.1 – 2007, as LEED certification requires this standard in assessments (ASHRAE, 2007). For this model,

the proposed building model is changed following this standard and a reference building model for the case building is achieved. First of all, the shading devices around the building are removed, as they provide a positive effect to the building according to the ASHRAE Standard. Then the U-values of the external building elements are changed to the U-values defined in the standard depending to the climate zone of the building. The climate zone of Istanbul is explained in the ASHRAE standard as 3A. The **Table 4.1** shows the U-values of the proposed building and reference building models. Besides, there are some changes about the internal gains of the building. In the reference building, ligthing heat gains of spaces should be like it's stated in the ANSI/ASHRAE/IESNA Standard 90.1 – 2007 standard. The **Table 4.2** presents the different internal gains from lighting of the proposed and the reference building model.

Table 4.1: U-values of the proposed and the reference building.

U-Values [W/m²K]	Proposed Building	Reference Building
Exterior Walls	0,690	0,365
Roof	0,355	0,273
Ground	1,254	1,264 (F factor)
Basement Walls	0,029	0,678 (C factor)
Glazing	1,59	2,56

Table 4.2: Lighting heat gains of the proposed and the reference building.

Lighting – Internal Heat Gains [W/m²]	Proposed Building	Reference Building
Offices	12	12
Stairs	1,2	6
Corridors	10	5
Sanitary spaces	25	10
Car parks	2	2

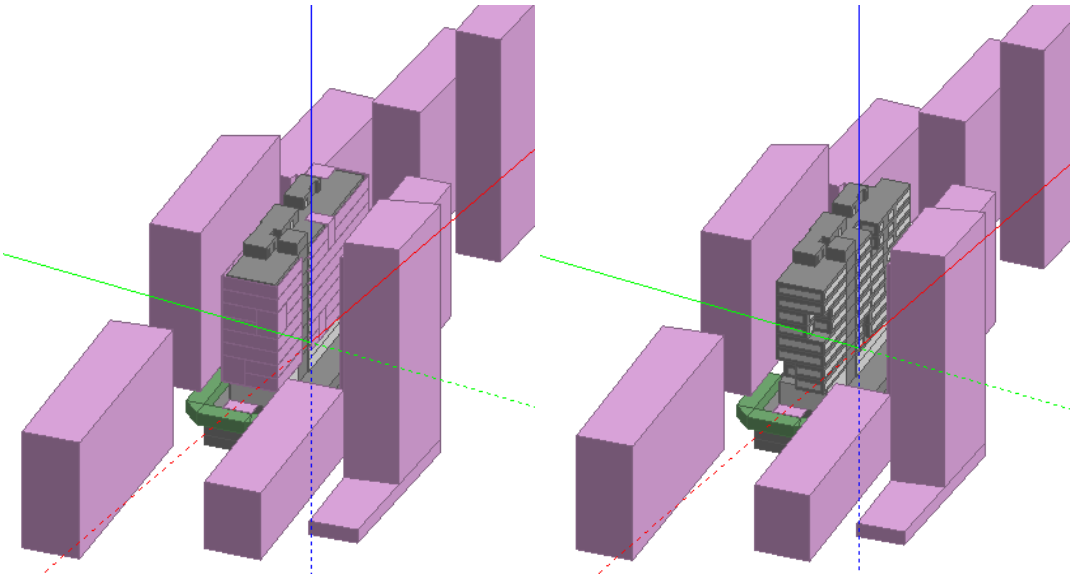

Figure 4.3 : The model of the proposed and baseline building.

4.2.1.3 Results and comparison

The results from the energy modeling of the proposed and reference building are presented and compared in this part. They are annually energy demands of the building models in kWh and kWh/m². In addition, energy demands of different end uses can be seen separately.

According to the results, energy demand of the proposed building is 73,56 kWh/m² and annually 1.060.803,32 kWh. 178.771,70 kWh of this amount is needed for heating, 348.662,28 kWh for cooling and 533.369,34 kWh for interior lighting and equipments. This means that the proposed building needs 12,4 kWh/m² heating energy, 24,18 kWh/m² cooling energy and 36,99 kWh/m² electricity energy with lighting and electrical equipments annually (**Table 4.3**). The **Figure 4.4** shows that cooling demands is almost two times of heating energy and electricity requirement for lighting and equipments is more than cooling and heating.

Table 4.3 : Energy demand of the proposed building.

	Electricity	Cooling	Heating
Lighting	17,23	-	-
HVAC	-	24,18	12,4
Equipments	19,76	-	-
TOTAL	**36,99**	**24,18**	**12,4**

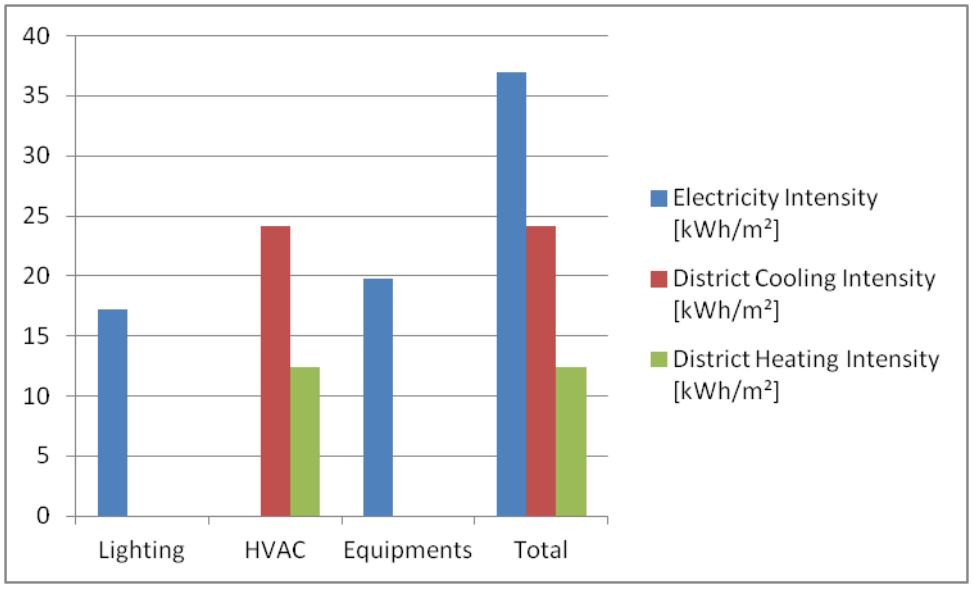

Figure 4.4 : Energy demands of the proposed building.

The reference building is also modeled with the ideal loads air system. The results coming from this model is that the energy demand of the reference building is 78,00 kWh/m² and 1.124.760,77 kWh annualy. The reference building requires 301.674,06 kWh for heating, 288.205,76 kWh for cooling and 534.880,95 kWh for interior lighting and equipments per year. The results per square meter of the building are 20,92 kWh/m² heating energy, 19,99 kWh/m² cooling energy and 37,09 kWh/m² electricity energy (**Table 4.2**). The reference building required almost the same amount of heating and cooling energy, the electricity demand is around to times of it (**Figure 4.4**).

Table 4.4 : Energy demand of the reference building.

	Electricity	Cooling	Heating
Lighting	17,33	-	-
HVAC	-	19,99	20,92
Equipments	19,76	-	-
TOTAL	**37,09**	**19,99**	**20,92**

The **Figure 4.6** presents the energy demand comparison between proposed and reference building. This comparison also means energy efficiency of the building in consideration of the green building certifications. Totally the proposed building is 5,7% energy efficient in comparison to the reference building. However, the efficiency varies according to the different end uses. In heating the proposed building requires 40,7% less energy than the reference building, but in cooling 21% more energy is needed for proposed building than the reference building. About interior

lighting the difference is very small as 0,6% proposed building is better.

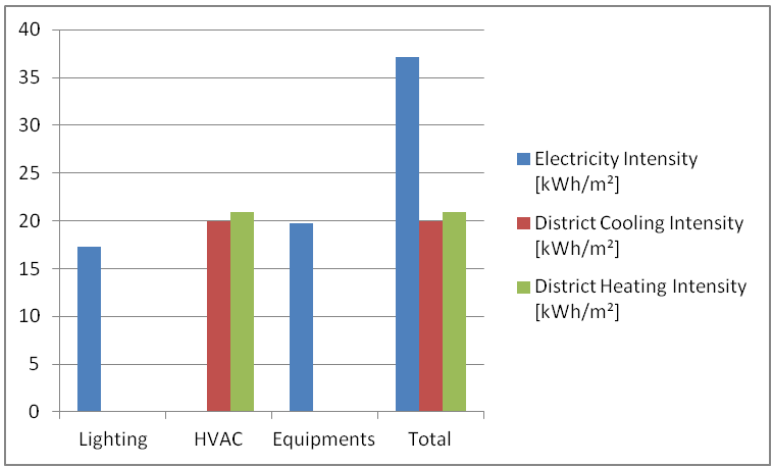

Figure 4.5 : Energy demands of the reference building.

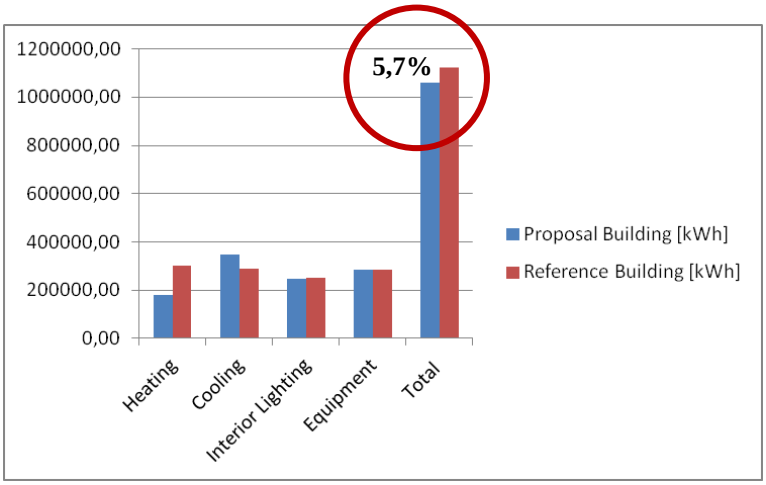

Figure 4.6 : Comparison of energy demands.

4.2.2 Daylight modeling

Daylight is very important for indoor environment quality and energy efficiency. User comfort, health, occupant performance and productivity are affected by daylight through visual quality of indoor environment. Besides proper daylight availability reduces the need of electrical lighting, so electricity savings from lighting and cooling systems are achieved (Keller, n.d.). To analyze the daylight level of building design, daylight modeling tools are preferred. Simpkins (2012) defines daylight modeling as a way of evaluation the illuminance level of a room in building depending to sunlight directly or indirectly. It leads the daylight strategies for improving visual quality and minimizing energy use.

4.2.2.1 BPS-Tools and calculation of daylight availability

The calculation of daylight availability requires daylight modelling using a computational simulation tool. Normally a simulation with a BPS-Tool is enough for the calculation of daylight availability of a building. However, in the research a proposed and a reference building models are subjected to the daylight modeling in order to see the difference between these buildings and to understand the influence of shading system of the building.

In the daylight modeling it is very important to model the building correctly with its geometry and dimentions. The building model is oriented on the simulation surface as in the real case and the surroundings buildings / obstacles should be located also in model, if there is any of them. In addition to that, transparent surfaces affect daylight modeling considerably, so that the dimentions and materials of any transparent building elements should be as much as real-like, especially properties of glazing such as solar heat gain coefficient (SHGC) and visible transmittance (Tvis). The shading and solar control systems are also significant about the result and because of that all these elements and systems should be defined in the simulation. Interior partitions should be in the model as well, as it affects illuminance distribution inside.

After the completion of building model in the simulation program the weather file is defined to this simulation depending to the building's location. The clear sky mode is used for the simulations. The simulation is run on 21st of September, but on two different times of the day, which are 9 a.m. and 3 p.m.. From these two results the lowest one is accepted as the daylight availability of the building. As the results of this simulation the illuminance map of building spaces and minimum daylight availability of the spaces are presented. In the illuminance map the daylighting level inside a space showed with a coloured scale.

4.2.2.2 Daylight modeling of the proposed and the reference building

The daylight modeling of the case study building is made in Design Builder simulation tool, a program used energy modeling and daylight modeling of buildings. First of all, the case study building is modeled and oriented correctly in this program. Surrorunding buildings are raised also in the model. The glazed curtain wall is formed in the proposed model as 210cm high glazing begining after 60cm from the finished grade.

The shading system of the case study building covers all the façade and it consists vertical metal elements and vegetation. It would have been very hard to model and simulate this system one by one, so the transmittance of that system is calculated on the façade and this number is used as a transparency fraction of the surface on the façade. As the vegetation is not same all around the building, there are three different types: long and short plants and without vegetation, three different transparency fractions are prepared (**Figure 4.7**).

Calculation of the daylight transmittance of the shading elemensts (for one unit on the facade) is:

a- shaded area: 1,03 m² → (4,88-1,03) / 4,88 *100 = 79 %

total area: 4,88 m²

b- shaded area: 2,53 m² → (4.88-2,53) / 4,88 *100 = 48 %

total area: 4,88 m²

c- shaded area: 1,46 m² → (4,88-1,46) / 4,88 *100 = 70 %

total area: 4,88 m²

The datas about the exterior glazing are defined that SHGC (solar heat gain coefficient) of the glazing is 0,43 and Tvis (visible transmittance) of the glazing is 0,69.

In the daylight modeling of the reference building the important issue is the shading system and the glazing. As it's stated in the pervious part about energy modeling, the reference building model doesn't have any shading system on the building facade and the thermal conductivity of tha glazing should be 1,6 W/mK according to the ASHRAE standard. These are the changes, which are related to the daylight modeling of the reference building.

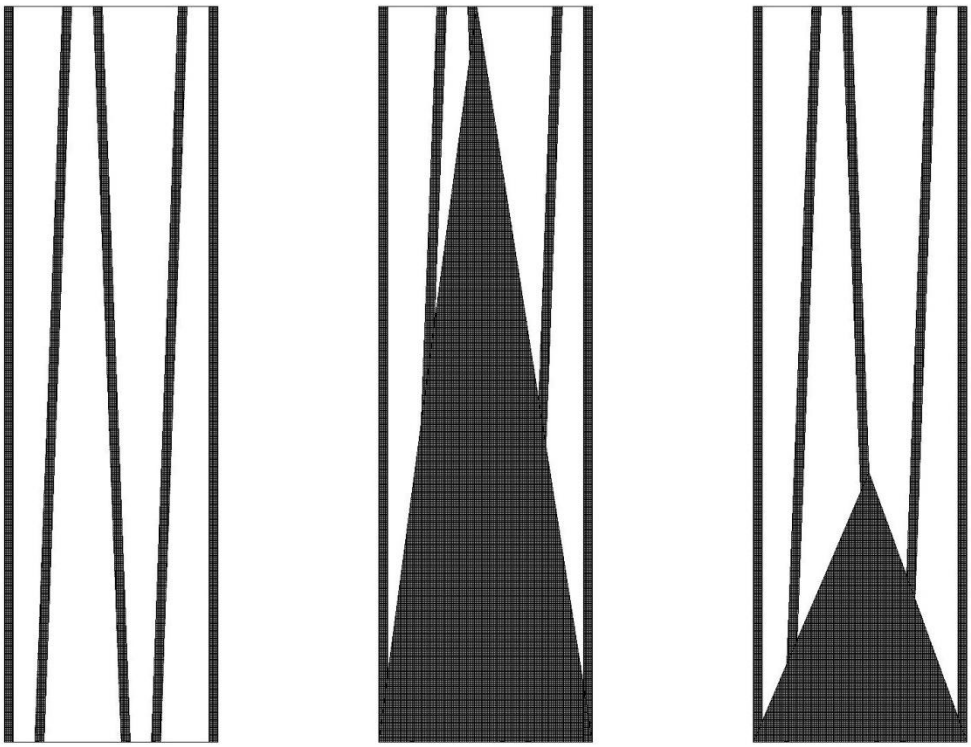

Figure 4.7 : Simplification of the building's shading system (a- metal elements without vegetation, b- metal elements with long vegetation and c- metal elements with short vegetation)

4.2.2.3 Results and comparison

The results of the daylight modeling are presented the daylight availability as floor area percentages of the case building. These percentges show comparison of the floor area, which has daylight minimum as the threshold value or more, with the total floor area of glazed spaced. In the tables, "Floor Area" refers to total floor area of the related spaces and "Floor Area above Threshold" means the floor area, which has more daylighting than the limit value stated in IESNA. The threshold value for daylight level is defined for LEED certification as 269.098 lux. Besides, the simulation tool gives illumimance maps of the building floor in order to show daylight grade on that space.

The results show that daylight availability of the proposed building is very few. The illuminance maps (**Figure 4.8, 4.9, 4.10)** and daylight availability (**Table 4.1**) depending on the limit value are presented following. As it can be seen from the illuminance maps and the daylight availability table, the daylight level inside the proposed building is not sufficient. Totally the rate of building area, which has more daylight than the limit value, is 3,65% of the whole building area covered with

glazed curtain wall. The highest level is in the entrance on the ground floor and there is daylight on the mezzanine and eighth floor, although it is not too much. However, the daylighting level on the other floor the area that has daylight exceeding minimum level is almost zero. The same situation is also presented in the illuminance maps. There is almost no daylight on the floors from first to eigth. Another important thing is that the enlighten areas with a grade appear generally on the east or the west side of the building.

Table 4.5 : Daylight availability of the proposed building.

Zone	Floor Area (m2)	Floor Area Above Threshold (m2)	Floor Area Above Threshold (%)
1st basement - office	244,64	21,40	8,75
Ground floor - office	411,44	0,04	0,00
Ground floor - entrance	174,40	150,48	86,28
Mezzanine floor - office	364,24	20,96	5,75
1st floor – office	506,16	0,04	0,00
2nd floor – office	506,16	0,00	0,00
3rd floor – office	530,84	0,00	0,00
4th floor – office	530,84	0,04	0,00
5th floor – office	506,84	0,04	0,00
6th floor – office	506,84	0,04	0,00
7th floor – office	506,20	0,00	0,00
8th floor – office	506,20	9,24	2,00
TOTAL	**5.292,80**	**192,84**	**3,65**

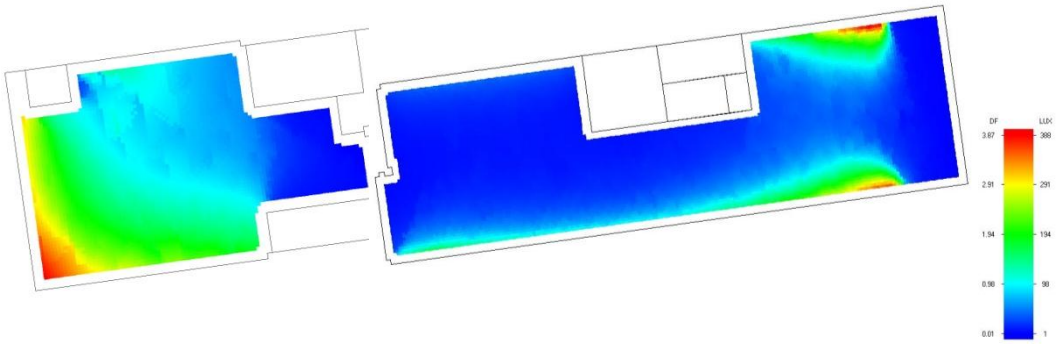

Figure 4.8 : Illuminance map of the office on the ground floor.

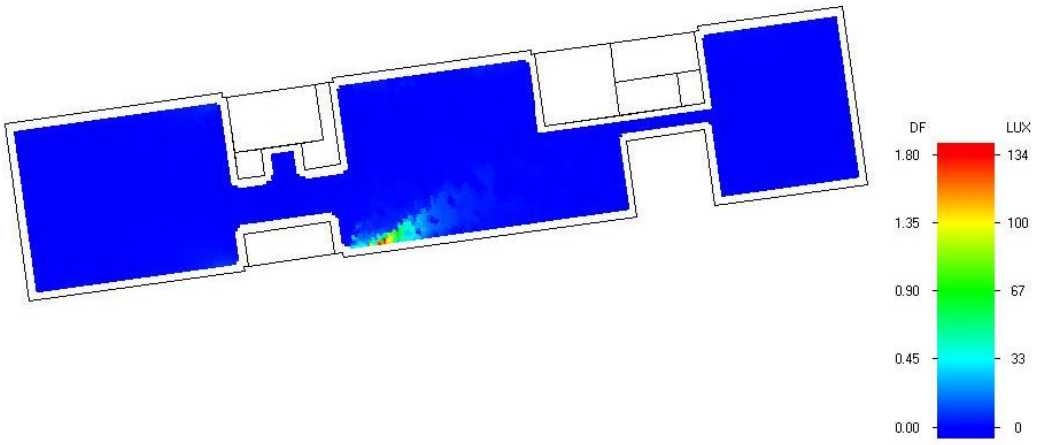

Figure 4.9 : Illuminance map of the office on the fourth floor.

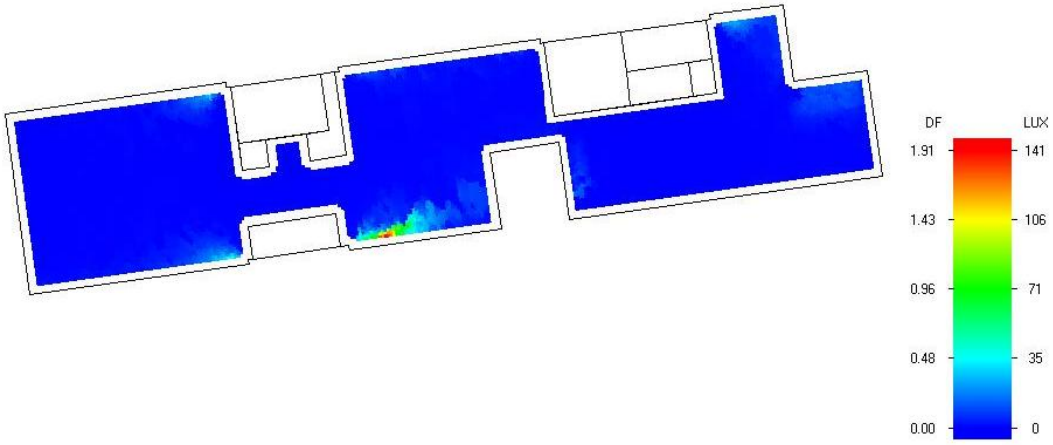

Figure 4.10 : Illuminance map of the office on the eighth floor.

The daylight model results of the reference building are presented in following table and figures. The results show that the total daylighting rate of the reference building is 28,46%. Mostly the ground floor entrance takes daylight and mean daylight availability of the offices on 1st to 8th floors is 21%.

Table 4.6 : Daylight availability of the reference building.

Zone	Floor Area (m2)	Floor Area Above Threshold (m2)	Floor Area Above Threshold (%)
1st basement - office	244,64	22,92	9,37
Ground floor - office	411,44	0,12	0,03
Ground floor - entrance	174,40	152,36	87,36
Mezzanine floor - office	364,24	24,52	6,73
1st floor – office	506,16	114,16	22,55
2nd floor – office	506,16	120,44	23,79
3rd floor – office	530,84	153,68	28,95
4th floor – office	530,84	161,76	30,47
5th floor – office	506,84	151,44	29,88

6th floor – office	506,84	164,76	32,51
7th floor – office	506,20	193,12	38,23
8th floor – office	506,20	247,00	48,89
TOTAL	**5.292,80**	**1.506,28**	**28,46**

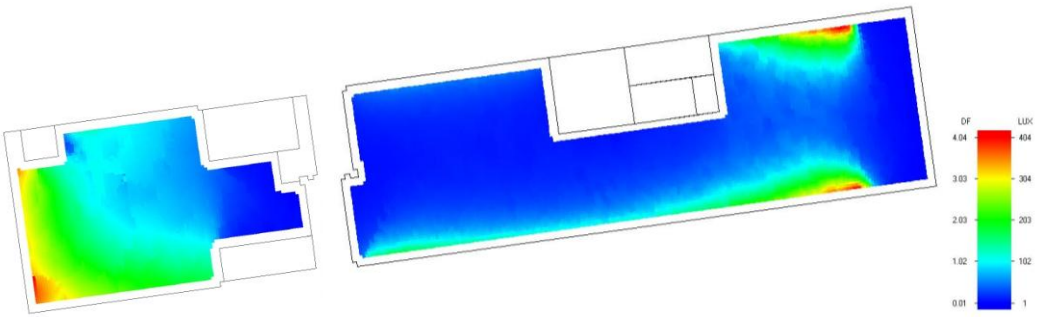

Figure 4.11 : Illuminance map of the office on the ground floor.

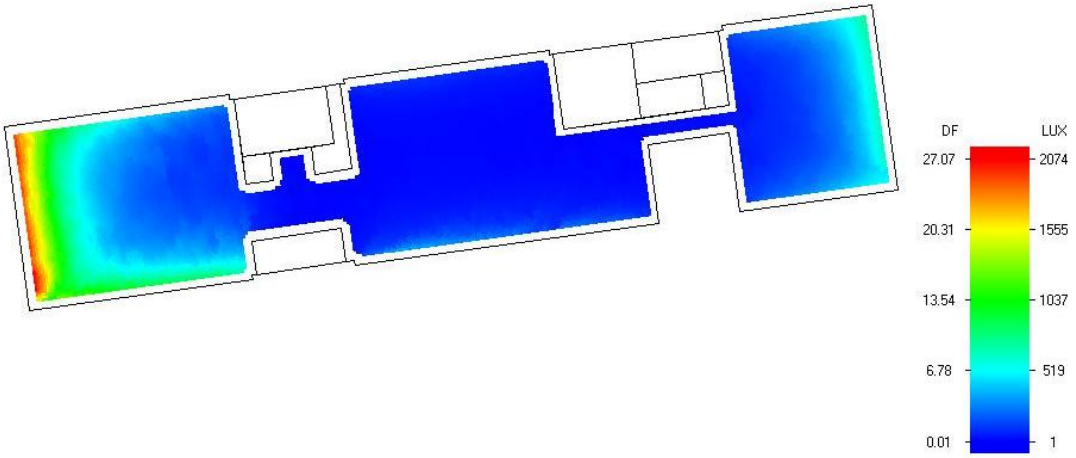

Figure 4.12: Illuminance map of the office on the fourth floor.

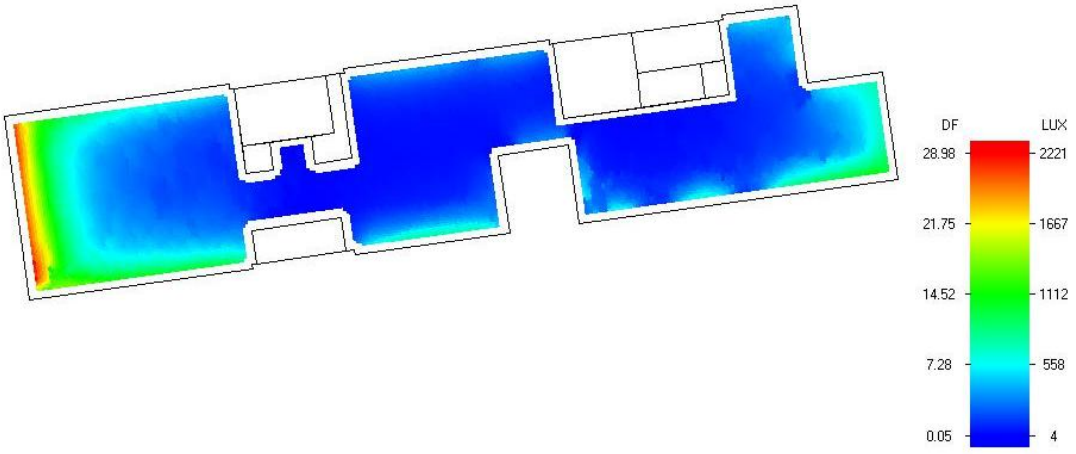

Figure 4.13 : Illuminance map of the office on the eighth floor.

When the daylight availability of the proposed and reference building are compared, it is seen that there is a big difference between these two total daylighting results. The proposed building has almost 72% less daylight than the reference building. Also in the office on first – eighth floors the daylighting difference can be easily noticed, as in the proposed building there is almost no enough daylight, but in the reference building these office areas have mean 21% daylight.

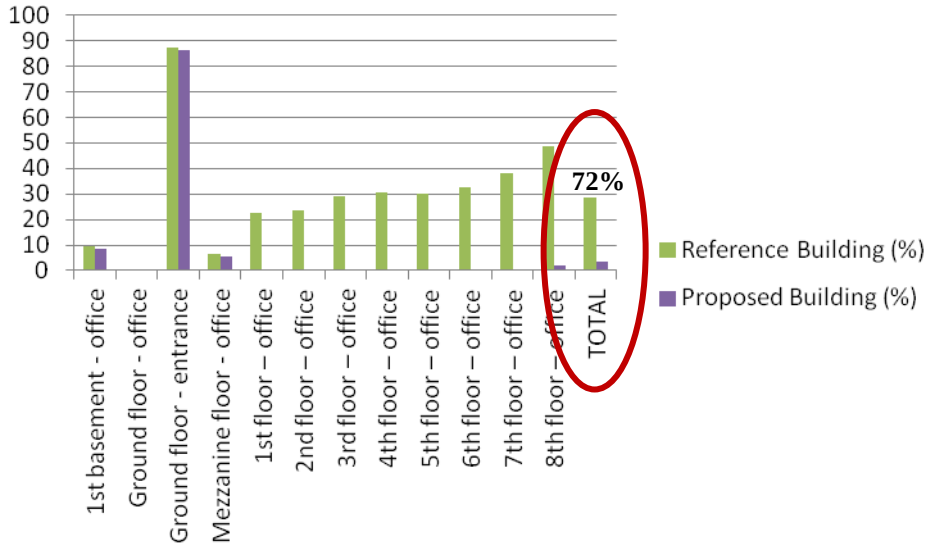

Figure 4.14 : Comparison of the daylighting rates of the building models.

Analyzing the results received from the daylight modeling of the case study building two different issue can be come up for discussion: shading system of the building and closeness of the building to the other buildings.

The big difference between the daylighting rates of the proposed and baseline building is the clearest evidence of the effect of the shading system. The reference building which has no shading elements on the facade has 72% more daylight than the proposed building. In addition, there is more daylight transmission on the facades without shading system like the entrance on the ground floor. The daylight availability for this space is 67% and it is considerably high to the others. Probably absence of shading elements is not the only reason for that; higher glazing and west side location also influence the result. However, the huge difference between the daylighting rates can be proof to the effect of the shading elements.

When the illuminance maps of the building are reviewed, it can be seen that there is more daylight on the east and the west side of the building and in contrast to that almost no daylight on the north and south of the building. This shows the obstacle

effect of the other buildings next to the case study building. Besides in this case those buildings are so high and close to the case study building. The presence of shading elements on these facades increases this effect and it results with very less daylight.

Shadings elements on the building's façade and the short distance with the high neighbour buildings affect daylight transmission to the indoor environment. The results of the daylight modeling reveal that these issues did not come into consideration enough in the design process of the building. In addition to that it is pointed out in the following parts of this chapter that these issues also weren't considered in the green building certification process.

4.3 Critical Review About the Green Building Certification Score

The aim of the critical review part to the building's green building certification score is to analyse the assessment of the building in a critical point of view. This critical point of view depends to the observations from building market, literatural critics and the interview and questionnaires with experts. Also the gathered informations about the building are very beneficial in this study about critical analyse of building "green" score.

The critical review about the green building certifictaion score is splited into four groups considering the credits' assesrment method and the applications for the credits. The groups are: Credits with inappropriate assessment method for local conditions, credits with misapplications in the construction phase and credits with misapplications in the certification phase.

4.3.1 Methodology

For the critical study about green building certification score, in this case LEED score, first of all, the LEED score of the building should be looked over again. For the achieved credits the assessment method of them are examined again from the green building certification's application book. Using all gathered informations, observations and results the credits in which there are any problems are put on of these groups. Every credit in the groups are reanalysed and criticised again. The groups and the credits are:

- Credits with inappropriate assessment method for local conditions

  - Site selection (SSc.1)

  - Development density & community connectivity (SSc.2)

  - Alternative transportation, bicycle storage & changing rooms (SSc4.2)

  - Alternative transportation, low-emitting & fuel efficient vehicles (SSc4.3)

  - Storage & collection of recyclables (MRp.1)

  - Environmental tobacco smoke (ETS) control (EQp.2)

  - Indoor chemical & pollutant source control (EQc.5)

- Credits with misapplications in the construction phase

  - Construction activity pollution prevention (SSp.1)

  - Enhanced commissioning (EAc.3)

  - Construction waste management (MRc2.1 / 2.2)

  - Construction IAQ management plan, during construction (EQc.3)

- Credits with misapplications in the certification phase

  - Optimize energy performance (EAc.1)

  - Daylight & views (EQc8.1 / 8.2)

4.3.2 Credits with inappropriate assessment method for local conditions

Under the title of "Credits with Inappropriate Assessment Method for Local Conditions" the credit points are analysed considering their relations with the local conditions. This approach is very important either for the trust against the green building certifications in the market or better and sufficient green building assessment. Credits, which are inappropriate for local conditions become easily achieved credits because of properties, life style or regulations in that country. Mostly these credits are called "easy point" in the market, so they are kind of weak side of the certification.

4.3.2.1 Site selection (SSc.1)

SSc1 is about avoiding development of inappropriate sites and reducing the environmental impact from the location of a building on a site. To achieve this credit it shouldn't be built near water sources, farmlands and such environmantally important areas (USGBC, 2007).

The Site Selection credit is predicated on protecting virgin lands and encouraging building projects more in urban areas. However, when the subject is considered in Istanbul, then this credit loses its meaning. Because, first of all, in Istanbul there are hardly ever virgin lands. Secondly all the investers want to raise the building projects in the dense city centers and they give so much money to have any land from there. The location of the case study building is one of the most dense areas in Istanbul. This building gained one point form the Site Selection credit, as it stands on a proper urban area. However, the situation of Istanbul causes suspicion about the achievement of this credit. As the building does nothing for a green improvement, when the land protection is not an important issue for Istanbul and the investers are allready interested in urban areas. Besides, the result of this credit doesn't mean that building site selection is right for building users which can be examined as another issue in the green building assessment.

4.3.2.2 Development density & community connectivity (SSc.2)

SSc2 encourages the development to urban areas with existing infrastructure, protect greenfields and preserve habitat and natural resources. To meet the requirements of this credit there are two options. Option one is that building should be constructed on previosly developed site and building site should be in a community with 60.000 square feet per acre (circa 5600 square meter) minimum density. For second option, building site should be within ½ mile (circa 800 meter) of a residental area or at least 10 basic services such as bank, post office, pharmacy etc (USGBC, 2007).

The development density and community connectivity credit is about the building place and its neighbourhood. So similar to the site selection credit this does not also consider the condition in Istanbul or in Turkey. As it is mentioned for the previous credit the investers prefer to practice their building projects in the urban areas. This situation invites the amenities needed in this urban area like banks, supermarkts,

cafes, etc. So in this picture the building doesn't seem that it gains any green improvement from this credit.

4.3.2.3 Alternative transportation, bicycle storage & changing rooms (SSc4.2)

SSc4.2 means to decrease automobile use by preferring cycling. For commercial or institutional buildings, which have circa 28.000 square meter or less floor area, it should be provided secure bicycle racks and/or storage within circa 183 meter of a building entrance for 3% or more of all building users and also shower & changing facilities in the building (USGBC, 2007).

The alternative transportation credit in respect of bicycle usage is an important credit for reduce energy consumption in transportation; however this assessment does not consider the local conditions in Istanbul and Turkey. Transportation by bicycle is hard made in Istanbul because of the city's size, geographical properties and insufficient bicycle substructure. Riding bicycle can be very tough and also dangerous in this city. Ignoring this situation, all what is done for this credit are only for achieving the point. In the case study building bicycle racks were provided near the first basement ramp and there are shower facilities in the second & third basements. The building got one point of this credit; however, those bicycle racks and showers have never been used unfortunately.

4.3.2.4 Alternative transportation, low-emitting & fuel efficient vehicles (SSc4.3)

SSc4.3 is another alternative transportation credit which demands preferred parking close to main entrance for low-emitting and fuel-efficient vehicles for 5% of the total vehicle parking capacity of the site or installation of alternative-fuel refuelling stations for 3% of the total vehicle capacity of the site (USGBC, 2007).

The alternative transportation credit with low emitting and fuel efficient vehicles supports preserved parking spaces for these type energy efficient cars. This credits become an "easy point" for green building assessment in Istanbul as the low emitting and fuel efficient cars are not very common for now. Hopefully in the future these cars might be widespread for energy efficiency and less greenhouse gas emission. However, for now the park spaces separated for the low emitting and fuel efficient vehicles are used like normal park spaces, although the sign about low emitting cars. In the third basement floor of building, there are parking lots for low-emitting and

fuel efficient vehicles. In inside or outside the building not so many people are aware of these separated parking places.

4.3.2.5 Storage & collection of recyclables (MRp.1)

The prerequisite credit of materials & resources considers about the reduction of waste generated by building occupants that is hauled to and disposed of in landfills. An easily accessible area serving the entire building should be provided and in this area should only be used for the collection and storage of non-hazardous materials for recycling, including (at a minimum) paper, corrugated cardboard, glass, plastics and metals (USGBC, 2007).

The storage and collection of recyclables credit support recyclable waste in the operational period of the building. According to the requirements of this credit a storage room should be saved for the recyclable waste. But the difficulty is in the operating period, especially in Istanbul, as in Turkey there is not a proper recycling policy and habit in comparison to the European countries. So this assessment method does not work in Turkey's conditions so well, because in the operational period this room is not used properly. The case study building garbage rooms reserved for recyclables on the first basement. Due to the reference guide table, if construction area is between 9290 m² and 18580 m², then waste room should be at least 25.54 m². This building has around 15000 m² construction area and with 27 m² recyclable waste storage room. However, getting the limit value does not mean that collection and storage of waste is not working properly. The aim should be providing proper waste room for usage of people in the building.

4.3.2.6 Environmental tobacco smoke (ETS) control (EQp.2)

In prerequisite credits about smoking control it should be minimized exposure of building occupants, indoor surfaces, and ventilation air distribution systems to environmental tobacco smoke (ETS). First option is to prohibit smoking in the building and to locate any exterior designated smoking areas at least 25 feet away from entries, outdoor air intakes and operable windows (USGBC, 2007).

The ETS Control credit in LEED plays an important role for indoor air quality, as it is considered as prerequisite credit. However, it remains unimportant in any assessment in Turkey, because smoking is prohibited in all interior public spaces in

there. In this situation the building projects achieve easily this prerequisite credit not doing anything.

4.3.2.7 Indoor chemical & pollutant source control (EQc.5)

For the quality of interior air, exposure of building occupants should be minimized to potentially hazardous particulates and chemical pollutants. Pollutant entry into buildings and later cross-contamination of regularly occupied areas should be controlled and decreased. For this credit, permanent entryway systems should be used in the primary direction of travel to capture dirt and particulates from entering the building at all entryways that are directly connected to the outdoors (USGBC, 2007).

The indoor chemical and pollutant source control credit leads to better indoor air conditions through precautions against chemical and pollutants entering. One of these precautions is a permanent grill-mat on the main entrance. Placing a door mat is not a difficult thing, because of that the credit is known as "mat credit" and it is considered as an easy point in the Turkey. This opinion is not good for good practices in green building assessments.

4.3.3 Credits with misapplications in the construction phase

Because of the mistakes and misapplications in the construction phase of the building some credits are not succeeded as good as it is stated in the green building certifications. Sometimes this type of credits can become also easy credits, as there is not enough control in the construction and certification processes. In addition, the conscious of the contractor of the building takes an important role to achieve these credits better.

4.3.3.1 Construction activity pollution prevention (SSp.1)

SSp1 is a prerequisite credit for Core & Shell buildings and refers to the reducement of pollution from construction activities by controlling soil erosion, waterway sedimentation and airborne dust generation. An erosion and sedimentation control (ESC) Plan, which is about precautions to prevent loss of soil during construction by storm water runoff and/or wind erosion, to prevent sedimentation of storm sewer or receiving streams and to prevent polluting the air with dust and particulate matter, is should be prepared in order to meet the credit's requirements (USGBC, 2007).

The construction activity pollution prevention credit is an important credit about environment protection and because of that it is a prerequisite credit. The credit requires various precautions and a management plan against pollution through construction activities. In the construction process of the case study building there were some precautions in respect of this credit, however, they are not well organized, so it can be called as the erosion and sedimentation control plan. The most important problem in the application of these required activities for this credit is the unconsciousness of the contractors and lack of knowledge of the workers. Because of that mostly these precautions against pollution are forgotten or not cared. After the construction there are only left some photos of these activities which are supposed to be given for LEED applications. However, as there is not any other control except that photos, most of the building projects do not have a good performance about this credit.

4.3.3.2 Enhanced commissioning (EAc.3)

Enhanced commissioning credits is similar to the prerequisite credit of the commissioning, only difference is that commissioning process should begin early during the design process and additional activities should be executed after systems performance verification is completed (USGBC, 2007).

The enhanced commissioning credit in LEED plays an important role for a proper performance of the buildings. Although this big importance of the credit there are some problems in the practice in the construction period. One reason of that the commissioning process begins mostly very late in the Turkish building sector. Although beginning from the design stage the commissioning activities should start and continue, but generally in Turkey it is made in the end of construction period. The second reason of the problems is that the quality of the commissioning activities strongly depends on conscious and attention of the contractors. If there are not enough and well organized professionals and enough time for commissioning, then the results of it won't be sufficient enough.

4.3.3.3 Construction waste management (MRc2.1 / 2.2)

Construction waste management is very important issue, because in construction period there are a lot of recyclable wastes. In order to manage this big amount of waste, construction and demolition debris should be diverted from disposal in

landfills and incinerators, recyclable recovered resources should be redirected back to the manufacturing process. And also reusable materials should be transferred to appropriate sites and at least 50%, 75% of non-hazardous construction and demolition debris should be recycled. Waste management calculations can be done by weight or volume, but must be consistent throughout (USGBC, 2007).

The construction waste management credit in LEED encourages recycling, reusing and reducing construction waste. In order to achieve this credit there should be a waste management in the construction site collecting, separating and transferring this waste. During the construction phase of the case study building paper, wood, metal waste were separated and sent at for recycling. However, normally in the construction sites in Turkey a well organized waste management is hardly applied. Unconscious contractors and careless workers prevent the process of this management. Because of that the construction waste management process should be followed and controlled carefully.

4.3.3.4 Construction IAQ management plan, during construction (EQc.3)

Indoor air quality management during construction period is an important issue for user comfort in the operational period. Various measures should be taken to avoid the air pollution that is generated during the construction in order to provide a qualified air for occupants. In order to meet this credit's requirements, on-site stored or installed materials should be protected from moisture damage (USGBC, 2007).

The construction IAQ management plan credit assesses the indoor air quality precautions during construction activities. One of the important precautions in this process is protecting air channels against dust before use and closing these air channel connections. Otherwise construction dust covers inside of the air channels and after the installation it is very hard to clean them. So, all the dust enters the rooms through the air from HVAC system. When the contractors and worker don't pay enough attention to this precaution and there is not enough control to correct the mistakes this type of problems might occur in the building. For the achievement of the credit some photos, which show closed air channel connections and preserved air channels in the construction sites, are needed. However, if the process is not controlled enough, it is really easy to cheat.

4.3.1 Credits with misapplications in the certification phase

As the last group of the critical review part, here the misapplications in the certification process are discussed. These types of credits are generally the ones that are required some special interest and information about the certifications method. Contractors and designers might not know so much about the application of these credits, so many times it works with a green building certifications consulting company. If there is not enough control about these credits, there might occur some misapplications in this process.

4.3.1.1 Optimize energy performance (EAc.1)

EAc.1 is about to achieve increasing levels of energy performance above the baseline in the prerequisite standard to reduce environmental and economic impacts associated with excessive energy use. Project teams can document the achievement using any of the three options: whole building energy simulation (1–8 points), prescriptive compliance path (3 points possible), and prescriptive compliance path (1 point). With whole building energy simulation, building's energy demand and performance can be determined. A percentage improvement in the proposed building performance rating should be demonstrated compared to the baseline building performance rating per ASHRAE/IESNA Standard 90.1-2004 by a whole building project simulation using the Building Performance Rating Method in Appendix G of the Standard (USGBC, 2007).

The optimize energy performance credit in LEED is one of the most important credits in the green building assessment and also for the building performance. In this assessment the computational simulation tools can be used preferably. Building energy performance simulation of the case study was performed by a consultant firm using Design Builder program. According to the LEED reports of the case study building, the proposed building model has 1.639.533 kWh and the reference building 2.509.426 kWh energy consumption annually. Comparison between energy simulations of proposed building and reference building presents 34.7% energy optimization and 24% cost performance compared the proposed building. This means that four points were gained from eight points of this credit.

The energy modelling in the research calculates the energy demand of the proposed and the reference building depending to the case study building. As it is mentioned in

the previous part about energy modelling the energy efficiency of the case study building is 5,7 % considering energy demand. To be able to compare this result with the one from the building's LEED report, the estimated energy demand of the case study building depending to the LEED report should be declared. The **Figures 4.15 – 4.16** point out the big difference between these two energy efficiency results. Considering the results of the research the building is not able to gain any point from the credit. This might be a serious problem for the certification, as at least point must be gained in order to have the LEED certification.

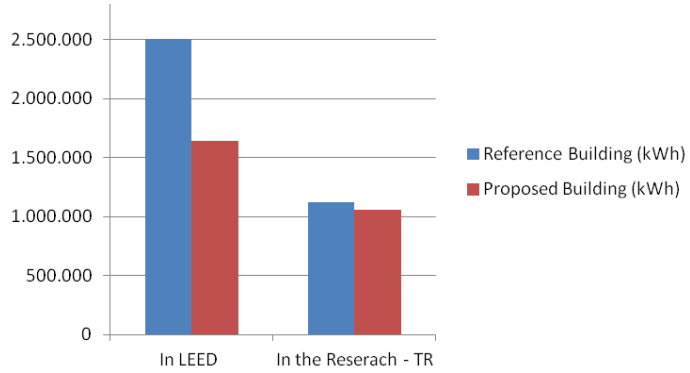

Figure 4.15 : Energy demand comparison.

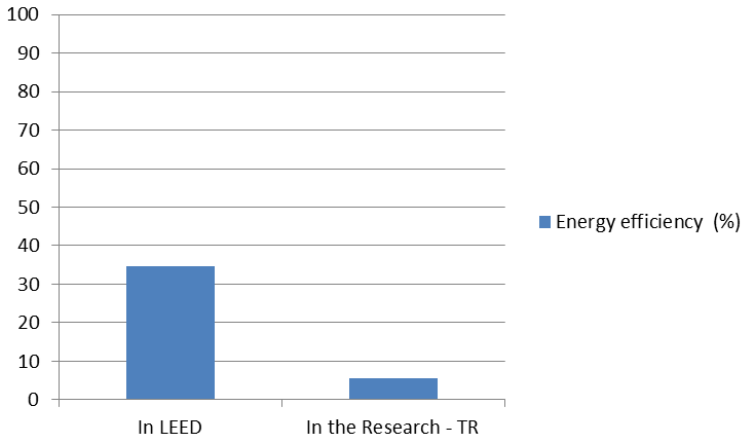

Figure 4.16 : Energy efficiency comparison.

The unconsidered point in the energy modelling is the shading effect of the surrounding buildings. Because the difference in the models of consultant firm and of the research can be clearly seen from the **Figure 4.17 – 4.18**. The surrounding high buildings weren't modelled in the one prepared for LEED certification. Another thing is the modelling of the shading system of the building, as in this shading system there are many components like vertical metal elements and various plants. There is not any information regarding to how this system is modelled into the

building energy modelling. These two important issues may affect the simulation results considerably through the amount of solar energy entering. Besides these results which are very different from each other might be a sign for the need of more control in the BPS-tools usage. The BPS-Tools and energy modelling required a proficiency in that area, so people working in design and construction phases of building are not able to follow and control them. However, incorrect results affect all the building users, tenants and building owners.

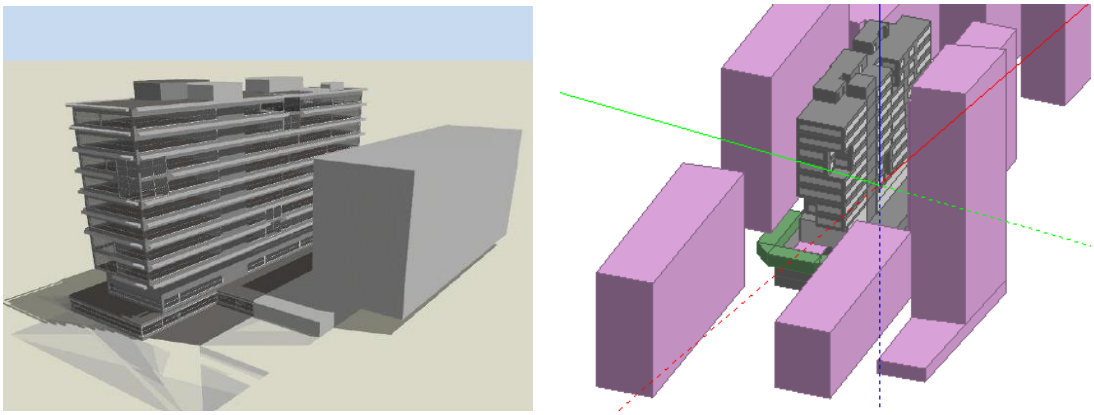

Figure 4.17 – 4.18 : Reference building model prepared for LEED and for the research.

4.3.1.2 Daylight & views (EQc8.1 / 8.2)

The aim of the daylight and view credits is to provide for the building occupants daylight and view into the regularly occupied areas of the building. LEED recommends four options to define the daylight level in the building. In the LEED certification of the case study building the daylight calculation method is used which is defined in LEED as that it should be a minimum glazing factor of 2% in a minimum of 75% of all regularly occupied areas. For the calculation of view is also similar to daylight calculation method and LEED wants the occupied areas to have 90% view. In plan view and in section view the area with the direct line of sight should be determined (USGBC, 2007).

According to the daylight calculation, which is made by the consultant firm, the case study building has 96% daylight and 97% view. With these high results totally four points were gained; one point for daylight, one point for view and two more points as innovation.

In the research the daylight availability of the case study building is calculated using BPS-Tools and considering shading system and surrounding buildings unlikely in the method used by consulting firm. The results of the daylight modelling in the research are that the proposed building has 3% daylighted area and the reference building has 20% daylighted area. **Figure 4.19** presents the big difference between the results regarding to the daylighting rate of the case study building. According to the results which are calculated by BPS-Tool any points can be gained from LEED. So the big difference in results means four points in the LEED certification.

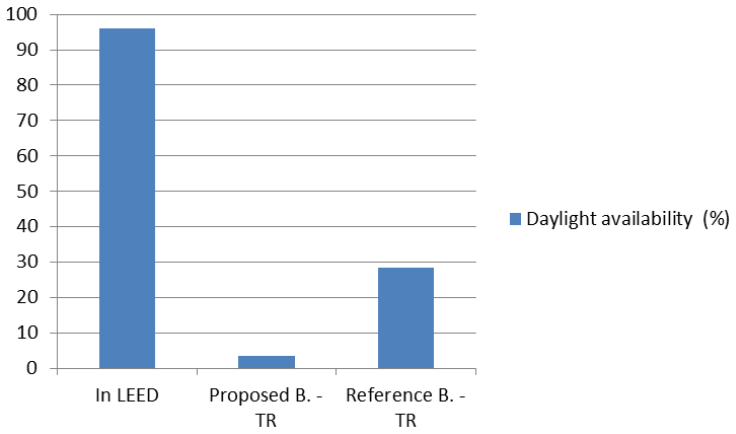

Figure 4.19 : Daylight availability comparison.

The daylight availability results are very different in LEED certification of the case study building and in the research. The reason of that situation is different methods to calculate the daylight availability. The method used in LEED certification doesn't consider surrounding buildings and the shading system which is covered all facade of the building. Besides building place on earth, sun angles and weather conditions are not able to influence the results in this calculation method. When those effects are considered in daylight calculation like in the method used in the research it can be seen that the daylight availability of the building is very few.

In the end of analysis about the case study building, significant outcomes are achieved. First of all the building performance simulation results, which are made in the research, are considerably different than the green builidng certification results of the case study building. This situation causes also a considerable difference about building green performance, because they are regarding to energy and daylight performance of the case study building.

On the other hand, the awarded credits from the green building certification, with which the case study building is certified, are analyzed with critics. In the analysis these aspects are considered: local chracateristics in assessment, possible problems in construction phase and certification phase. According to this critical review to the building's green performance in the certification tool it is understood that there are many credits, which do not have enough consideration about local conditions. Besides, it is pointed out that many credit points are awarded inspite of inappropriate applications in construction and certification phase. All these points, which are awarded although the problems in process, might create a incorrect results about building green performance.

5. EVALUATION OF THE CASE STUDY BUILDING IN THE NETHERLANDS

The fifth chapter of the research deals with evaluation of the case study building in the Netherlands and the analyses, which are made on the basis of this evaluation. The aim of the evaluation study is observing the situation of the case study building, which is built in the Turkish green building market and green building certification practices, in another and more developed green building market like the Dutch green building market. Besides through this study the advantages/disadvantages and criticized points of the case study building might be reconsidered in the Netherlands' conditions.

The evaluation study of the case study building is explained in several parts, which are methodology, location in the Netherlands, energy modeling, daylighting modeling, green building assessment and conclusion.

5.1 Methodology

The methodology used in the evaluation study is reconsidering the case study building in a new location in the Netherlands, remaking the building performance simulations with the new location, practicing green building certifications and in the end analyzing all the information and results acquired. Also in the final chapter, these results and analyses are used to come through reasonable conclusions.

Explaining step by step, first a new and proper location is chosen for the case study building in order to build it virtually in the Netherlands. In the second and third steps the building performance simulations, which are made also with the same building on its original location, are performed for energy and daylighting modeling. After that, the case study building on its new location is assessed with the green building certification considering the credits that are reviewed critically in the previous chapter. As the last part all the information and results are gathered together and analyzed to achieve a conclusion.

5.2 Location in the Netherlands

In order to evaluate the case study building in the Netherlands it is very important to find a suitable location for the building. The suitability here can be defined as similarity with the building's original location in respect of physical environment, density and function of the place. Accordingly, the "Zuidas" region in Amsterdam is chosen as the new location of the case study building in the Netherlands.

The Zuidas, also known as the "financial mile", is a developing business region in the south of the Amsterdam's city centre. (Wikipedia, 2011). Between the main rivers of Amsterdam, the Amstel and the Schinkel, Zuidas locates in the middle of residential areas of Oud-Zuid and Buitenveldert. As the prime location of Amsterdam the Zuidas consists international knowledge and business headquarters with 650.000 m² office space and around 450 companies (Amsterdam, 2012). Through the big projects in construction and transportation areas the Zuidas is developed continuously.

Figure 5.1 : The Zuidas region in Amsterdam.

5.3 Energy Modeling

As a building performance simulation, energy modeling is one the important analyses in the evaluation study of the case study building. The energy simulations in the Netherlands are made according to the building's new locations in Amsterdam. Besides, a new location in the Netherlands means new weather conditions, so in the simulations Amsterdam's weather data is used. As it is explained in the fourth chapter, the energy modeling of the building is performed in two kinds: proposed and reference building. However, in these both simulations HVAC system is modeled "Ideal Loads Air System" and buildings' energy demand are calculated.

The case study building is modeled on the same orientation with the building model in original location. In the proposed building model the building is modeled with all of its own properties and characteristics on the new location and using the new weather data the simulation is run. On the other hand, for the reference building model the building's envelope is changed according to the ASHRAE standard. The U-values for the reference building envelope come from the values defined in the standard for the climatic zone 5. The lighting internal heat gain data are entered as the values in the standard (Table 5.2). Also shading system of the building is taken off in the reference building in the Netherlands. After that, it is simulated with the new location and weather data like in the proposed model simulation. The difference between these two models regarding to the building's facade can be seen from the **Figure 5.7** and **5.8**.

Table 5.1: U-values of the proposed and the reference buildings.

U-Values [W/m²K]	Proposed Building	Reference Building
Exterior Walls	0,690	0,365
Roof	0,355	0,273
Ground	1,254	1,264 (F factor)
Basement Walls	0,029	0,678 (C factor)
Glazing	1,59	2,56

Table 5.2: Lighting heat gains of the proposed and reference building.

Lighting – Internal Heat Gains [W/m²]	Proposed Building	Reference Building
Offices	12	12
Stairs	1,2	6
Corridors	10	5
Sanitary spaces	25	10
Car parks	2	2

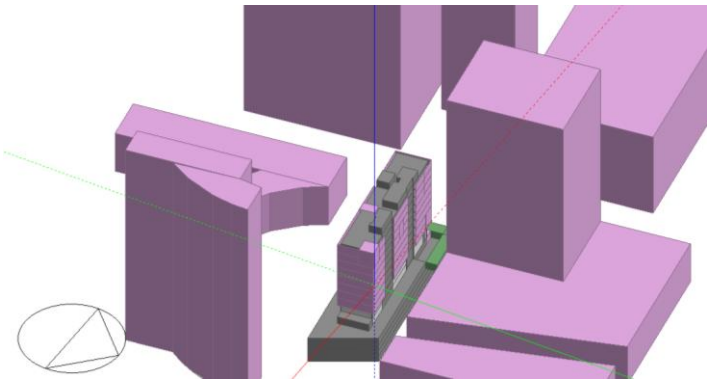

Figure 5.2 : Proposed building model in the design builder.

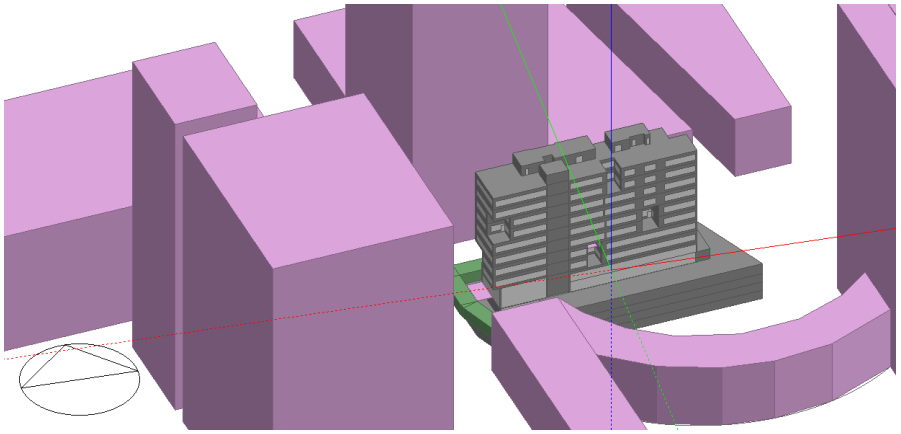

Figure 5.3 : Reference building model in the design builder.

5.3.1 Results and comparison

The energy modelings of the case study building in the Netherlands are presented as the proposed and the reference building models. Their results are compared with each other. According to the energy modeling results, the proposed building in the Netherlands has an energy demand per square meter of total area as 67,79 kWh/m² and total energy demand annually is 977.645,90 kWh. 132.073,71 kWh of that is needed for cooling of the building and 313.726,76 kWh for heating. In addition to that the electrical energy demand for lighting and various equipments results 531.845,42 kWh in one year. The energy demand values for different utilities are shown in the **Table 5.3** below. The peak cooling is measured in 14th of June at 14:00 with 265.766,53 W energy demand; the peak heating is 2.483.388,20 W in 5th of January at 07:10.

Table 5.3: Utility use of proposed model per total floor area

	Electricity	Cooling	Heating
Lighting	17,12	-	-
HVAC	-	9,16	21,76
Equipments	19,76	-	-
TOTAL	**36,88**	**9,16**	**21,76**

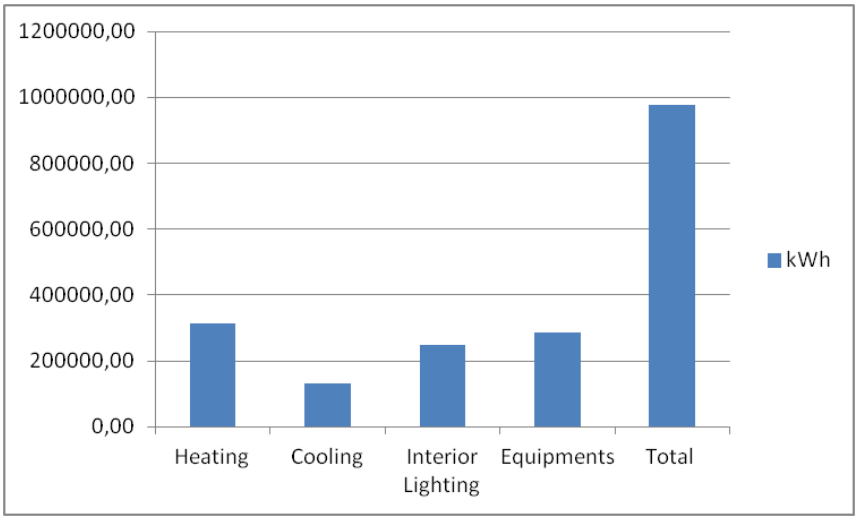

Figure 5.4 : Energy demands of the proposed building.

The energy modeling results of the reference building show that the reference building in the Netherlands has 73,90 kWh/m² energy demand per square meter of total area. Annually the building demands 1.065.536,78 kWh energy, of which it is 102.199,08 kWh for cooling, 428.564,62 kWh for heating and 534.773,07 kWh for electricity including lighting and equipments. **Table 5.2** presents also the energy demands per square meter considering utility uses. Cooling system of the building makes a peak demand as 287.137,35 W in 7th of June at 13:20; the peak of the building's heating system is 3.113.876,58 W in 5th of January at 07:10.

Table 5.3: Utility use of reference model per total floor area.

	Electricity [kWh/m²]	Cooling [kWh/m²]	Heating [kWh/m²]
Lighting	17,33	-	-
HVAC	-	7,09	29,72
Equipments	19,76	-	-
TOTAL	**37,09**	**7,09**	**29,72**

The comparison between the energy modeling of the proposed and the reference building presents the energy efficiency of the building in the Netherlands. According to the results the case study building provides yearly 7,6% energy efficiency in the Netherlands' conditions. When examined different energy uses in the building they have various results. The heating demand of the proposed building there is less energy demand than the one of the reference building as 21,3%, however, the cooling more energy as 5,6%. The required energy for electrical equipments is the same in all

models, but the interior lighting is energy efficient in the proposed building with a small difference as 1,2%.

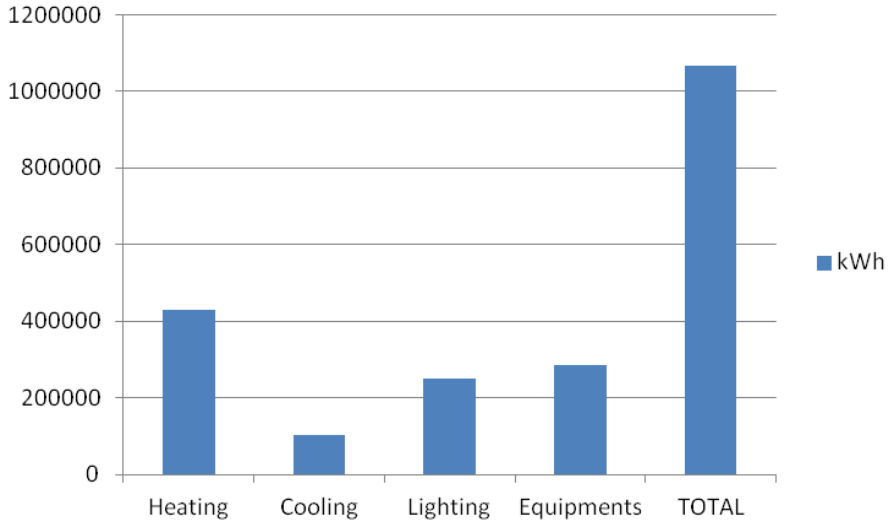

Figure 5.5 : Energy demands of the reference building.

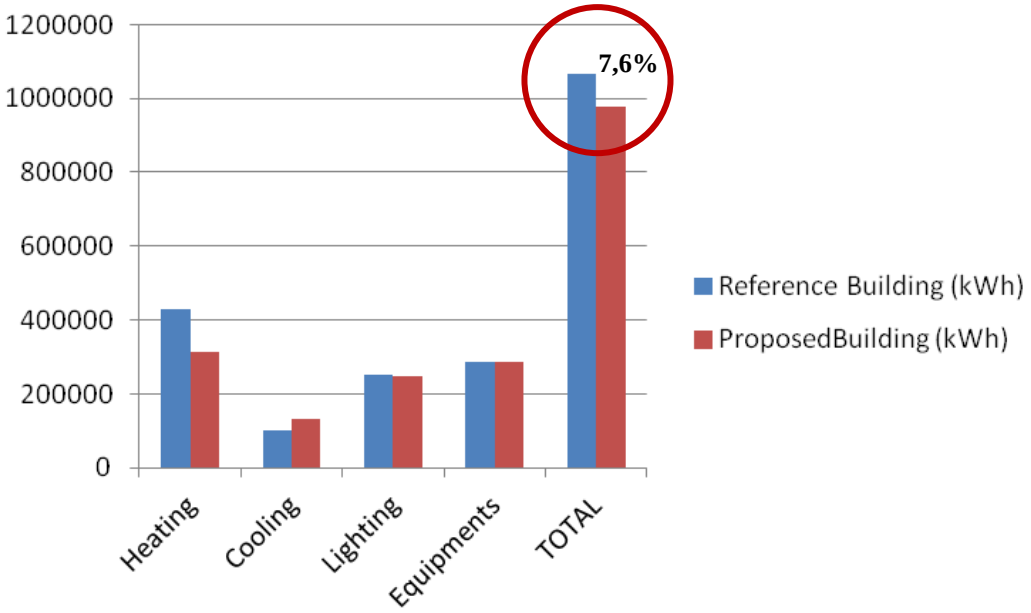

Figure 5.6 : Comparison between energy demands of the building models.

5.4 Daylight Modelling

Daylight modelling is the second BPS type made in the research. As the daylight modelling is very responsive to the different locations and weather conditions, it plays a significant role in this evaluation study of the case study building. In the new location, the surrounding buildings are not completely same as in the original place.

Also with the location changes, the altitude and attitude of the sunlights and weather conditions are changed. Like in the energy modelling there are two different daylighting modeling, one for the proposed building and one for the reference building.

5.4.1 Results and comparison

The results of the daylight modeling for the proposed and the reference model are presented below through tables and lighting scales. Tables show that the percentage of floor area that has more daylight than the limit value according to the LEED. Besides lighting scales provide lighting analyses for each floor, so it can be understood which part of the building has more daylight, which part less.

The daylight modeling of the proposed building points out that daylight availability of the building is notably low and the percentage of building area with accepted daylight is 14,41%. Only on the ground and mezzanine floors have well enough daylighting; even the basement office has a little daylight. However, on another floors, from first floor to the top, there is almost no daylight inside.

Table 5.4 : Daylighting rate of the proposed building.

Zone	Floor Area (m2)	Floor Area Above Threshold (m2)	Floor Area Above Threshold (%)
1st basement - office	244,64	29,72	12,15
Ground floor - office	411,44	243,80	59,26
Ground floor - entrance	174,40	153,84	88,21
Mezzanine floor - office	364,24	103,80	28,50
1st floor – office	506,16	0,00	0,00
2nd floor – office	506,16	0,00	0,00
3rd floor – office	530,84	0,00	0,00
4th floor – office	530,84	0,00	0,00
5th floor – office	506,84	0,00	0,00
6th floor – office	506,84	0,00	0,00
7th floor – office	506,20	0,08	0,02
8th floor – office	506,20	0,48	0,09
TOTAL	**5.292,80**	**762,64**	**14,41**

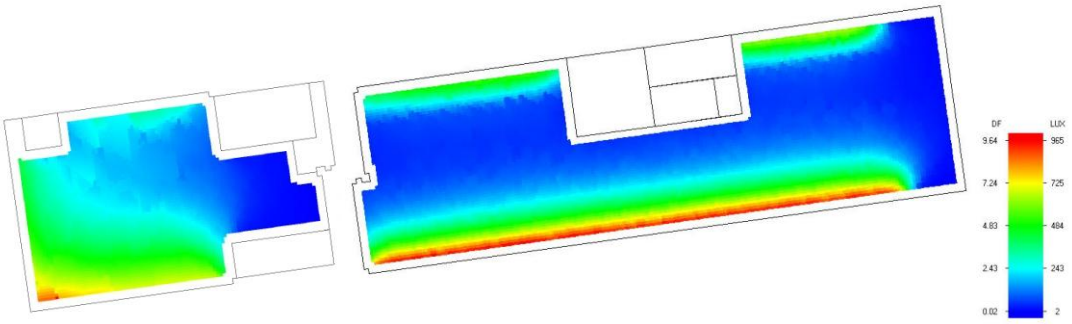

Figure 5.7 : Illuminance map of the proposed building – ground floor.

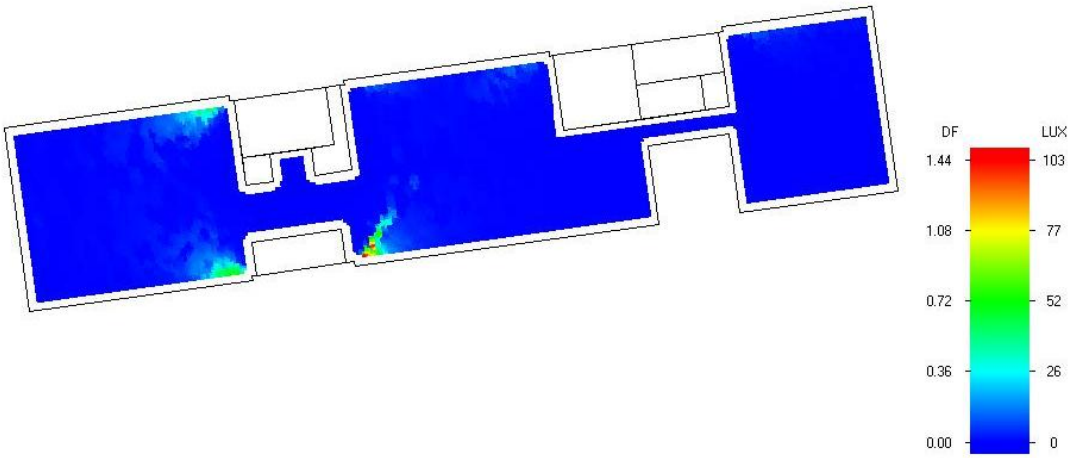

Figure 5.8 : Illuminance map of the proposed building – fourth floor.

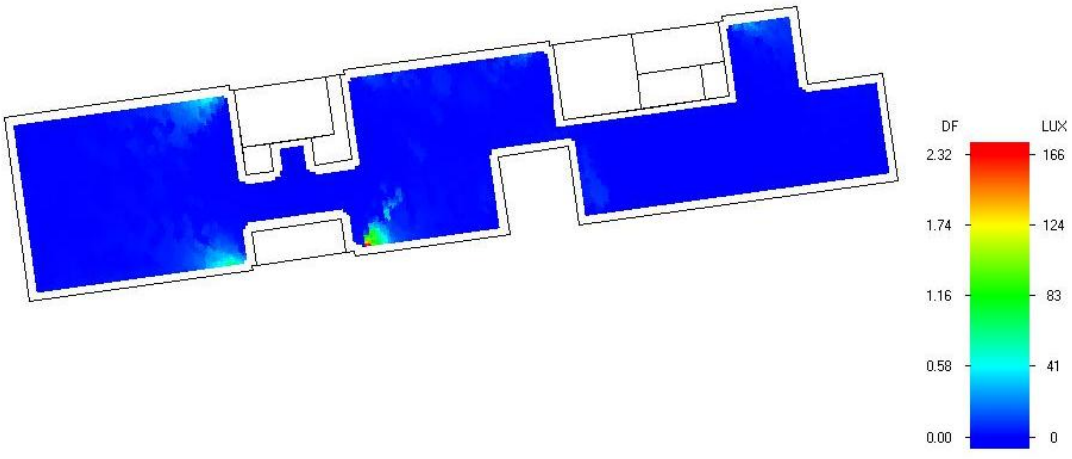

Figure 5.9 : Illuminance map of the proposed building – eighth floor.

The situation of the reference building is quite different in comparison to the proposed building results. Totally, the building has 78,89% enough daylighted area. Besides, the daylight availability on each floor increases going upwards. Especially

on the south side of the building has more daylight and it goes inside around 1-2 meters from the window.

Table 5.5: Daylight availability of the reference building.

Zone	Floor Area (m2)	Floor Area Above Threshold (m2)	Floor Area Above Threshold (%)
1st basement - office	244,64	28,60	11,69
Ground floor - office	411,44	235,84	57,32
Ground floor - entrance	174,40	153,72	88,14
Mezzanine floor - office	364,24	353,28	96,99
1st floor – office	506,16	412,96	81,59
2nd floor – office	506,16	417,44	82,47
3rd floor – office	530,84	438,48	82,60
4th floor – office	530,84	458,16	86,31
5th floor – office	506,84	411,68	81,22
6th floor – office	506,84	424,20	83,70
7th floor – office	506,20	406,40	80,28
8th floor – office	506,20	434,48	85,83
TOTAL	**5.292,80**	**4.175,24**	**78,86**

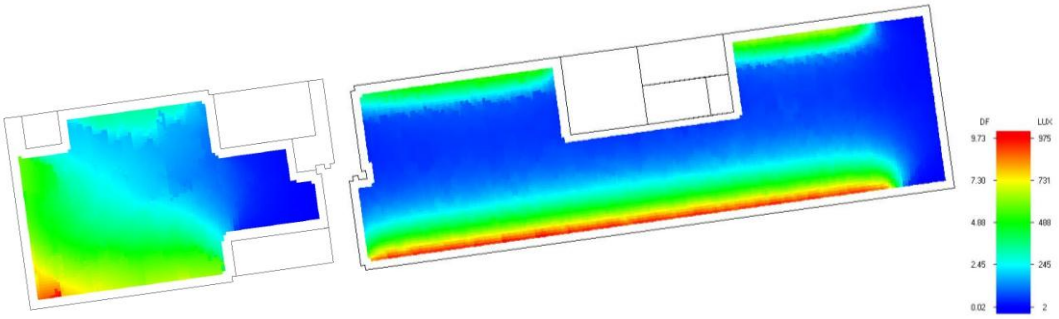

Figure 5.10 : Illuminance map of the reference building – ground floor.

The daylight availability results of the proposed and reference buildings are very different. As it can be seen from the **Figure 5.13** there is big difference between the total daylight availability of these buildings. The proposed building has 80,3% less enough delighted space than the reference building. The daylight availability on the first basement, ground and mezzanine floors are almost the same in two buildings. However, on the normal floors there is big improvement, as their daylight availability increase around 35% when there is no enough daylight in the proposed building. All these difference arise from the shading system of the building which covers the entire building facade. Without this shading system, daylight availability

increase considerably despite all these high buildings around. In addition to that it is obvious that daylight enters more from the south and east facade of the building. It is caused by the orientation of the building and also nonbeing of high buildings on those sides.

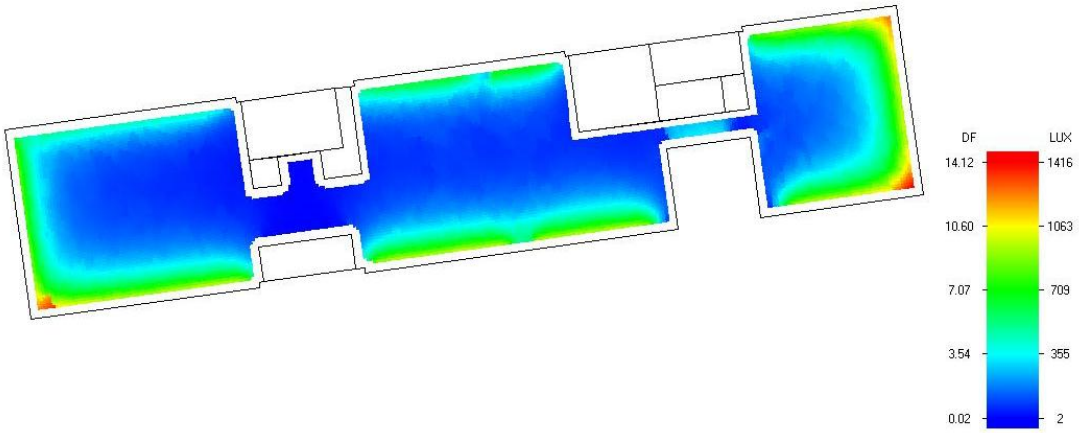

Figure 5.11 : Illuminance map of the reference building – fourth floor.

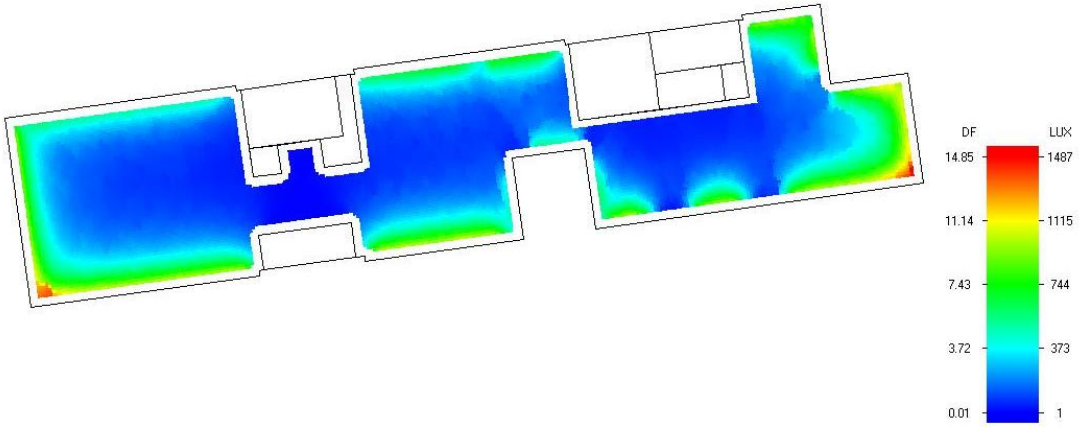

Figure 5.12 : Illuminance map of the reference building – eighth floor.

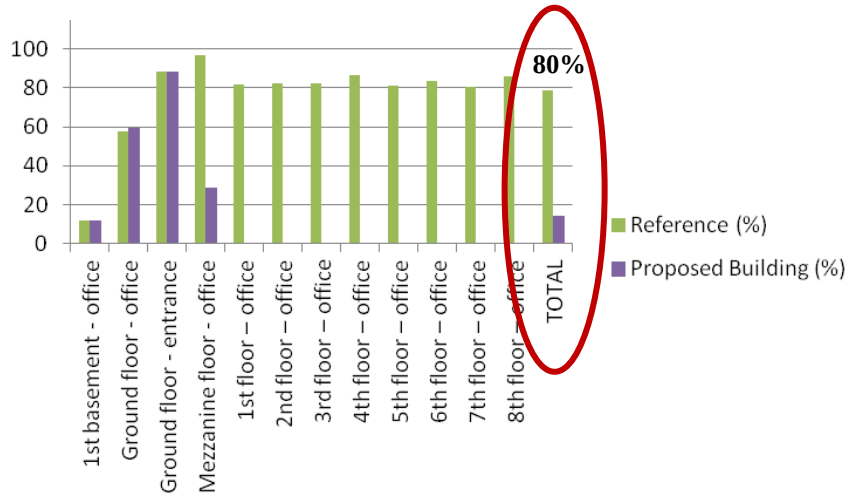

Figure 5.13: The comparison between daylight availability.

5.5 Green Building Assessment Considering Criticized Credits

Assessment through the green building certifications plays an important role either to understand the case study building's situation on the new place in respect of green certified buildings or plus and minuses in comparison to the green building certification on the original location. For that purpose, the criticized credits of the green building assessment, which are analyzed in the fourth chapter, are reconsidered in this part with a new location and another green building certification. The green assessment of the case study building was made with LEED V2.0, but here in the new location in the Netherlands, this assessment is processed with BREEAM-NL V2.0, as there is an adapted version of the green building certification in this country. The reconsideration the criticized credits with a new green building certification helps to see differences in assessment with different green building certifications and with an adapted green building certification. The BREEAM-NL credits analyzed in this study are listed below under the proper headlines:

- Credits criticized with inappropriate assessment method for local conditions

  - Site selection → *Reuse of Land (LE 1)*

  - Development density and community connectivity → *Proximity to amenities (TRA 2)*

  - Alternative transportation with bicycles → *Cyclist facilities (TRA 3) and pedestrian and cyclist safety (TRA 4)*

  - Alternative transportation with low-emitting and fuel-efficient vehicles → -

  - Storage and collection of recyclables → *Recyclable waste storage (WST 3)*

  - Environmental tobacco smoke control → -

  - Indoor chemical and pollutant source control → *Internal air quality (HEA 8)*

- Credits with misapplications in the construction phase

  - Construction activity pollution prevention → *Responsible construction practices (MAN 2) and construction site impacts (MAN 3)*

  - Enhanced commissioning → *Commissioning (MAN 1)*

  - Construction waste management → *Waste management on the construction site (WST 1)*

- Construction IAQ management → -

- Credits with misapplications in the certification phase

  - Optimize energy performance → *Reduction of CO2 emissions (ENE 1), energy-efficient lifts (ENE 8) and assurance of thermal quality of building shell (ENE 26)*

  - Daylight & views: *Daylighting (HEA 1), view out (HEA 2), glare control (HEA 3), high frequency lighting (HEA 4) and internal and external lighting levels (HEA 5)*

5.5.1 Credits criticized with inappropriate assessment method for local conditions

5.5.1.1 Site selection

Reuse of land (LE 1): Promoting building projects to urban locations and reused lands, and minimizing use of lands with high ecological value. It can earn up to five points. Requirements: Building project should not be inside the main ecological structure (EHS) and/or similar ecological zones. The table in BREEAM-NL presents proper points depending to the building's place (DGBC, 2010).

The reuse of land credit of BREEAM-NL has the similar aspect with the site selection credit in LEED, but BREEAM-NL was prepared according to the Netherlands' conditions and needs. Protecting and preserving unused lands is a significant issue in the Netherlands. Because of that, the case study building in the Netherland deserves the point from this credit. However, it can be hardly said the same for the building in Istanbul, as the characteristics of these cities and countries are very different.

5.5.1.2 Development density and community connectivity

Proximity to amenities (TRA 2.): Supporting building projects which are close to amenities in neighbourhood and so increasing emissions and energy use through transportation. One point can be earned. Requirements: There should be local facilities like shops, banks, groceries etc. within 500 m in order to go by walking (DGBC, 2010).

The assessment of the credit proximity to amenities in BREEAM-NL is fairly similar to the development density and community connectivity credit in LEED. This credit encourages the building projects in urban areas and so it protects the virgin lands and also minimizes travel energy consumptions. It is very important for an assessment in the Netherlands' conditions; however, it is not the same in such a big and dense city like Istanbul.

5.5.1.3 Alternative transportation with bicycles

Cyclist facilities (TRA 3): Increasing bicycle usage by building's occupants through proper bicycle storage facilities. It can earn up to two points. Requirements: For one point, there should be available bicycle storage, which is covered and lockable. For two points showers, changing rooms and lockers should be supplied in addition to bicycle storages (DGBC, 2010).

Pedestrian and cyclist safety (TRA 4): Providing pedestrian and cycling ways to access to the site safely and comfortably. It can earn up to two points. Requirements: For one point, useful and safe cycle paths are needed from the entrance to the bicycle storage in the building. Those paths should have connections with public cycle paths and should not cross highways. For the other point, pedestrian ways are also supplied like cycle paths (DGBC, 2010).

In BREEAM-NL, the Alternative Transportation with Bicycle issue is improved a little with the credits Cyclist Facilities and Pedestrian and Cyclist Safety. These credits subject proper bicycle paths, which are connected to the main bicycle paths in the city, to a condition. For an assessment in the Netherlands, the case study building can achieve the points, but it does not happen for the situation in Istanbul, as there is not any cycling path in the city and people do not use bicycle for transportation.

5.5.1.4 Alternative transportation with low-emitting and fuel efficient vehicles

In BREEAM-NL there is no credit about low emitting and fuel efficient vehicles. It can be said that LEED's consideration about this type of transportation is very important and this situation can be thought as a deficiency in BREEAM-NL, as these cars are becoming widespread day by day.

5.5.1.5 Storage and collection of recyclables

Recyclable waste storage (WST 3): Encouraging storage facilities in building in order to collect operational recyclable wastes. One point can be earned. Requirement: There should be a centrally located room for collection of recyclable wastes and this room should be easily accessible, noticeable and including water supply for cleaning (DGBC, 2010).

Regarding to storage and collection of recyclables the assessment in BREEAM-NL is made with the credit Recyclable Waste Storage similarly in LEED. But the difference is that in BREEAM-NL the usage of this space is defined better in aspect of cleaning and access. This also shows the conscious in the Netherlands about this issue. The case study building might not achieve the point with the storage rooms for recyclables, as there is not any water supply for this room and also it's not easy to notice that rooms.

5.5.1.6 Environmental tobacco smoke control

In BREEAM-NL, the environmental tobacco smoke control issue is not considered, as there is a smoking prohibition in all public spaces in the Netherlands. This credit presents also a good example for advantages of adapted green building certification in comparison to the problem that the ETS control credit of LEED has about local conditions.

5.5.1.7 Indoor chemical and pollutant source control

Regarding to indoor chemical and pollutant source control there is not any credit in BREEAM-NL.

5.5.2 Credits criticized with misapplications in the construction phase

5.5.2.1 Construction activity pollution prevention

Responsible construction practices (MAN 2): Providing responsible construction sites to the environment and better management in order to decrease the influence of construction to area. It can earn up to two points. Requirements: For one point construction site should be managed according to a plan providing best practices. In order to show that in documents BREEAM request to test the construction with a Checklist A2 and at least six requirements should be met by the construction for this

one point. If the construction presents extreme success and has all the requirements of the checklist, then it is awarded with two points (DGBC, 2010).

Construction site impacts (MAN 3): Encouraging energy and resource efficient and less polluted construction site management. It can earn up to four points. Requirements: For one point 80% of the used timber materials should be sourced responsibly and all of the timber should be obtained legally. The other three points depend on how many of the requirements are practiced in the construction management. This requirement is about CO2 or energy monitoring and efficiency, reducing water consumption, reducing air and water pollution and providing source efficiency for the construction activities (DGBC, 2010).

BREEAM-NL assesses the construction activity pollution prevention issue with the two credits, Responsible Construction Practices and Construction Site Impacts, and these assessments are more detailed and controlled processes in comparison the one in LEED. First of all according to the one these credits the construction site should be controlled with test by a BREEAM professional. On the other hand all the energy, water and resource consumptions and also the polluted activities should be monitored and controlled for the other credit. The case study building might not achieve the credit point with what is done in the construction period of the building.

5.5.2.2 Enhanced commissioning

Commissioning (MAN 1): Leading proper and better commissioning for building services in order to provide optimum performance from building. It can earn up to two points. Requirement: For one point schedules, occupancy and resources should be presented in a proper plan for construction and pre-handover commissioning. The commissioning should be processed by a definite team beginning from the design stage of the building. After the first point is gained, best practices in the commissioning process and also seasonal commissioning bring the second point to the building (DGBC, 2010).

The Commissioning credit in BREEAM-NL is quite similar to the Enhanced Commissioning credit of LEED. Practising commissioning according to a proper plan with well-arranged schedules, working professional and resources results better building performance in the operational period. Also the seasonal commissioning idea can be very beneficial to keep a commissioning level of a building through

controlling the systems time to time. Assessment aspect in BREEAM-NL is a little wider than in LEED, and the case study building might not have the point from this credit.

5.5.2.3 Construction waste management

Waste management on the construction site (WST 1): Encouraging resource efficient construction practices through a waste management on the construction site. It can earn up to three points. Requirement: For one point there should be a management plan to reduce construction waste which is progressed by the contractor. For the second point these wastes should be separated in addition to what is done for the first point. The third point also can be gained if 80% of the non-hazardous waste is reused or recycled (DGBC, 2010).

In respect of construction waste management BREEAM-NL applies the credit Waste Management on the Construction Site. In both credit the assessment is similar, but the improvement about this issue provided in BREEAM-NL credit is 80% reused or recycled waste requirement. The case study building can achieve points from this credit according to the presented results. However, there is still more control is needed to ensure this numbers.

5.5.2.4 Construction IAQ management

In BREEAM there is not any criterion about the effects of construction to the air quality in operational time and about pollutant control through entrances or chemical control through laundry areas. The importance of indoor air quality in LEED's approach becomes more apparent with this credit which considers the measurements during construction pollutant control.

5.5.3 Credits criticized with misapplications in the certification phase

5.5.3.1 Optimized energy performance

Reduction of CO2 emissions (ENE 1): Support building projects with minimum CO2 emissions in the occupied period of the building. The assessment about CO2 emissions processes through a calculation using the energy performance standard defined in the Buildings Decree. In this standard energy performance requirements are indicated according to the buildings with various functions. It is possible to gain

up to 15 points from this credit. Requirements: The points from this credit depend on the building's energy efficiency which is defined through energy performance calculation. The energy performance calculation is made according to the NEN standards using computer tools (DGBC, 2010).

Energy-efficient lifts (ENE 8): Encouraging energy efficient lifts in order to reduce energy consumption and CO2 emissions. It can earn up to two points. Requirements: For one point, the usage of energy efficient lifts should be proved. The lift capacity of the building should be defined according to a transport analysis in the design stage. In addition to that, if there is coordination between lifts in the building, which provides the respond of the nearest lift for a call, then the second point can be also earned (DGBC, 2010).

Assurance of thermal quality of building shell (ENE 26): Leading to proper designed and constructed buildings in order to minimize CO2 emissions. It can earn up to two points. Requirements: For one point a thermo graphic survey on the building envelop should be applied in the post-construction period and so it can be understood that if the building has still design specifications which are used in the energy calculations. For the other point it should be applied an air permeability test on the building envelope (DGBC, 2010).

The energy issue is assessed in BREEAM-NL with the main credit Reduction of CO2 Emissions and it considers energy efficiency in respect of CO2 emission. In this assessment some computational calculations and simulations can be used as it is in LEED, but in BREEAM-NL this issue is supported with assisting credits like Energy-Efficient Lifts and Assurance of Thermal Quality of Building Shell. On the other hand, BREEAM's energy assessment bases on CO2 consumption without relating with money or budget on contrary of LEED.

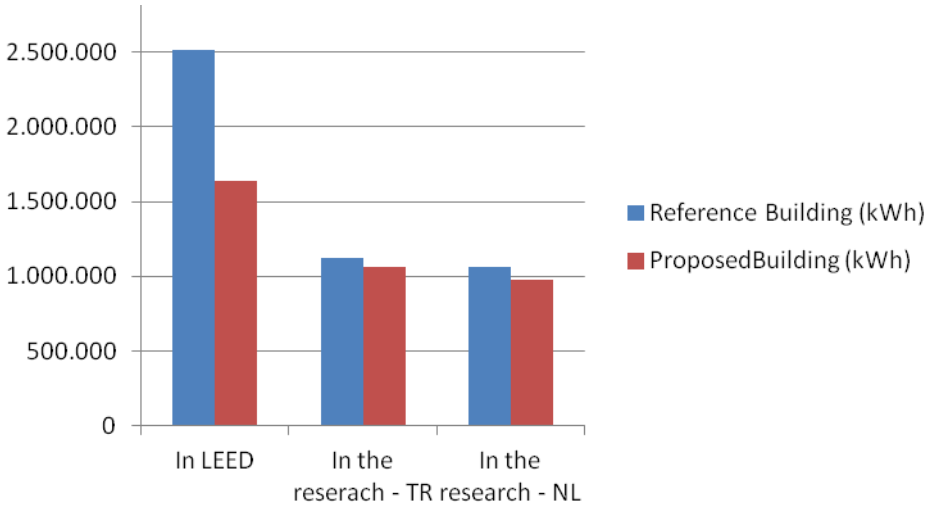

Figure 5.20 : Energy demand comparison.

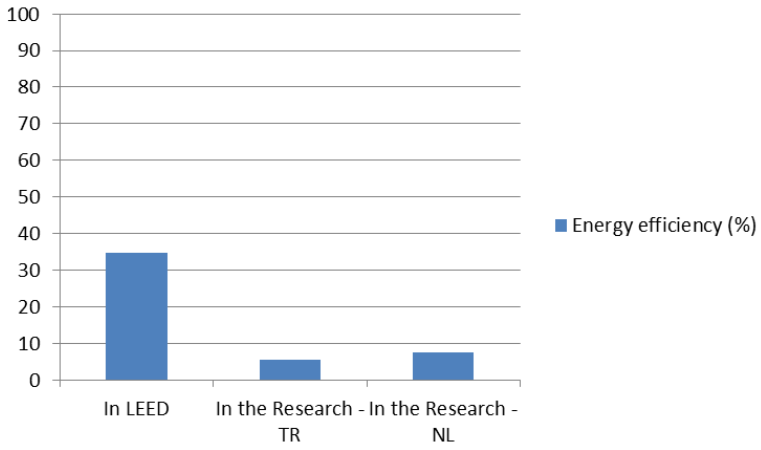

Figure 5.21 : Energy efficiency comparison.

The energy modelling results of the case study building in Turkey and in the Netherlands are different to each other, but the difference is very small. **Figure 5.19, 5.20 and 5.21** show that the case study building model in the Netherlands is more energy efficient than the model in Istanbul. However, the energy efficiency is still very low the energy efficiency rate presented in the LEED report.

5.5.3.2 Daylight and view

Daylighting (HEA 1): Providing more comfortable working and living spaces with sufficient daylight. One point can be gained from this credit. Requirements: For one point the daylight availability in the rooms should be compatible with the visual comfort standards and it should be proved through some calculations and documents. The table in the BREEAM-NL consisting proper daylight factors and the calculation method of BRE can be used for this process (DGBC, 2010).

View out (HEA 2): Supporting better occupied spaced with a required view to outside in order to provide visual comfort and better feeling in the indoor environment. One point can be gained from this credit. Requirements: For one point the occupied spaces should have proper external view without any obstacles and it should be proved that these spaces can achieve enough view through the qualifications in the credit (DGBC, 2010).

Glare Control (HEA 3): Preventing reflection and glare through shading systems to achieve better interior environment with visual comfort. One point can be gained from this credit. Requirements: For that point there should be a shading system which can be controlled by occupants to control glare from daylight in the working places (DGBC, 2010).

BREEAM-NL assesses daylight and view with the credits Daylighting, View Out and Glare Control considering also visual comfort which is not assessed in LEED. However, on the other hand, the assessment method of these credits is similar in LEED, as calculation method without BPS-Tools are allowed in the certification.

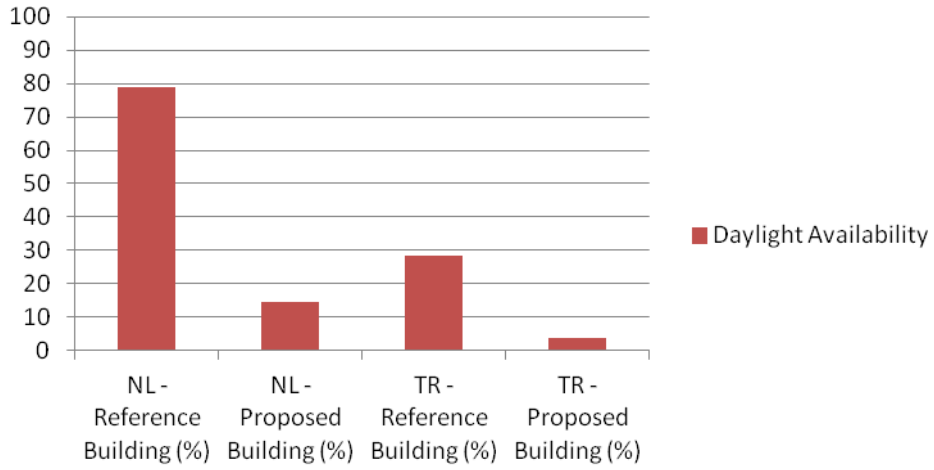

Figure 5.22 : Daylight availability in Turkey and in the Netherlands.

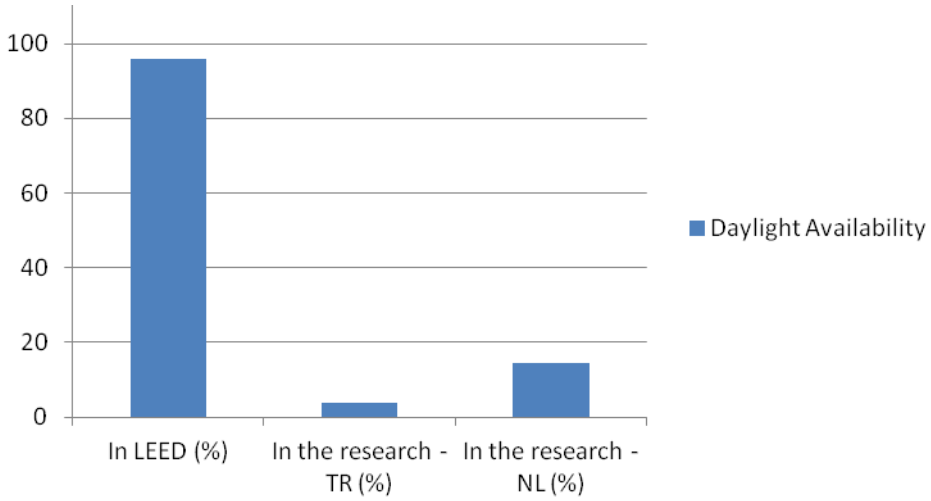

Figure 5.23 : Daylight availability comparison.

In conclusion, the evaluation of the case study building in the Netherlands reveals two important results. First result is the mismatch of the building performance simulation results. Case study building's energy and daylight performance is analysed through building performance simulation tools in two different locations. The energy and daylight modelling of the case study building in the Netherlands give slightly different results to the ones made in Istanbul. It is very normal that the performance changes depending to the location. However, the LEED scores of the building are very different than the simulation results in Istanbul and in the Netherlands. This situation creates doubts about the accuracy of the LEED results.

The second important result achieved through the case study building analyses in the Netherlands is the importance of local conditions and characteristics in green building assessment. Building's performance in LEED is analyzed and compared with the assessment criteria in BREEAM-NL. These analyze and comparison show that an adapted green building certification according to the specific local conditions gives more precise results. The concerns that appear about the local characteristics in the LEED certification are mostly solved in the BREEAM-NL. Because of that it can be mentioned that considering local conditions and characteristics of a location or a country provides to buildings better green assessment.

6. CONCLUSION

In this chapter, the results of simulations and comparisons are analyzed and concluded. This conclusion is the last chapter of the research and it deals with a total consideration and inference from the research based on achieved literary references, interview and questionnaires, building modeling results, analyze about green building certification score and evaluation study of the building in the Netherlands. All these studies and results are combined here and analyzed together in order to attain main discussions and conclusions regarding to the purpose of the research. Through these discussions and conclusions, the green building market can develop and the green building practices can be conducted in a better way.

The analyses are made in four subtitles that are about the results of interviews and questionnaires with experts from the market, of building modeling, critical reviews about green building certification and of estimating the case study building in the Netherlands.

The conclusion of the research is explained in three parts, which are performance of green certified buildings, assessment method of green building certifications and consideration of local properties.

6.1 Performance of Green Certified Buildings

The first main conclusion of the research is about the performance of the green certified buildings. The literary research which is mentioned in the beginning of the research expresses that there are important criticisms regarding to that many green certified buildings are not able have the performance which is claimed by the green building certification score. This is a significant problem in the green building market, as the users, tenants and building owners expect their buildings have green performance like energy efficiency, indoor environment comfort, environment friendly etc. when the building has a green building certification. When these

buildings fail to satisfy the expectation, the mistrust might appear against to the green building certification.

About the performance of green certified buildings, the experts from the Turkish and Dutch building market think that more performance is expected from green certified buildings and they are supposed to fulfill requirements of being a "green building". Especially in the Turkish market the trust regarding to the green building certifications and green certified buildings are very low. Mostly they do not believe that the certification score and the certified building performance are the same. In the both market it is stated that green building certification practices are not sufficient for a proper green performance.

The analyses through energy efficiency and daylight availability of the case study building, which has the LEED Gold Certification in Core&Shell class, support the critics from the literature research and survey in the market. This analysis is applied with the BPS-Tools (Building Performance Simulation Tools) and the energy efficiency and daylight availability of the case study building is calculated. Energy and daylight are the ones of the most important aspects regarding to the green performance of a building. The simulation results show that the case study building do not have any enough energy efficiency and daylight performance to gain any points from the LEED certification. However, it is known that the building had already totally 7 points from these two aspects in the LEED certification.

The difference between the building's LEED score and simulation results leads that the performance problem of the green certified buildings is related to the certification process of the buildings. In order to solve the problems in the certification period of the buildings there should be more control for green building certification and for the simulation results of the building. This is also mentioned by the experts in the interview and questionnaire survey. Also making reassessment in the operational period of the building can be very beneficial to declare the building's real performance to users, tenants and owners.

6.2 Problems in the Green Building Certification Method

The second main conclusion of the research is that there are problems in the green building certifications and their assessment methods. Literary researches state that

the assessment method of the green building certification is criticized in some aspects especially the usage of points and credits; and application and control of the credits of the certifications. This issue is also related to the performance of the green certified buildings, as the result of the assessment shows buildings performance as a scorecard. However, the assessment method includes some other critical review aspects especially in the construction phase of the buildings, so that it should be analyzed and discussed separately.

One of main results of the survey with interviews and questionnaires is that there are problems in the green building certification assessment and practices. Many experts from Turkey and Dutch market mention that the usage and construction phases are the building period in which mostly green building certification problems appear. Construction phase gains importance, as the biggest part of the green building certification is applied and prepared in this phase.

In the critical review part of the research, the green building certification practices in the construction phase are analyzed. There are many assessment credits, which are directly depending to the application quality in the construction phase. The most important ones are construction pollution, air quality precautions, commissioning and construction waste. The performance in these issues might influence considerably the building performance regarding to environment, indoor environment quality and energy efficiency. The analyses present that the applications, management and decisions about these aspects in the construction phase are very important and effective for the result.

In order to minimize the mistakes or incorrect applications and assessments in the construction phase three things are very necessary: knowledge, conscious and control. If a building is in the green building certification process, everyone in this process should be informed about the goals and requirements of the green performance and green building certifications. In addition, the applications and results, which are presented to the green building certification authorities, should be controlled properly not to make mistakes and to cause misleading in the certification score.

6.3 Consideration of Local Characteristics in the Green Building Certification

The last conclusion point of the research is the consideration of local characteristic in the green building certification. This subject is one of main criticisms about green building certifications according to the references in the literature research. This criticisms show that many green building certifications, especially the common ones like LEED, BREEAM, make assessments generally according to standards, conditions, living style etc. of their own countries and don't consider enough the local characteristics in other countries. This situation causes problems in the assessment and result of the building green score. Because the assessment credits might not be proper to these countries and so, the certification score cannot show their actual performance.

In the critical analyze of the LEED assessment of case study building the assessment credits, which are related to the local characteristics of the country, are presented. For Turkey site selection, development density, cycling facilities, low emitting vehicles, recyclable storage and smoke control are the important credits in a green building certification with LEED. They are mostly about buildings environmental performance and indoor air quality. In addition, the credits like these are defined as "easy points", because they do not suit Turkey's conditions and so they cannot make a proper assessment. Buildings might gain points easily and high results in the certification score, although they do not have high points from energy and indoor environmental comfort credits.

In the research, the case study building is estimated in the Netherlands conditions through BPS-Tools and BREEAM-NL assessment. The simulation results support the building performance results in comparison to the LEED score, but also they show importance of the local properties in an energy and daylight analyses. Besides the BREEAM-NL comparison to the critical review of LEED assessment of the case study building show that many credits might provide more proper and correct assessment when they consider local conditions like in BREEAM-NL.

The experts have the same opinion about consideration of local characteristics. People from the market are aware of this situation and it creates mistrust against the green building certifications. When a green building certification prepared according to a specific country is tried to use for another country, then some credits become

very easy, very meaningless or very difficult to do. Also comparing the green certified buildings with the others in that specific country makes no sense, as the conditions are different between them and the assessment considerations are not same. To remove these differences in the green building markets it is important to have a green building certification with local concerns, it can be adapted or local certification.

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APPENDICES

APPENDIX A: Questionnaire prepared for participants in Turkey.

APPENDIX B: Questionnaire prepared for participants in the Netherlands.

APPENDIX C: Questionnaires filled out by the participants in Turkey.

APPENDIX D: Questionnaires filled out by the participants in the Netherlands.

APPENDIX A

Green Building Certifications Questionnaire

QUESTIONNAIRE FOR THE EXPERTS FROM THE TURKISH AND DUTCH MARKET ABOUT THE GREEN BUILDING CERTIFICATIONS

Required for the Graduation Project "Building Performance and Energy Efficiency of Green Certified Buildings: Case Study in Turkey and in the Netherlands"

Özden DEMIR, M.Sc. Student
Istanbul Technical University - Eindhoven University of Technology (Exchange)

ABSTRACT: The research of graduation project deals with a critical review about green certified buildings and green building certifications. LEED and BREEAM are the most preferred green building certifications in market all over the world. However, there are many doubts about energy efficiency and building performance assessment of these green building certifications. In this research the green building certification issue is analyzed through a case study building and it is also compared in the markets in Turkey and in the Netherlands. In addition to that, the views and comments from the market experts are considered in the scope of this project in order to find out reasons of the problems about green building certifications.

Fields with the sign (*) are not necessary to fill

EXPERT INFORMATION

Name

Title

E-mail

Department

Green experiences

- Green buildings
- Green building certifications (LEED, BREEAM, etc.)
- Other

COMPANY INFORMATION

* Company Name

Company Size

Industry

Please explain briefly your opinions about green buildings and green certified buildings:

Green buildings

Green certified buildings

Please rank the different categories of the green building certifications according to your preference:

	Unimportant	Low Importance	Neutral	Important	Very Important
Energy efficiency					
Water conservation					
Renewable energy					
Indoor environmental quality					
Recycle & reuse					
Land & source efficiency					
Waste reduction					
Reduction of greenhouse gases					
Cost and management					
Other					

Other

CREDIBILITY OF THE GREEN BUILDING CERTICATIONS

Do you think the award of green building certifications can ensure good green building performance?

Yes No Don't know

Do you think that the green building certifications are easily understandable and applicable?

Yes No Don't know

In your opinion, does the green building certification method based on credits & points provide a proper assessment for buildings?

Yes No Don't know

Do you think that the “point-chasing” mentality in green building certifications might hinder the green building design and construction performance?

Yes No Don't know

Do you think that green building certifications reduce costs in operational period of buildings?

Yes No Don't know

Do the green building certifications affect buildings' price?

Yes No Don't know

Do you think green buildings are economically more desirable than traditional buildings?

Yes No Don't know

Do you think that the green building label might be misleading for building users and tenants?

Yes No Don't know

In your opinion, do “green buildings” and “green certified buildings” refer to the same thing?

Yes No Don't know

GREEN BUILDING CERTICATION PROCESS

In which building processes do you think that some problems might occur about green building certifications?

- Design
- Construction
- Usage
- Maintenance
- Documentation (for green building certifications)
- Other

In your opinion, what are the reasons of these problems?

- Lack of knowledge
- Less green-building-conscious
- Disinterest
- Difficulties about certification
- Difficulties in application
- Costs
- Lack of control
- Insufficiency in certification
- Other

GREEN BUILDING CERTICATIONS IN THE MARKET

Do you consider the green building certification practices in Turkey good enough?

Yes No Don't know

Considering the Turkish construction market, which type of green building assessment will be more beneficial for better green building performance?

Do you have any recommendations for better green building certification practices in Turkey?

* Any other comments

THANK YOU FOR YOUR TIME AND CONSIDERATION

Özden DEMIR
ozden.demir@yahoo.com

APPENDIX B

Green Building Certifications Questionnaire

QUESTIONNAIRE FOR THE EXPERTS FROM THE TURKISH AND DUTCH MARKET ABOUT THE GREEN BUILDING CERTIFICATIONS

Required for the Graduation Project "Building Performance and Energy Efficiency of Green Certified Buildings: Case Study in Turkey and in the Netherlands"

Özden DEMIR, M.Sc. Student
Istanbul Technical University - Eindhoven University of Technology (Exchange)

ABSTRACT: The research of graduation project deals with a critical review about green certified buildings and green building certifications. LEED and BREEAM are the most preferred green building certifications in market all over the world. However, there are many doubts about energy efficiency and building performance assessment of these green building certifications. In this research the green building certification issue is analyzed through a case study building and it is also compared in the markets in Turkey and in the Netherlands. In addition to that, the views and comments from the market experts are considered in the scope of this project in order to find out reasons of the problems about green building certifications.

Fields with the sign (*) are not necessary to fill

EXPERT INFORMATION

Name

Title

E-mail

Department

Green experiences

- Green buildings
- Green building certifications (LEED, BREEAM, etc.)
- Other

COMPANY INFORMATION

* Company Name

Company Size

Industry

Please explain briefly your opinions about green buildings and green certified buildings:

Green buildings

Green certified buildings

Please rank the different categories of the green building certifications according to your preference:

	Unimportant	Low Importance	Neutral	Important	Very Important
Energy efficiency					
Water conservation					
Renewable energy					
Indoor environmental quality					
Recycle & reuse					
Land & source efficiency					
Waste reduction					
Reduction of greenhouse gases					
Cost and management					
Other					

Other

CREDIBILITY OF THE GREEN BUILDING CERTICATIONS

Do you think the award of green building certifications can ensure good green building performance?

Yes No Don't know

Do you think that the green building certifications are easily understandable and applicable?

Yes No Don't know

In your opinion, does the green building certification method based on credits & points provide a proper assessment for buildings?

Yes No Don't know

Do you think that the “point-chasing” mentality in green building certifications might hinder the green building design and construction performance?

Yes No Don't know

Do you think that green building certifications reduce costs in operational period of buildings?

Yes No Don't know

Do the green building certifications affect buildings' price?

Yes No Don't know

Do you think green buildings are economically more desirable than traditional buildings?

Yes No Don't know

Do you think that the green building label might be misleading for building users and tenants?

Yes No Don't know

In your opinion, do “green buildings” and “green certified buildings” refer to the same thing?

Yes No Don't know

GREEN BUILDING CERTICATION PROCESS

In which building processes do you think that some problems might occur about green building certifications?

- Design
- Construction
- Usage
- Maintenance
- Documentation (for green building certifications)
- Other

In your opinion, what are the reasons of these problems?

- Lack of knowledge
- Less green-building-conscious
- Disinterest
- Difficulties about certification
- Difficulties in application
- Costs
- Lack of control
- Insufficiency in certification
- Other

GREEN BUILDING CERTICATIONS IN THE MARKET

Do you consider the green building certification practices in the Netherlands good enough?

Yes No Don't know

Considering the Dutch construction market, which type of green building assessment will be more beneficial for better green building performance?

Do you have any recommendations for better green building certification practices in the Netherlands?

* Any other comments

THANK YOU FOR YOUR TIME AND CONSIDERATION

Özden DEMIR
ozden.demir@yahoo.com

APPENDIX C

Green Building Certifications Questionnaire

QUESTIONNAIRE FOR THE EXPERTS FROM THE TURKISH AND DUTCH MARKET ABOUT THE GREEN BUILDING CERTIFICATIONS

Required for the Graduation Project "Building Performance and Energy Efficiency of Green Certified Buildings: Case Study in Turkey and in the Netherlands"

Özden DEMIR, M.Sc. Student
Istanbul Technical University - Eindhoven University of Technology (Exchange)

ABSTRACT: The research of graduation project deals with a critical review about green certified buildings and green building certifications. LEED and BREEAM are the most preferred green building certifications in market all over the world. However, there are many doubts about energy efficiency and building performance assessment of these green building certifications. In this research the green building certification issue is analyzed through a case study building and it is also compared in the markets in Turkey and in the Netherlands. In addition to that, the views and comments from the market experts are considered in the scope of this project in order to find out reasons of the problems about green building certifications.

Fields with the sign (*) are not necessary to fill

EXPERT INFORMATION

Name

Title

E-mail

Department

Green experiences

- Green buildings
- Green building certifications (LEED, BREEAM, etc.)
- Other

COMPANY INFORMATION

* Company Name

Company Size

Industry

Please explain briefly your opinions about green buildings and green certified buildings:

Green buildings

Green certified buildings

Please rank the different categories of the green building certifications according to your preference:

	Unimportant	Low Importance	Neutral	Important	Very Important
Energy efficiency					
Water conservation					
Renewable energy					
Indoor environmental quality					
Recycle & reuse					
Land & source efficiency					
Waste reduction					
Reduction of greenhouse gases					
Cost and management					
Other					

Other

CREDIBILITY OF THE GREEN BUILDING CERTICATIONS

Do you think the award of green building certifications can ensure good green building performance?

Yes No Don't know

Do you think that the green building certifications are easily understandable and applicable?

Yes No Don't know

In your opinion, does the green building certification method based on credits & points provide a proper assessment for buildings?

Yes No Don't know

Do you think that the “point-chasing” mentality in green building certifications might hinder the green building design and construction performance?

Yes No Don't know

Do you think that green building certifications reduce costs in operational period of buildings?

Yes No Don't know

Do the green building certifications affect buildings' price?

Yes No Don't know

Do you think green buildings are economically more desirable than traditional buildings?

Yes No Don't know

Do you think that the green building label might be misleading for building users and tenants?

Yes No Don't know

In your opinion, do “green buildings” and “green certified buildings” refer to the same thing?

Yes No Don't know

GREEN BUILDING CERTICATION PROCESS

In which building processes do you think that some problems might occur about green building certifications?

- Design
- Construction
- Usage
- Maintenance
- Documentation (for green building certifications)
- Other

In your opinion, what are the reasons of these problems?

- Lack of knowledge
- Less green-building-conscious
- Disinterest
- Difficulties about certification
- Difficulties in application
- Costs
- Lack of control
- Insufficiency in certification
- Other

GREEN BUILDING CERTICATIONS IN THE MARKET

Do you consider the green building certification practices in Turkey good enough?

Yes No Don't know

Considering the Turkish construction market, which type of green building assessment will be more beneficial for better green building performance?

Do you have any recommendations for better green building certification practices in Turkey?

* Any other comments

THANK YOU FOR YOUR TIME AND CONSIDERATION

Özden DEMIR
ozden.demir@yahoo.com

Green Building Certifications Questionnaire

QUESTIONNAIRE FOR THE EXPERTS FROM THE TURKISH AND DUTCH MARKET ABOUT THE GREEN BUILDING CERTIFICATIONS

Required for the Graduation Project "Building Performance and Energy Efficiency of Green Certified Buildings: Case Study in Turkey and in the Netherlands"

Özden DEMIR, M.Sc. Student
Istanbul Technical University - Eindhoven University of Technology (Exchange)

ABSTRACT: The research of graduation project deals with a critical review about green certified buildings and green building certifications. LEED and BREEAM are the most preferred green building certifications in market all over the world. However, there are many doubts about energy efficiency and building performance assessment of these green building certifications. In this research the green building certification issue is analyzed through a case study building and it is also compared in the markets in Turkey and in the Netherlands. In addition to that, the views and comments from the market experts are considered in the scope of this project in order to find out reasons of the problems about green building certifications.

Fields with the sign (*) are not necessary to fill

EXPERT INFORMATION

Name: SAYGIN AKSOY

Title: SALES SUPPORT MANAGER

E-mail: saygin.aksoy@dumankaya.com

Department: SALES

Green experiences:
- [X] Green buildings
- [X] Green building certifications (LEED, BREEAM, etc.)
- [ ] Other

COMPANY INFORMATION

* Company Name: DUMANKAYA CONS. INC.

Company Size:

Industry: CONSTRUCTION / REAL ESTATE

GREEN BUILDINGS AND GREEN CERTIFIED BUILDINGS

Please explain briefly your opinions about green buildings and green certified buildings:

Green buildings

#There are many benefits. Some of them: emission reduction, water conservation, waste reduction, increased property values, decreased infrastructure stress ...

Green certified buildings

Please rank the different categories of the green building certifications according to your preference:

	Unimportant	Low Importance	Neutral	Important	Very Important
Energy efficiency	○	○	○	○	●
Water conservation	○	○	○	●	○
Renewable energy	○	○	●	○	○
Indoor environmental quality	○	○	○	●	○
Recycle & reuse	○	○	○	●	○
Land & source efficiency	○	○	○	●	○
Waste reduction	○	○	○	●	○
Reduction of greenhouse gases	○	○	●	○	○
Cost and management	○	○	○	○	●
Other	○	○	○	○	○

Other: Healthier lifestyles and recreation.

CREDIBILITY OF THE GREEN BUILDING CERTICATIONS

Do you think the award of green building certifications can ensure good green building performance?

● Yes ○ No ○ Don't know

Do you think that the green building certifications are easily understandable and applicable?

○ Yes ● No ○ Don't know

In your opinion, does the green building certification method based on credits & points provide a proper assessment for buildings?

● Yes ○ No ○ Don't know

Do you think that the "point-chasing" mentality in green building certifications might hinder the green building design and construction performance?

○ Yes ○ No ○ Don't know

Do you think that green building certifications reduce costs in operational period of buildings?

● Yes ○ No ○ Don't know

Do the green building certifications affect buildings' price?

● Yes ○ No ○ Don't know

Do you think green buildings are economically more desirable than traditional buildings?

● Yes ○ No ○ Don't know

Do you think that the green building label might be misleading for building users and tenants?

○ Yes ● No ○ Don't know

In your opinion, do "green buildings" and "green certified buildings" refer to the same thing?

● Yes ○ No ○ Don't know

but I know that's wrong.

GREEN BUILDING CERTICATION PROCESS

In which building processes do you think that some problems might occur about green building certifications?

- [ ] Design
- [x] Construction
- [ ] Usage
- [ ] Maintenance
- [ ] Documentation (for green building certifications)
- [ ] Other: increase construction cost.

In your opinion, what are the reasons of these problems?

- [ ] Lack of knowledge
- [ ] Less green-building-conscious
- [ ] Disinterest
- [ ] Difficulties about certification
- [ ] Difficulties in application
- [x] Costs
- [ ] Lack of control
- [ ] Insufficiency in certification
- [ ] Other

GREEN BUILDING CERTICATIONS IN THE MARKET

Do you consider the green building certification practices in Turkey good enough?

○ Yes ● No ○ Don't know

Considering the Turkish construction market, which type of green building assessment will be more beneficial for better green building performance?

Do you have any recommendations for better green building certification practices in Turkey?

Green Building Certifications Questionnaire

QUESTIONNAIRE FOR THE EXPERTS FROM THE TURKISH AND DUTCH MARKET ABOUT THE GREEN BUILDING CERTIFICATIONS

Required for the Graduation Project "Building Performance and Energy Efficiency of Green Certified Buildings: Case Study in Turkey and in the Netherlands"

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Fields with the sign (*) are not necessary to fill

EXPERT INFORMATION

Name

Title

E-mail

Department

Green experiences

- Green buildings
- Green building certifications (LEED, BREEAM, etc.)
- Other

COMPANY INFORMATION

* Company Name

Company Size

Industry

Please explain briefly your opinions about green buildings and green certified buildings:

Green buildings

Green certified buildings

Please rank the different categories of the green building certifications according to your preference:

	Unimportant	Low Importance	Neutral	Important	Very Important
Energy efficiency					
Water conservation					
Renewable energy					
Indoor environmental quality					
Recycle & reuse					
Land & source efficiency					
Waste reduction					
Reduction of greenhouse gases					
Cost and management					
Other					

Other

CREDIBILITY OF THE GREEN BUILDING CERTICATIONS

Do you think the award of green building certifications can ensure good green building performance?

Yes No Don't know

Do you think that the green building certifications are easily understandable and applicable?

Yes No Don't know

In your opinion, does the green building certification method based on credits & points provide a proper assessment for buildings?

Yes No Don't know

Do you think that the “point-chasing” mentality in green building certifications might hinder the green building design and construction performance?

Yes No Don't know

Do you think that green building certifications reduce costs in operational period of buildings?

Yes No Don't know

Do the green building certifications affect buildings' price?

Yes No Don't know

Do you think green buildings are economically more desirable than traditional buildings?

Yes No Don't know

Do you think that the green building label might be misleading for building users and tenants?

Yes No Don't know

In your opinion, do “green buildings” and “green certified buildings” refer to the same thing?

Yes No Don't know

GREEN BUILDING CERTICATION PROCESS

In which building processes do you think that some problems might occur about green building certifications?

- Design
- Construction
- Usage
- Maintenance
- Documentation (for green building certifications)
- Other

In your opinion, what are the reasons of these problems?

- Lack of knowledge
- Less green-building-conscious
- Disinterest
- Difficulties about certification
- Difficulties in application
- Costs
- Lack of control
- Insufficiency in certification
- Other

GREEN BUILDING CERTICATIONS IN THE MARKET

Do you consider the green building certification practices in Turkey good enough?

Yes No Don't know

Considering the Turkish construction market, which type of green building assessment will be more beneficial for better green building performance?

Do you have any recommendations for better green building certification practices in Turkey?

* Any other comments

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Özden DEMIR
ozden.demir@yahoo.com

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Fields with the sign (*) are not necessary to fill

EXPERT INFORMATION

Name

Title

E-mail

Department

Green experiences

- Green buildings
- Green building certifications (LEED, BREEAM, etc.)
- Other

COMPANY INFORMATION

* Company Name

Company Size

Industry

Please explain briefly your opinions about green buildings and green certified buildings:

Green buildings

Green certified buildings

Please rank the different categories of the green building certifications according to your preference:

	Unimportant	Low Importance	Neutral	Important	Very Important
Energy efficiency					
Water conservation					
Renewable energy					
Indoor environmental quality					
Recycle & reuse					
Land & source efficiency					
Waste reduction					
Reduction of greenhouse gases					
Cost and management					
Other					

Other

CREDIBILITY OF THE GREEN BUILDING CERTICATIONS

Do you think the award of green building certifications can ensure good green building performance?

Yes No Don't know

Do you think that the green building certifications are easily understandable and applicable?

Yes No Don't know

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Yes No Don't know

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Do you think that green building certifications reduce costs in operational period of buildings?

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Do you think green buildings are economically more desirable than traditional buildings?

Yes No Don't know

Do you think that the green building label might be misleading for building users and tenants?

Yes No Don't know

In your opinion, do “green buildings” and “green certified buildings” refer to the same thing?

Yes No Don't know

GREEN BUILDING CERTICATION PROCESS

In which building processes do you think that some problems might occur about green building certifications?

- Design
- Construction
- Usage
- Maintenance
- Documentation (for green building certifications)
- Other

In your opinion, what are the reasons of these problems?

- Lack of knowledge
- Less green-building-conscious
- Disinterest
- Difficulties about certification
- Difficulties in application
- Costs
- Lack of control
- Insufficiency in certification
- Other

GREEN BUILDING CERTICATIONS IN THE MARKET

Do you consider the green building certification practices in Turkey good enough?

Yes No Don't know

Considering the Turkish construction market, which type of green building assessment will be more beneficial for better green building performance?

Do you have any recommendations for better green building certification practices in Turkey?

* Any other comments

THANK YOU FOR YOUR TIME AND CONSIDERATION

Özden DEMIR
ozden.demir@yahoo.com

Green Building Certifications Questionnaire

QUESTIONNAIRE FOR THE EXPERTS FROM THE TURKISH AND DUTCH MARKET ABOUT THE GREEN BUILDING CERTIFICATIONS

Required for the Graduation Project "Building Performance and Energy Efficiency of Green Certified Buildings: Case Study in Turkey and in the Netherlands"

Özden DEMIR, M.Sc. Student
Istanbul Technical University - Eindhoven University of Technology (Exchange)

ABSTRACT: The research of graduation project deals with a critical review about green certified buildings and green building certifications. LEED and BREEAM are the most preferred green building certifications in market all over the world. However, there are many doubts about energy efficiency and building performance assessment of these green building certifications. In this research the green building certification issue is analyzed through a case study building and it is also compared in the markets in Turkey and in the Netherlands. In addition to that, the views and comments from the market experts are considered in the scope of this project in order to find out reasons of the problems about green building certifications.

Fields with the sign (*) are not necessary to fill

EXPERT INFORMATION

Name

Title

E-mail

Department

Green experiences

- Green buildings
- Green building certifications (LEED, BREEAM, etc.)
- Other

COMPANY INFORMATION

* Company Name

Company Size

Industry

Please explain briefly your opinions about green buildings and green certified buildings:

Green buildings

Green certified buildings

Please rank the different categories of the green building certifications according to your preference:

	Unimportant	Low Importance	Neutral	Important	Very Important
Energy efficiency					
Water conservation					
Renewable energy					
Indoor environmental quality					
Recycle & reuse					
Land & source efficiency					
Waste reduction					
Reduction of greenhouse gases					
Cost and management					
Other					

Other

CREDIBILITY OF THE GREEN BUILDING CERTICATIONS

Do you think the award of green building certifications can ensure good green building performance?

Yes No Don't know

Do you think that the green building certifications are easily understandable and applicable?

Yes No Don't know

In your opinion, does the green building certification method based on credits & points provide a proper assessment for buildings?

Yes No Don't know

Do you think that the “point-chasing” mentality in green building certifications might hinder the green building design and construction performance?

Yes No Don't know

Do you think that green building certifications reduce costs in operational period of buildings?

Yes No Don't know

Do the green building certifications affect buildings' price?

Yes No Don't know

Do you think green buildings are economically more desirable than traditional buildings?

Yes No Don't know

Do you think that the green building label might be misleading for building users and tenants?

Yes No Don't know

In your opinion, do “green buildings” and “green certified buildings” refer to the same thing?

Yes No Don't know

GREEN BUILDING CERTICATION PROCESS

In which building processes do you think that some problems might occur about green building certifications?

- Design
- Construction
- Usage
- Maintenance
- Documentation (for green building certifications)
- Other

In your opinion, what are the reasons of these problems?

- Lack of knowledge
- Less green-building-conscious
- Disinterest
- Difficulties about certification
- Difficulties in application
- Costs
- Lack of control
- Insufficiency in certification
- Other

GREEN BUILDING CERTICATIONS IN THE MARKET

Do you consider the green building certification practices in Turkey good enough?

Yes No Don't know

Considering the Turkish construction market, which type of green building assessment will be more beneficial for better green building performance?

Do you have any recommendations for better green building certification practices in Turkey?

* Any other comments

THANK YOU FOR YOUR TIME AND CONSIDERATION

Özden DEMIR
ozden.demir@yahoo.com

Green Building Certifications Questionnaire

QUESTIONNAIRE FOR THE EXPERTS FROM THE TURKISH AND DUTCH MARKET ABOUT THE GREEN BUILDING CERTIFICATIONS

Required for the Graduation Project "Building Performance and Energy Efficiency of Green Certified Buildings: Case Study in Turkey and in the Netherlands"

Özden DEMIR, M.Sc. Student
Istanbul Technical University - Eindhoven University of Technology (Exchange)

ABSTRACT: The research of graduation project deals with a critical review about green certified buildings and green building certifications. LEED and BREEAM are the most preferred green building certifications in market all over the world. However, there are many doubts about energy efficiency and building performance assessment of these green building certifications. In this research the green building certification issue is analyzed through a case study building and it is also compared in the markets in Turkey and in the Netherlands. In addition to that, the views and comments from the market experts are considered in the scope of this project in order to find out reasons of the problems about green building certifications.

Fields with the sign (*) are not necessary to fill

EXPERT INFORMATION

Name

Title

E-mail

Department

Green experiences

- Green buildings
- Green building certifications (LEED, BREEAM, etc.)
- Other

COMPANY INFORMATION

* Company Name

Company Size

Industry

Please explain briefly your opinions about green buildings and green certified buildings:

Green buildings

Green certified buildings

Please rank the different categories of the green building certifications according to your preference:

	Unimportant	Low Importance	Neutral	Important	Very Important
Energy efficiency					
Water conservation					
Renewable energy					
Indoor environmental quality					
Recycle & reuse					
Land & source efficiency					
Waste reduction					
Reduction of greenhouse gases					
Cost and management					
Other					

Other

CREDIBILITY OF THE GREEN BUILDING CERTICATIONS

Do you think the award of green building certifications can ensure good green building performance?

Yes No Don't know

Do you think that the green building certifications are easily understandable and applicable?

Yes No Don't know

In your opinion, does the green building certification method based on credits & points provide a proper assessment for buildings?

Yes No Don't know

Do you think that the “point-chasing” mentality in green building certifications might hinder the green building design and construction performance?

Yes No Don't know

Do you think that green building certifications reduce costs in operational period of buildings?

Yes No Don't know

Do the green building certifications affect buildings' price?

Yes No Don't know

Do you think green buildings are economically more desirable than traditional buildings?

Yes No Don't know

Do you think that the green building label might be misleading for building users and tenants?

Yes No Don't know

In your opinion, do “green buildings” and “green certified buildings” refer to the same thing?

Yes No Don't know

GREEN BUILDING CERTICATION PROCESS

In which building processes do you think that some problems might occur about green building certifications?

- Design
- Construction
- Usage
- Maintenance
- Documentation (for green building certifications)
- Other

In your opinion, what are the reasons of these problems?

- Lack of knowledge
- Less green-building-conscious
- Disinterest
- Difficulties about certification
- Difficulties in application
- Costs
- Lack of control
- Insufficiency in certification
- Other

GREEN BUILDING CERTICATIONS IN THE MARKET

Do you consider the green building certification practices in Turkey good enough?

Yes No Don't know

Considering the Turkish construction market, which type of green building assessment will be more beneficial for better green building performance?

Do you have any recommendations for better green building certification practices in Turkey?

* Any other comments

THANK YOU FOR YOUR TIME AND CONSIDERATION

Özden DEMIR
ozden.demir@yahoo.com

Green Building Certifications Questionnaire

QUESTIONNAIRE FOR THE EXPERTS FROM THE TURKISH AND DUTCH MARKET ABOUT THE GREEN BUILDING CERTIFICATIONS

Required for the Graduation Project "Building Performance and Energy Efficiency of Green Certified Buildings: Case Study in Turkey and in the Netherlands"

Özden DEMIR, M.Sc. Student
Istanbul Technical University - Eindhoven University of Technology (Exchange)

ABSTRACT: The research of graduation project deals with a critical review about green certified buildings and green building certifications. LEED and BREEAM are the most preferred green building certifications in market all over the world. However, there are many doubts about energy efficiency and building performance assessment of these green building certifications. In this research the green building certification issue is analyzed through a case study building and it is also compared in the markets in Turkey and in the Netherlands. In addition to that, the views and comments from the market experts are considered in the scope of this project in order to find out reasons of the problems about green building certifications.

Fields with the sign (*) are not necessary to fill

EXPERT INFORMATION

Name

Title

E-mail

Department

Green experiences

- Green buildings
- Green building certifications (LEED, BREEAM, etc.)
- Other

COMPANY INFORMATION

* Company Name

Company Size

Industry

Please explain briefly your opinions about green buildings and green certified buildings:

Green buildings

Green certified buildings

Please rank the different categories of the green building certifications according to your preference:

	Unimportant	Low Importance	Neutral	Important	Very Important
Energy efficiency					
Water conservation					
Renewable energy					
Indoor environmental quality					
Recycle & reuse					
Land & source efficiency					
Waste reduction					
Reduction of greenhouse gases					
Cost and management					
Other					

Other

CREDIBILITY OF THE GREEN BUILDING CERTICATIONS

Do you think the award of green building certifications can ensure good green building performance?

Yes No Don't know

Do you think that the green building certifications are easily understandable and applicable?

Yes No Don't know

In your opinion, does the green building certification method based on credits & points provide a proper assessment for buildings?

Yes No Don't know

Do you think that the “point-chasing” mentality in green building certifications might hinder the green building design and construction performance?

Yes No Don't know

Do you think that green building certifications reduce costs in operational period of buildings?

Yes No Don't know

Do the green building certifications affect buildings' price?

Yes No Don't know

Do you think green buildings are economically more desirable than traditional buildings?

Yes No Don't know

Do you think that the green building label might be misleading for building users and tenants?

Yes No Don't know

In your opinion, do “green buildings” and “green certified buildings” refer to the same thing?

Yes No Don't know

GREEN BUILDING CERTICATION PROCESS

In which building processes do you think that some problems might occur about green building certifications?

- Design
- Construction
- Usage
- Maintenance
- Documentation (for green building certifications)
- Other

In your opinion, what are the reasons of these problems?

- Lack of knowledge
- Less green-building-conscious
- Disinterest
- Difficulties about certification
- Difficulties in application
- Costs
- Lack of control
- Insufficiency in certification
- Other

GREEN BUILDING CERTICATIONS IN THE MARKET

Do you consider the green building certification practices in Turkey good enough?

Yes No Don't know

Considering the Turkish construction market, which type of green building assessment will be more beneficial for better green building performance?

Do you have any recommendations for better green building certification practices in Turkey?

* Any other comments

THANK YOU FOR YOUR TIME AND CONSIDERATION

Özden DEMIR
ozden.demir@yahoo.com

Green Building Certifications Questionnaire

QUESTIONNAIRE FOR THE EXPERTS FROM THE TURKISH AND DUTCH MARKET ABOUT THE GREEN BUILDING CERTIFICATIONS

Required for the Graduation Project "Building Performance and Energy Efficiency of Green Certified Buildings: Case Study in Turkey and in the Netherlands"

Özden DEMIR, M.Sc. Student
Istanbul Technical University - Eindhoven University of Technology (Exchange)

ABSTRACT: The research of graduation project deals with a critical review about green certified buildings and green building certifications. LEED and BREEAM are the most preferred green building certifications in market all over the world. However, there are many doubts about energy efficiency and building performance assessment of these green building certifications. In this research the green building certification issue is analyzed through a case study building and it is also compared in the markets in Turkey and in the Netherlands. In addition to that, the views and comments from the market experts are considered in the scope of this project in order to find out reasons of the problems about green building certifications.

Fields with the sign (*) are not necessary to fill

EXPERT INFORMATION

Name

Title

E-mail

Department

Green experiences

- Green buildings
- Green building certifications (LEED, BREEAM, etc.)
- Other

COMPANY INFORMATION

* Company Name

Company Size

Industry

Please explain briefly your opinions about green buildings and green certified buildings:

Green buildings

Green certified buildings

Please rank the different categories of the green building certifications according to your preference:

	Unimportant	Low Importance	Neutral	Important	Very Important
Energy efficiency					
Water conservation					
Renewable energy					
Indoor environmental quality					
Recycle & reuse					
Land & source efficiency					
Waste reduction					
Reduction of greenhouse gases					
Cost and management					
Other					

Other

CREDIBILITY OF THE GREEN BUILDING CERTICATIONS

Do you think the award of green building certifications can ensure good green building performance?

Yes No Don't know

Do you think that the green building certifications are easily understandable and applicable?

Yes No Don't know

In your opinion, does the green building certification method based on credits & points provide a proper assessment for buildings?

Yes No Don't know

Do you think that the “point-chasing” mentality in green building certifications might hinder the green building design and construction performance?

Yes No Don't know

Do you think that green building certifications reduce costs in operational period of buildings?

Yes No Don't know

Do the green building certifications affect buildings' price?

Yes No Don't know

Do you think green buildings are economically more desirable than traditional buildings?

Yes No Don't know

Do you think that the green building label might be misleading for building users and tenants?

Yes No Don't know

In your opinion, do “green buildings” and “green certified buildings” refer to the same thing?

Yes No Don't know

GREEN BUILDING CERTICATION PROCESS

In which building processes do you think that some problems might occur about green building certifications?

- Design
- Construction
- Usage
- Maintenance
- Documentation (for green building certifications)
- Other

In your opinion, what are the reasons of these problems?

- Lack of knowledge
- Less green-building-conscious
- Disinterest
- Difficulties about certification
- Difficulties in application
- Costs
- Lack of control
- Insufficiency in certification
- Other

GREEN BUILDING CERTICATIONS IN THE MARKET

Do you consider the green building certification practices in Turkey good enough?

Yes No Don't know

Considering the Turkish construction market, which type of green building assessment will be more beneficial for better green building performance?

Do you have any recommendations for better green building certification practices in Turkey?

* Any other comments

THANK YOU FOR YOUR TIME AND CONSIDERATION

Özden DEMIR
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Green Building Certifications Questionnaire

QUESTIONNAIRE FOR THE EXPERTS FROM THE TURKISH AND DUTCH MARKET ABOUT THE GREEN BUILDING CERTIFICATIONS

Required for the Graduation Project "Building Performance and Energy Efficiency of Green Certified Buildings: Case Study in Turkey and in the Netherlands"

Özden DEMIR, M.Sc. Student
Istanbul Technical University - Eindhoven University of Technology (Exchange)

ABSTRACT: The research of graduation project deals with a critical review about green certified buildings and green building certifications. LEED and BREEAM are the most preferred green building certifications in market all over the world. However, there are many doubts about energy efficiency and building performance assessment of these green building certifications. In this research the green building certification issue is analyzed through a case study building and it is also compared in the markets in Turkey and in the Netherlands. In addition to that, the views and comments from the market experts are considered in the scope of this project in order to find out reasons of the problems about green building certifications.

Fields with the sign (*) are not necessary to fill

EXPERT INFORMATION

Name

Title

E-mail

Department

Green experiences

- Green buildings
- Green building certifications (LEED, BREEAM, etc.)
- Other

COMPANY INFORMATION

* Company Name

Company Size

Industry

Please explain briefly your opinions about green buildings and green certified buildings:

Green buildings

Green certified buildings

Please rank the different categories of the green building certifications according to your preference:

	Unimportant	Low Importance	Neutral	Important	Very Important
Energy efficiency					
Water conservation					
Renewable energy					
Indoor environmental quality					
Recycle & reuse					
Land & source efficiency					
Waste reduction					
Reduction of greenhouse gases					
Cost and management					
Other					

Other

CREDIBILITY OF THE GREEN BUILDING CERTICATIONS

Do you think the award of green building certifications can ensure good green building performance?

Yes No Don't know

Do you think that the green building certifications are easily understandable and applicable?

Yes No Don't know

In your opinion, does the green building certification method based on credits & points provide a proper assessment for buildings?

Yes No Don't know

Do you think that the “point-chasing” mentality in green building certifications might hinder the green building design and construction performance?

Yes No Don't know

Do you think that green building certifications reduce costs in operational period of buildings?

Yes No Don't know

Do the green building certifications affect buildings' price?

Yes No Don't know

Do you think green buildings are economically more desirable than traditional buildings?

Yes No Don't know

Do you think that the green building label might be misleading for building users and tenants?

Yes No Don't know

In your opinion, do “green buildings” and “green certified buildings” refer to the same thing?

Yes No Don't know

GREEN BUILDING CERTICATION PROCESS

In which building processes do you think that some problems might occur about green building certifications?

- Design
- Construction
- Usage
- Maintenance
- Documentation (for green building certifications)
- Other

In your opinion, what are the reasons of these problems?

- Lack of knowledge
- Less green-building-conscious
- Disinterest
- Difficulties about certification
- Difficulties in application
- Costs
- Lack of control
- Insufficiency in certification
- Other

GREEN BUILDING CERTICATIONS IN THE MARKET

Do you consider the green building certification practices in Turkey good enough?

Yes No Don't know

Considering the Turkish construction market, which type of green building assessment will be more beneficial for better green building performance?

Do you have any recommendations for better green building certification practices in Turkey?

* Any other comments

THANK YOU FOR YOUR TIME AND CONSIDERATION

Özden DEMIR
ozden.demir@yahoo.com

Green Building Certifications Questionnaire

QUESTIONNAIRE FOR THE EXPERTS FROM THE TURKISH AND DUTCH MARKET ABOUT THE GREEN BUILDING CERTIFICATIONS

Required for the Graduation Project "Building Performance and Energy Efficiency of Green Certified Buildings: Case Study in Turkey and in the Netherlands"

Özden DEMIR, M.Sc. Student
Istanbul Technical University - Eindhoven University of Technology (Exchange)

ABSTRACT: The research of graduation project deals with a critical review about green certified buildings and green building certifications. LEED and BREEAM are the most preferred green building certifications in market all over the world. However, there are many doubts about energy efficiency and building performance assessment of these green building certifications. In this research the green building certification issue is analyzed through a case study building and it is also compared in the markets in Turkey and in the Netherlands. In addition to that, the views and comments from the market experts are considered in the scope of this project in order to find out reasons of the problems about green building certifications.

Fields with the sign (*) are not necessary to fill

EXPERT INFORMATION

Name

Title

E-mail

Department

Green experiences

- Green buildings
- Green building certifications (LEED, BREEAM, etc.)
- Other

COMPANY INFORMATION

* Company Name

Company Size

Industry

Please explain briefly your opinions about green buildings and green certified buildings:

Green buildings

Green certified buildings

Please rank the different categories of the green building certifications according to your preference:

	Unimportant	Low Importance	Neutral	Important	Very Important
Energy efficiency					
Water conservation					
Renewable energy					
Indoor environmental quality					
Recycle & reuse					
Land & source efficiency					
Waste reduction					
Reduction of greenhouse gases					
Cost and management					
Other					

Other

CREDIBILITY OF THE GREEN BUILDING CERTICATIONS

Do you think the award of green building certifications can ensure good green building performance?

Yes No Don't know

Do you think that the green building certifications are easily understandable and applicable?

Yes No Don't know

In your opinion, does the green building certification method based on credits & points provide a proper assessment for buildings?

Yes No Don't know

Do you think that the “point-chasing” mentality in green building certifications might hinder the green building design and construction performance?

Yes No Don't know

Do you think that green building certifications reduce costs in operational period of buildings?

Yes No Don't know

Do the green building certifications affect buildings' price?

Yes No Don't know

Do you think green buildings are economically more desirable than traditional buildings?

Yes No Don't know

Do you think that the green building label might be misleading for building users and tenants?

Yes No Don't know

In your opinion, do “green buildings” and “green certified buildings” refer to the same thing?

Yes No Don't know

GREEN BUILDING CERTICATION PROCESS

In which building processes do you think that some problems might occur about green building certifications?

- Design
- Construction
- Usage
- Maintenance
- Documentation (for green building certifications)
- Other

In your opinion, what are the reasons of these problems?

- Lack of knowledge
- Less green-building-conscious
- Disinterest
- Difficulties about certification
- Difficulties in application
- Costs
- Lack of control
- Insufficiency in certification
- Other

GREEN BUILDING CERTICATIONS IN THE MARKET

Do you consider the green building certification practices in Turkey good enough?

Yes No Don't know

Considering the Turkish construction market, which type of green building assessment will be more beneficial for better green building performance?

Do you have any recommendations for better green building certification practices in Turkey?

* Any other comments

THANK YOU FOR YOUR TIME AND CONSIDERATION

Özden DEMIR
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APPENDIX D

Green Building Certifications Questionnaire

QUESTIONNAIRE FOR THE EXPERTS FROM THE TURKISH AND DUTCH MARKET ABOUT THE GREEN BUILDING CERTIFICATIONS

Required for the Graduation Project "Building Performance and Energy Efficiency of Green Certified Buildings: Case Study in Turkey and in the Netherlands"

Özden DEMIR, M.Sc. Student
Istanbul Technical University - Eindhoven University of Technology (Exchange)

ABSTRACT: The research of graduation project deals with a critical review about green certified buildings and green building certifications. LEED and BREEAM are the most preferred green building certifications in market all over the world. However, there are many doubts about energy efficiency and building performance assessment of these green building certifications. In this research the green building certification issue is analyzed through a case study building and it is also compared in the markets in Turkey and in the Netherlands. In addition to that, the views and comments from the market experts are considered in the scope of this project in order to find out reasons of the problems about green building certifications.

Fields with the sign (*) are not necessary to fill

EXPERT INFORMATION

Name

Title

E-mail

Department

Green experiences

- Green buildings
- Green building certifications (LEED, BREEAM, etc.)
- Other

COMPANY INFORMATION

* Company Name

Company Size

Industry

Please explain briefly your opinions about green buildings and green certified buildings:

Green buildings

Green certified buildings

Please rank the different categories of the green building certifications according to your preference:

	Unimportant	Low Importance	Neutral	Important	Very Important
Energy efficiency					
Water conservation					
Renewable energy					
Indoor environmental quality					
Recycle & reuse					
Land & source efficiency					
Waste reduction					
Reduction of greenhouse gases					
Cost and management					
Other					

Other

CREDIBILITY OF THE GREEN BUILDING CERTICATIONS

Do you think the award of green building certifications can ensure good green building performance?

Yes No Don't know

Do you think that the green building certifications are easily understandable and applicable?

Yes No Don't know

In your opinion, does the green building certification method based on credits & points provide a proper assessment for buildings?

Yes No Don't know

Do you think that the “point-chasing” mentality in green building certifications might hinder the green building design and construction performance?

Yes No Don't know

Do you think that green building certifications reduce costs in operational period of buildings?

Yes No Don't know

Do the green building certifications affect buildings' price?

Yes No Don't know

Do you think green buildings are economically more desirable than traditional buildings?

Yes No Don't know

Do you think that the green building label might be misleading for building users and tenants?

Yes No Don't know

In your opinion, do “green buildings” and “green certified buildings” refer to the same thing?

Yes No Don't know

GREEN BUILDING CERTICATION PROCESS

In which building processes do you think that some problems might occur about green building certifications?

- Design
- Construction
- Usage
- Maintenance
- Documentation (for green building certifications)
- Other

In your opinion, what are the reasons of these problems?

- Lack of knowledge
- Less green-building-conscious
- Disinterest
- Difficulties about certification
- Difficulties in application
- Costs
- Lack of control
- Insufficiency in certification
- Other

GREEN BUILDING CERTICATIONS IN THE MARKET

Do you consider the green building certification practices in the Netherlands good enough?

Yes No Don't know

Considering the Dutch construction market, which type of green building assessment will be more beneficial for better green building performance?

Do you have any recommendations for better green building certification practices in the Netherlands?

* Any other comments

THANK YOU FOR YOUR TIME AND CONSIDERATION

Özden DEMIR
ozden.demir@yahoo.com

Green Building Certifications Questionnaire

QUESTIONNAIRE FOR THE EXPERTS FROM THE TURKISH AND DUTCH MARKET ABOUT THE GREEN BUILDING CERTIFICATIONS

Required for the Graduation Project "Building Performance and Energy Efficiency of Green Certified Buildings: Case Study in Turkey and in the Netherlands"

Özden DEMIR, M.Sc. Student
Istanbul Technical University - Eindhoven University of Technology (Exchange)

ABSTRACT: The research of graduation project deals with a critical review about green certified buildings and green building certifications. LEED and BREEAM are the most preferred green building certifications in market all over the world. However, there are many doubts about energy efficiency and building performance assessment of these green building certifications. In this research the green building certification issue is analyzed through a case study building and it is also compared in the markets in Turkey and in the Netherlands. In addition to that, the views and comments from the market experts are considered in the scope of this project in order to find out reasons of the problems about green building certifications.

Fields with the sign (*) are not necessary to fill

EXPERT INFORMATION

Name

Title

E-mail

Department

Green experiences

- Green buildings
- Green building certifications (LEED, BREEAM, etc.)
- Other

COMPANY INFORMATION

* Company Name

Company Size

Industry

Please explain briefly your opinions about green buildings and green certified buildings:

Green buildings

Green certified buildings

Please compare the assessment method of various categories in the green building certifications

	Unimportant	Low Importance	Neutral	Important	Very Important
Energy efficiency					
Water conservation					
Renewable energy					
Indoor environmental quality					
Recycle & reuse					
Land & source efficiency					
Waste reduction					
Reduction of greenhouse gases					
Cost and management					
Other					

Other

CREDIBILITY OF THE GREEN BUILDING CERTICATIONS

Do you think that the content of green building certifications is sufficient for a good green building performance?

Yes No Don't know

Do you think that the green building certifications are easily understandable and applicable?

Yes No Don't know

In your opinion, does the green building certification method depending on credits & points provide a proper assessment for buildings?

Yes No Don't know

Do you think that the “point-chasing” mentality in green building certifications might hinder the green building design and construction performance?

Yes No Don't know

Do you think that green building certifications reduce costs in operational period of buildings?

Yes No Don't know

Do the green building certifications effect buildings' price?

Yes No Don't know

Do you think green buildings are economically more desirable than traditional buildings?

Yes No Don't know

Do you think that the green building label might be misleading for building users and tenants?

Yes No Don't know

In your opinion, do “green buildings” and “green certified buildings” refer to the same thing?

Yes No Don't know

GREEN BUILDING CERTICATION PROCESS

In which building process do you think that some problems might occur about green building certifications?

- Design
- Construction
- Usage
- Maintenance
- Documentation (for green building certifications)
- Other

In your opinion, what are the reasons of these problems?

- Lack of knowledge
- Less green-building-conscious
- Disinterestedness
- Difficulties about certification
- Difficulties in application
- Costs
- Lack of control
- Insufficiency in certification
- Other

GREEN BUILDING CERTICATIONS IN THE MARKET

Do you consider the green building certification practices in the Netherlands good enough?

Yes No Don't know

Considering the Dutch construction market, which type of green building assessment will be more beneficial for better green building performance?

Do you have any recommendations for better green building certification practices in the Netherlands?

* Any other comments

THANK YOU FOR YOUR TIME AND CONSIDERATION

Özden DEMIR
ozden.demir@yahoo.com

Green Building Certifications Questionnaire

QUESTIONNAIRE FOR THE EXPERTS FROM THE TURKISH AND DUTCH MARKET ABOUT THE GREEN BUILDING CERTIFICATIONS

Required for the Graduation Project "Building Performance and Energy Efficiency of Green Certified Buildings: Case Study in Turkey and in the Netherlands"

Özden DEMIR, M.Sc. Student
Istanbul Technical University - Eindhoven University of Technology (Exchange)

ABSTRACT: The research of graduation project deals with a critical review about green certified buildings and green building certifications. LEED and BREEAM are the most preferred green building certifications in market all over the world. However, there are many doubts about energy efficiency and building performance assessment of these green building certifications. In this research the green building certification issue is analyzed through a case study building and it is also compared in the markets in Turkey and in the Netherlands. In addition to that, the views and comments from the market experts are considered in the scope of this project in order to find out reasons of the problems about green building certifications.

Fields with the sign (*) are not necessary to fill

EXPERT INFORMATION

Name

Title

E-mail

Department

Green experiences

- Green buildings
- Green building certifications (LEED, BREEAM, etc.)
- Other

COMPANY INFORMATION

* Company Name

Company Size

Industry

Please explain briefly your opinions about green buildings and green certified buildings:

Green buildings

Green certified buildings

Please rank the different categories of the green building certifications according to your preference:

	Unimportant	Low Importance	Neutral	Important	Very Important
Energy efficiency					
Water conservation					
Renewable energy					
Indoor environmental quality					
Recycle & reuse					
Land & source efficiency					
Waste reduction					
Reduction of greenhouse gases					
Cost and management					
Other					

Other

CREDIBILITY OF THE GREEN BUILDING CERTICATIONS

Do you think the award of green building certifications can ensure good green building performance?

Yes No Don't know

Do you think that the green building certifications are easily understandable and applicable?

Yes No Don't know

In your opinion, does the green building certification method based on credits & points provide a proper assessment for buildings?

Yes No Don't know

Do you think that the “point-chasing” mentality in green building certifications might hinder the green building design and construction performance?

Yes No Don't know

Do you think that green building certifications reduce costs in operational period of buildings?

Yes No Don't know

Do the green building certifications affect buildings' price?

Yes No Don't know

Do you think green buildings are economically more desirable than traditional buildings?

Yes No Don't know

Do you think that the green building label might be misleading for building users and tenants?

Yes No Don't know

In your opinion, do “green buildings” and “green certified buildings” refer to the same thing?

Yes No Don't know

GREEN BUILDING CERTICATION PROCESS

In which building processes do you think that some problems might occur about green building certifications?

- Design
- Construction
- Usage
- Maintenance
- Documentation (for green building certifications)
- Other

In your opinion, what are the reasons of these problems?

- Lack of knowledge
- Less green-building-conscious
- Disinterest
- Difficulties about certification
- Difficulties in application
- Costs
- Lack of control
- Insufficiency in certification
- Other

GREEN BUILDING CERTICATIONS IN THE MARKET

Do you consider the green building certification practices in the Netherlands good enough?

Yes No Don't know

Considering the Dutch construction market, which type of green building assessment will be more beneficial for better green building performance?

Do you have any recommendations for better green building certification practices in the Netherlands?

* Any other comments

THANK YOU FOR YOUR TIME AND CONSIDERATION

Özden DEMIR
ozden.demir@yahoo.com

Green Building Certifications Questionnaire

QUESTIONNAIRE FOR THE EXPERTS FROM THE TURKISH AND DUTCH MARKET ABOUT THE GREEN BUILDING CERTIFICATIONS

Required for the Graduation Project "Building Performance and Energy Efficiency of Green Certified Buildings: Case Study in Turkey and in the Netherlands"

Özden DEMIR, M.Sc. Student
Istanbul Technical University - Eindhoven University of Technology (Exchange)

ABSTRACT: The research of graduation project deals with a critical review about green certified buildings and green building certifications. LEED and BREEAM are the most preferred green building certifications in market all over the world. However, there are many doubts about energy efficiency and building performance assessment of these green building certifications. In this research the green building certification issue is analyzed through a case study building and it is also compared in the markets in Turkey and in the Netherlands. In addition to that, the views and comments from the market experts are considered in the scope of this project in order to find out reasons of the problems about green building certifications.

Fields with the sign (*) are not necessary to fill

EXPERT INFORMATION

Name: R. VAN GERWEN

Title: ING. PMSE

E-mail: RVANGERWEN @ BARTELS.NL

Department:

Green experiences:
- ☐ Green buildings
- ☒ Green building certifications (LEED, BREEAM, etc.)
- ☐ Other

COMPANY INFORMATION

* Company Name: BARTELS INGENIEURSBUREAU

Company Size: ± 150 FTE

Industry: BUILDINGS & INFRASTRUCTURE

GREEN BUILDINGS AND GREEN CERTIFIED BUILDINGS

Please explain briefly your opinions about green buildings and green certified buildings:

Green buildings

Green certified buildings

DIFFICULT TO MEASURE, TO COMPARE AND TO RATE ALL THE PARAMETERS INVOLVED WITH BUILDINGS. WHAT IS THE VALUE OF THE OUTCOME?

Please rank the different categories of the green building certifications according to your preference:

	Unimportant	Low Importance	Neutral	Important	Very Important
Energy efficiency	○	○	○	⊗	○
Water conservation	○	○	○	⊗	○
Renewable energy	○	○	○	⊗	○
Indoor environmental quality	○	○	⊗	○	○
Recycle & reuse	○	○	○	⊗	○
Land & source efficiency	○	○	⊗	○	○
Waste reduction	○	○	○	⊗	○
Reduction of greenhouse gases	○	○	○	⊗	○
Cost and management	○	○	⊗	○	○
Other	○	○	○	○	○

Other

CREDIBILITY OF THE GREEN BUILDING CERTICATIONS

Do you think the award of green building certifications can ensure good green building performance?

○ Yes ⊗ No ○ Don't know

Do you think that the green building certifications are easily understandable and applicable?

⊗ Yes ○ No ○ Don't know

In your opinion, does the green building certification method based on credits & points provide a proper assessment for buildings?

○ Yes ⊗ No ○ Don't know

Do you think that the "point-chasing" mentality in green building certifications might hinder the green building design and construction performance?

⊗ Yes ○ No ○ Don't know

Do you think that green building certifications reduce costs in operational period of buildings?

○ Yes ⊗ No ○ Don't know

Do the green building certifications affect buildings' price?

⊗ Yes ○ No ○ Don't know

Do you think green buildings are economically more desirable than traditional buildings?

○ Yes ⊗ No ○ Don't know

Do you think that the green building label might be misleading for building users and tenants?

⊗ Yes ○ No ○ Don't know

In your opinion, do "green buildings" and "green certified buildings" refer to the same thing?

○ Yes ○ No ⊗ Don't know

GREEN BUILDING CERTICATION PROCESS

In which building processes do you think that some problems might occur about green building certifications?

- [ ] Design
- [x] Construction
- [ ] Usage
- [x] Maintenance
- [ ] Documentation (for green building certifications)
- [ ] Other

In your opinion, what are the reasons of these problems?

- [ ] Lack of knowledge
- [ ] Less green-building-conscious
- [x] Disinterest
- [ ] Difficulties about certification
- [ ] Difficulties in application
- [x] Costs
- [ ] Lack of control
- [ ] Insufficiency in certification
- [ ] Other

GREEN BUILDING CERTICATIONS IN THE MARKET

Do you consider the green building certification practices in the Netherlands good enough?

○ Yes ○ No ⊗ Don't know

Considering the Dutch construction market, which type of green building assessment will be more beneficial for better green building performance?

Do you have any recommendations for better green building certification practices in the Netherlands?

* Any other comments

THANK YOU FOR YOUR TIME AND CONSIDERATION

Özden DEMIR
ozden.demir@yahoo.com

Green Building Certifications Questionnaire

QUESTIONNAIRE FOR THE EXPERTS FROM THE TURKISH AND DUTCH MARKET ABOUT THE GREEN BUILDING CERTIFICATIONS

Required for the Graduation Project "Building Performance and Energy Efficiency of Green Certified Buildings: Case Study in Turkey and in the Netherlands"

Özden DEMIR, M.Sc. Student
Istanbul Technical University - Eindhoven University of Technology (Exchange)

ABSTRACT: The research of graduation project deals with a critical review about green certified buildings and green building certifications. LEED and BREEAM are the most preferred green building certifications in market all over the world. However, there are many doubts about energy efficiency and building performance assessment of these green building certifications. In this research the green building certification issue is analyzed through a case study building and it is also compared in the markets in Turkey and in the Netherlands. In addition to that, the views and comments from the market experts are considered in the scope of this project in order to find out reasons of the problems about green building certifications.

Fields with the sign (*) are not necessary to fill

EXPERT INFORMATION

Name

Title

E-mail

Department

Green experiences

- Green buildings
- Green building certifications (LEED, BREEAM, etc.)
- Other

COMPANY INFORMATION

* Company Name

Company Size

Industry

Please explain briefly your opinions about green buildings and green certified buildings:

Green buildings

Green certified buildings

Please rank the different categories of the green building certifications according to your preference:

	Unimportant	Low Importance	Neutral	Important	Very Important
Energy efficiency					
Water conservation					
Renewable energy					
Indoor environmental quality					
Recycle & reuse					
Land & source efficiency					
Waste reduction					
Reduction of greenhouse gases					
Cost and management					
Other					

Other

CREDIBILITY OF THE GREEN BUILDING CERTICATIONS

Do you think the award of green building certifications can ensure good green building performance?

Yes No Don't know

Do you think that the green building certifications are easily understandable and applicable?

Yes No Don't know

In your opinion, does the green building certification method based on credits & points provide a proper assessment for buildings?

Yes No Don't know

Do you think that the “point-chasing” mentality in green building certifications might hinder the green building design and construction performance?

Yes No Don't know

Do you think that green building certifications reduce costs in operational period of buildings?

Yes No Don't know

Do the green building certifications affect buildings' price?

Yes No Don't know

Do you think green buildings are economically more desirable than traditional buildings?

Yes No Don't know

Do you think that the green building label might be misleading for building users and tenants?

Yes No Don't know

In your opinion, do “green buildings” and “green certified buildings” refer to the same thing?

Yes No Don't know

GREEN BUILDING CERTICATION PROCESS

In which building processes do you think that some problems might occur about green building certifications?

- Design
- Construction
- Usage
- Maintenance
- Documentation (for green building certifications)
- Other

In your opinion, what are the reasons of these problems?

- Lack of knowledge
- Less green-building-conscious
- Disinterest
- Difficulties about certification
- Difficulties in application
- Costs
- Lack of control
- Insufficiency in certification
- Other

GREEN BUILDING CERTICATIONS IN THE MARKET

Do you consider the green building certification practices in the Netherlands good enough?

Yes No Don't know

Considering the Dutch construction market, which type of green building assessment will be more beneficial for better green building performance?

Do you have any recommendations for better green building certification practices in the Netherlands?

* Any other comments

THANK YOU FOR YOUR TIME AND CONSIDERATION

Özden DEMIR
ozden.demir@yahoo.com

Green Building Certifications Questionnaire

QUESTIONNAIRE FOR THE EXPERTS FROM THE TURKISH AND DUTCH MARKET ABOUT THE GREEN BUILDING CERTIFICATIONS

Required for the Graduation Project "Building Performance and Energy Efficiency of Green Certified Buildings: Case Study in Turkey and in the Netherlands"

Özden DEMIR, M.Sc. Student
Istanbul Technical University - Eindhoven University of Technology (Exchange)

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Fields with the sign (*) are not necessary to fill

EXPERT INFORMATION

Name

Title

E-mail

Department

Green experiences

- Green buildings
- Green building certifications (LEED, BREEAM, etc.)
- Other

COMPANY INFORMATION

* Company Name

Company Size

Industry

Please explain briefly your opinions about green buildings and green certified buildings:

Green buildings

Green certified buildings

Please rank the different categories of the green building certifications according to your preference:

	Unimportant	Low Importance	Neutral	Important	Very Important
Energy efficiency					
Water conservation					
Renewable energy					
Indoor environmental quality					
Recycle & reuse					
Land & source efficiency					
Waste reduction					
Reduction of greenhouse gases					
Cost and management					
Other					

Other

CREDIBILITY OF THE GREEN BUILDING CERTICATIONS

Do you think the award of green building certifications can ensure good green building performance?

Yes No Don't know

Do you think that the green building certifications are easily understandable and applicable?

Yes No Don't know

In your opinion, does the green building certification method based on credits & points provide a proper assessment for buildings?

Yes No Don't know

Do you think that the “point-chasing” mentality in green building certifications might hinder the green building design and construction performance?

Yes No Don't know

Do you think that green building certifications reduce costs in operational period of buildings?

Yes No Don't know

Do the green building certifications affect buildings' price?

Yes No Don't know

Do you think green buildings are economically more desirable than traditional buildings?

Yes No Don't know

Do you think that the green building label might be misleading for building users and tenants?

Yes No Don't know

In your opinion, do “green buildings” and “green certified buildings” refer to the same thing?

Yes No Don't know

GREEN BUILDING CERTICATION PROCESS

In which building processes do you think that some problems might occur about green building certifications?

- Design
- Construction
- Usage
- Maintenance
- Documentation (for green building certifications)
- Other

In your opinion, what are the reasons of these problems?

- Lack of knowledge
- Less green-building-conscious
- Disinterest
- Difficulties about certification
- Difficulties in application
- Costs
- Lack of control
- Insufficiency in certification
- Other

GREEN BUILDING CERTICATIONS IN THE MARKET

Do you consider the green building certification practices in the Netherlands good enough?

Yes No Don't know

Considering the Dutch construction market, which type of green building assessment will be more beneficial for better green building performance?

Do you have any recommendations for better green building certification practices in the Netherlands?

* Any other comments

THANK YOU FOR YOUR TIME AND CONSIDERATION

Özden DEMIR
ozden.demir@yahoo.com

Green Building Certifications Questionnaire

QUESTIONNAIRE FOR THE EXPERTS FROM THE TURKISH AND DUTCH MARKET ABOUT THE GREEN BUILDING CERTIFICATIONS

Required for the Graduation Project "Building Performance and Energy Efficiency of Green Certified Buildings: Case Study in Turkey and in the Netherlands"

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Istanbul Technical University - Eindhoven University of Technology (Exchange)

ABSTRACT: The research of graduation project deals with a critical review about green certified buildings and green building certifications. LEED and BREEAM are the most preferred green building certifications in market all over the world. However, there are many doubts about energy efficiency and building performance assessment of these green building certifications. In this research the green building certification issue is analyzed through a case study building and it is also compared in the markets in Turkey and in the Netherlands. In addition to that, the views and comments from the market experts are considered in the scope of this project in order to find out reasons of the problems about green building certifications.

Fields with the sign (*) are not necessary to fill

EXPERT INFORMATION

Name

Title

E-mail

Department

Green experiences

- Green buildings
- Green building certifications (LEED, BREEAM, etc.)
- Other

COMPANY INFORMATION

* Company Name

Company Size

Industry

Please explain briefly your opinions about green buildings and green certified buildings:

Green buildings

Green certified buildings

Please rank the different categories of the green building certifications according to your preference:

	Unimportant	Low Importance	Neutral	Important	Very Important
Energy efficiency					
Water conservation					
Renewable energy					
Indoor environmental quality					
Recycle & reuse					
Land & source efficiency					
Waste reduction					
Reduction of greenhouse gases					
Cost and management					
Other					

Other

CREDIBILITY OF THE GREEN BUILDING CERTICATIONS

Do you think the award of green building certifications can ensure good green building performance?

Yes No Don't know

Do you think that the green building certifications are easily understandable and applicable?

Yes No Don't know

In your opinion, does the green building certification method based on credits & points provide a proper assessment for buildings?

Yes No Don't know

Do you think that the “point-chasing” mentality in green building certifications might hinder the green building design and construction performance?

Yes No Don't know

Do you think that green building certifications reduce costs in operational period of buildings?

Yes No Don't know

Do the green building certifications affect buildings' price?

Yes No Don't know

Do you think green buildings are economically more desirable than traditional buildings?

Yes No Don't know

Do you think that the green building label might be misleading for building users and tenants?

Yes No Don't know

In your opinion, do “green buildings” and “green certified buildings” refer to the same thing?

Yes No Don't know

GREEN BUILDING CERTICATION PROCESS

In which building processes do you think that some problems might occur about green building certifications?

- Design
- Construction
- Usage
- Maintenance
- Documentation (for green building certifications)
- Other

In your opinion, what are the reasons of these problems?

- Lack of knowledge
- Less green-building-conscious
- Disinterest
- Difficulties about certification
- Difficulties in application
- Costs
- Lack of control
- Insufficiency in certification
- Other

GREEN BUILDING CERTICATIONS IN THE MARKET

Do you consider the green building certification practices in the Netherlands good enough?

Yes No Don't know

Considering the Dutch construction market, which type of green building assessment will be more beneficial for better green building performance?

Do you have any recommendations for better green building certification practices in the Netherlands?

* Any other comments

THANK YOU FOR YOUR TIME AND CONSIDERATION

Özden DEMIR
ozden.demir@yahoo.com

Green Building Certifications Questionnaire

QUESTIONNAIRE FOR THE EXPERTS FROM THE TURKISH AND DUTCH MARKET ABOUT THE GREEN BUILDING CERTIFICATIONS

Required for the Graduation Project "Building Performance and Energy Efficiency of Green Certified Buildings: Case Study in Turkey and in the Netherlands"

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Istanbul Technical University - Eindhoven University of Technology (Exchange)

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Fields with the sign (*) are not necessary to fill

EXPERT INFORMATION

Name

Title

E-mail

Department

Green experiences

- Green buildings
- Green building certifications (LEED, BREEAM, etc.)
- Other

COMPANY INFORMATION

* Company Name

Company Size

Industry

Please explain briefly your opinions about green buildings and green certified buildings:

Green buildings

Green certified buildings

Please rank the different categories of the green building certifications according to your preference:

	Unimportant	Low Importance	Neutral	Important	Very Important
Energy efficiency					
Water conservation					
Renewable energy					
Indoor environmental quality					
Recycle & reuse					
Land & source efficiency					
Waste reduction					
Reduction of greenhouse gases					
Cost and management					
Other					

Other

CREDIBILITY OF THE GREEN BUILDING CERTICATIONS

Do you think the award of green building certifications can ensure good green building performance?

Yes No Don't know

Do you think that the green building certifications are easily understandable and applicable?

Yes No Don't know

In your opinion, does the green building certification method based on credits & points provide a proper assessment for buildings?

Yes No Don't know

Do you think that the “point-chasing” mentality in green building certifications might hinder the green building design and construction performance?

Yes No Don't know

Do you think that green building certifications reduce costs in operational period of buildings?

Yes No Don't know

Do the green building certifications affect buildings' price?

Yes No Don't know

Do you think green buildings are economically more desirable than traditional buildings?

Yes No Don't know

Do you think that the green building label might be misleading for building users and tenants?

Yes No Don't know

In your opinion, do “green buildings” and “green certified buildings” refer to the same thing?

Yes No Don't know

GREEN BUILDING CERTICATION PROCESS

In which building processes do you think that some problems might occur about green building certifications?

- Design
- Construction
- Usage
- Maintenance
- Documentation (for green building certifications)
- Other

In your opinion, what are the reasons of these problems?

- Lack of knowledge
- Less green-building-conscious
- Disinterest
- Difficulties about certification
- Difficulties in application
- Costs
- Lack of control
- Insufficiency in certification
- Other

GREEN BUILDING CERTICATIONS IN THE MARKET

Do you consider the green building certification practices in the Netherlands good enough?

Yes No Don't know

Considering the Dutch construction market, which type of green building assessment will be more beneficial for better green building performance?

Do you have any recommendations for better green building certification practices in the Netherlands?

* Any other comments

THANK YOU FOR YOUR TIME AND CONSIDERATION

Özden DEMIR
ozden.demir@yahoo.com

Green Building Certifications Questionnaire

QUESTIONNAIRE FOR THE EXPERTS FROM THE TURKISH AND DUTCH MARKET ABOUT THE GREEN BUILDING CERTIFICATIONS

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Fields with the sign (*) are not necessary to fill

EXPERT INFORMATION

Name	SCHIPPER . IM.
Title	ING.
E-mail	I. SCHIPPER @ HURKS.NL
Department	HURKS INTEGRAAL WERKEN
Green experiences	☒ Green buildings
	☒ Green building certifications (~~LEED~~, BREEAM, etc.)
	☒ Other GPR, DuBO (DUTCH GREEN & HEALTHY RULES)

COMPANY INFORMATION

* Company Name	HURKS
Company Size	± 300 Milj. €
Industry	BUILDING.

GREEN BUILDINGS AND GREEN CERTIFIED BUILDINGS

Please explain briefly your opinions about green buildings and green certified buildings:

Green buildings: Very good → But do we know what they are? A lot of traditional Buildings are called green.

Green certified buildings: Too much work, you can get a lot of points/credits without being green.

Please rank the different categories of the green building certifications according to your preference:

	Unimportant	Low Importance	Neutral	Important	Very Important
Energy efficiency	○	○	○	⊗	○
Water conservation	○	○	○	⊗	○
Renewable energy	○	○	○	○	⊗
Indoor environmental quality	○	○	○	○	⊗
Recycle & reuse	○	○	○	○	⊗
Land & source efficiency	○	○	○	⊗	○
Waste reduction	○	○	○	⊗	○
Reduction of greenhouse gases	○	○	○	⊗	○
Cost and management	○	○	⊗	○	○
Other	○	○	○	○	○

Other: you or we shouldn't just count the costs but also the effects & benefits for the future.

I also think that green Buildings are worth more € for developper in the future.

CREDIBILITY OF THE GREEN BUILDING CERTICATIONS

Do you think the award of green building certifications can ensure good green building performance?

○ Yes ⊗ No ○ Don't know

Do you think that the green building certifications are easily understandable and applicable?

○ Yes ⊗ No ○ Don't know

In your opinion, does the green building certification method based on credits & points provide a proper assessment for buildings? (But it measures a lot of things that are not that important

⊗ Yes ○ No ○ Don't know

Do you think that the "point-chasing" mentality in green building certifications might hinder the green building design and construction performance? par example p - [illegible] t. Management

⊗ Yes ○ No ○ Don't know

Do you think that green building certifications reduce costs in operational period of buildings?

○ Yes ⊗ No ○ Don't know

Do the green building certifications affect buildings' price?

⊗ Yes ○ No ○ Don't know

Do you think green buildings are economically more desirable than traditional buildings?

⊗ Yes ○ No ○ Don't know

Do you think that the green building label might be misleading for building users and tenants?

⊗ Yes ○ No ○ Don't know

In your opinion, do "green buildings" and "green certified buildings" refer to the same thing?

○ Yes ⊗ No ○ Don't know

GREEN BUILDING CERTICATION PROCESS

In which building processes do you think that some problems might occur about green building certifications?

- ☐ Design
- ☐ Construction
- ☐ Usage
- ☒ Maintenance
- ☐ Documentation (for green building certifications)
- ☐ Other

In your opinion, what are the reasons of these problems?

- ☐ Lack of knowledge
- ☐ Less green-building-conscious
- ☐ Disinterest
- ☐ Difficulties about certification
- ☐ Difficulties in application
- ☐ Costs
- ☐ Lack of control
- ☐ Insufficiency in certification
- ☒ Other: New unproved technics installations with higher costs to maintain or probems with the performance of the building installations.

GREEN BUILDING CERTICATIONS IN THE MARKET

Do you consider the green building certification practices in the Netherlands good enough?

○ Yes ○ No ✓ Don't know

Considering the Dutch construction market, which type of green building assessment will be more beneficial for better green building performance?

Buildings from wood and bio based materials

Do you have any recommendations for better green building certification practices in the Netherlands?

Just give credits to good (easy in a building) and healthy materials that is used for periods less than 50 years. and energy efficiency.

* Any other comments

THANK YOU FOR YOUR TIME AND CONSIDERATION

Özden DEMIR
ozden.demir@yahoo.com

Green Building Certifications Questionnaire

QUESTIONNAIRE FOR THE EXPERTS FROM THE TURKISH AND DUTCH MARKET ABOUT THE GREEN BUILDING CERTIFICATIONS

Required for the Graduation Project "Building Performance and Energy Efficiency of Green Certified Buildings: Case Study in Turkey and in the Netherlands"

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Istanbul Technical University - Eindhoven University of Technology (Exchange)

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Fields with the sign (*) are not necessary to fill

EXPERT INFORMATION

Name

Title

E-mail

Department

Green experiences

- Green buildings
- Green building certifications (LEED, BREEAM, etc.)
- Other

COMPANY INFORMATION

* Company Name

Company Size

Industry

Please explain briefly your opinions about green buildings and green certified buildings:

Green buildings

Green certified buildings

Please rank the different categories of the green building certifications according to your preference:

	Unimportant	Low Importance	Neutral	Important	Very Important
Energy efficiency					
Water conservation					
Renewable energy					
Indoor environmental quality					
Recycle & reuse					
Land & source efficiency					
Waste reduction					
Reduction of greenhouse gases					
Cost and management					
Other					

Other

CREDIBILITY OF THE GREEN BUILDING CERTICATIONS

Do you think the award of green building certifications can ensure good green building performance?

Yes No Don't know

Do you think that the green building certifications are easily understandable and applicable?

Yes No Don't know

In your opinion, does the green building certification method based on credits & points provide a proper assessment for buildings?

Yes No Don't know

Do you think that the “point-chasing” mentality in green building certifications might hinder the green building design and construction performance?

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Do you think that green building certifications reduce costs in operational period of buildings?

Yes No Don't know

Do the green building certifications affect buildings' price?

Yes No Don't know

Do you think green buildings are economically more desirable than traditional buildings?

Yes No Don't know

Do you think that the green building label might be misleading for building users and tenants?

Yes No Don't know

In your opinion, do “green buildings” and “green certified buildings” refer to the same thing?

Yes No Don't know

GREEN BUILDING CERTICATION PROCESS

In which building processes do you think that some problems might occur about green building certifications?

- Design
- Construction
- Usage
- Maintenance
- Documentation (for green building certifications)
- Other

In your opinion, what are the reasons of these problems?

- Lack of knowledge
- Less green-building-conscious
- Disinterest
- Difficulties about certification
- Difficulties in application
- Costs
- Lack of control
- Insufficiency in certification
- Other

GREEN BUILDING CERTICATIONS IN THE MARKET

Do you consider the green building certification practices in the Netherlands good enough?

Yes No Don't know

Considering the Dutch construction market, which type of green building assessment will be more beneficial for better green building performance?

Do you have any recommendations for better green building certification practices in the Netherlands?

* Any other comments

THANK YOU FOR YOUR TIME AND CONSIDERATION

Özden DEMIR
ozden.demir@yahoo.com

CURRICULUM VITAE

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