THE FUTURE OF GREEN BUILDING CONTRACTS IN TURKEY

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ABSTRACT

FUTURE OF GREEN BUILDING CONTRACTS IN TURKEY

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Construction sector has a great potential to reduce total energy consumption through sustainable projects. All over the world policy makers have already realized the potential and begun setting some governmental goals. As an energy dependent country, Turkey has also set some energy oriented policies in which sustainability issues in Turkish built environment are also gaining attention.

Since new regulations for achieving sustainability have been recently set to change the conventionally practiced administrative patterns in construction sector, the number of claims related to sustainability feature of the construction projects has been growing ever since. Construction contracts are playing a critical role in preventing these types of legal risks that can lead to claims. As a result, these changes have caused a need for some alterations in industry's contractual practices. Since these changes have newly taken place, there are limited number of researches conducted to study and analyze possible contractual and legal risks associated with green projects that may lead to probable legal claims. This thesis is intended to fill this gap in the literature and aims to collect a comprehensive information from Turkish construction industry's professionals about foreseen probable contractual and other legal risks and also find out the possible ways of diminishing those risks.

The information presented in this thesis is gathered by a comprehensive questionnaire survey designed based on a profound literature study. The questionnaire is filled out by green building professionals who have been involved in green building projects. To examine the gathered information, a range of statistical methods are used and the outcomes are evaluated accordingly. The outcomes of this thesis shall help identification of contractual and other legal risks related to green building projects in Turkish construction sector and seek for proper risk mitigation strategies accordingly. Finally, recommendations for policy makers, industry's professionals and researchers are presented so as to promote sustainability in construction sector.

Keywords: Green building, Green building contracts, Green building project delivery methods, Green building legal risk, Green building risk mitigation technique, Sustainability, Sustainable design, Green building claims, professional liability, Turkish construction sector

ÖZ

TÜRKİYE'DE YEŞİL BİNA SÖZLEŞMELERİNİN GELECEĞİ

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Yüksek Lisans, İnşaat Mühendisliği Bölümü

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İnşaat sektörü, sürdürülebilir projelerin gerçekleştirilmesi ile, toplam enerji tüketiminin azalmasına yüksek düzeyde katkıda bulunabilecek kapasiteye sahiptir. Dünya çapında karar verme konumunda olan kişiler, bu potansiyelin farkında olup, bu potansiyeli kullanarak, enerji verimliliği sağlama konusunda bazı ulusal hedefler belirlemeye başlamışlardır. Bu hedefler inşaat sektörünü doğrudan etkilemektedir. Türkiye'de enerjiye bağımlı bir ülke olarak, enerji konusunda bazı politikalar geliştirmiş ve bu konuda Türkiyenin yapım sektörü ve şehirlerin yapılaşması da göz önünde bulundurulmuştur.

Sürdürülebilir hedeflere ulaşılabilmesi amacıyla, dünya çapında geliştirilen yeni yönetmelikler ve standartlar, son zamanlarda, konvansiyonel projelerdeki uygulama ve idari işlemleri inşaat sektöründe etkilemesinden dolayı, bazı yasal mevzularda sorunlar ortaya çıkmaya başlamıştır.

Bu değişimle birlikte, projelerin yeşil özelliklerinden dolayı, bazı hukuksal hak talepleri gözlemlenmeye başlamıştır. İnşaat sözleşmeleri bu tarz hukuksal risklerin azaltılmasında ve onların kontrol altına alınmasında çok önemli bir role sahiptir. Ortaya çıkan bu hukuksal ihtilaflar ve hak talepleri sonucunda, yeni dönemlerde

geleneksel inşaat sektörünün sözleşme uygulamalarınında değişime neden olmuştur.

Bu değişiklikler daha dünya çapında çok yeni olduğundan dolayı, bu tarz yeni sözleşme uygulamalarında karşı karşıya kalınabilecek yasal durumların neler olabileceğini ve bu riskleri önlemek için, hangi yöntemlerin uygulanması gerektiğine dair herhangi bir araştırma henüz yapılmamıştır. Bu tez araştırmasında, literatürdeki bu boşluğu doldurmak amacı ile bazı adımlar atılmıştır. Bu kapsamda araştırmanın hedefi, Türkiye'deki yeşil bina uzmanlarına ulaşılarak, öngörülen yeşil binaların yasal riskleri, sözleşmelerin bu tarz riskleri kontrol etmek konusundaki önemi ve uygulanabilir risk aktarım stratejilerinin neler olabileceği hususunda kapsamlı bir araştırma gerçekleştirmektir.

Bu tezde sunulan araştırma bilgileri, çok kapsamlı bir anket araştırması sonucunda elde edilip, sunulmuştur. Bu anket araştırmasına katkıda bulunan katılımcılar, Türkiye'deki yeşil bina uzmanları veya herhangi bir şekilde sürdürülebilir projelerde tecrübeli insanlardan oluşmaktadır. Bu tez araştırmasında belli sonuçlara varabilmek için, farklı istatistik analizler uygulanmış, ve sonuçları değerlendirilmiştir.

Bu tez araştırması kapsamında, Türkiye'de yeşil binaların öngörülen yasal risklerinin tanımı, sözleşmesel ve diğer hukuksal anlamda çözüm önerileri incelenip, bu konuda çalışan profesyonellere ve diğer araştırmacılara faydalı bilgilerin aktarılabilmesi hedeflenmiştir. Son olarak ise, sürdürülebilir projeleri yaygınlaştırıp daha da desteklemek adına, Türkiye'deki karar verme konumunda bulunan kişilere ve endüstrideki uzmanlara önerilerde bulunmuştur.

Anahtar Kelimeler: Yeşil binalar, Yeşil bina sözleşmeleri, Yeşil bina proje teslim yöntemi, Yeşil binaların yasal riskleri, Yeşil binaların sözleşmesel risk aktarım stratejileri, Sürdürülebilirlik, Yeşil bina hukusal hak talepleri, Mesleki sorumluluk, Türk inşaat endüstrisi

Dedicated to my beloved family

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TABLE OF CONTENTS

LIST OF TABLES

TABLES

LIST OF FIGURES

FIGURES

LIST OF ABBREVIATIONS

AAA	American Arbitration Association®
ACFE	Associated Certified Fraud Examiners
AEC	Architecture, Engineering and Construction
AIA	American Institute of Architects
AP	Accredited Professional
BE	Built Environment
BIM	Building Information Modeling
BOT	Build Operate Transfer
BREEAM	Building Research Establishment Environmental Assessment Method
CM	Construction Management
CGL	Comprehensive General Liability
COP-3	Conference of Parties no: 3
CMAA	Construction Management Association of America
DB	Design Build
DBB	Design Bid Build
EIA	Energy Information Administration
EPA	US. Environmental Protection Agency
EPBD	Energy Performance in Buildings Directive

EPF	Economic Policy Forum
EPC	Engineer Procure Construct
EU	European Union
FIDIC	Fédération Internationale des Ingénieurs-Conseils The International Federation of Consulting Engineers
GHG	Greenhouse Gas
GMP	Guaranteed Maximum Price
IBA	International Bar Association
IPD	Integrated Project Delivery
JCT	The Joint Contracts Tribunal
LEED	Leadership in Energy and Environmental Design
NCDRC	National Construction Dispute Resolution Committee
NRDC	Natural Resources Defense Council
PSM I	Project Sustainability Management Guideline
TS	Turkish Standards
US	United States
UNFCCC	United Nations Framework Convention on Climate Change
USGBC	U.S. Green Building Council
ZCB	Zero Carbon Buildings
ZEB	Zero Energy Buildings

CHAPTER 1

INTRODUCTION

In today's world, the blooming industries' demand for energy is increasing drastically and as a result, the supply of fossil fuels are getting depleted in a faster rate compare to the past decades, and the price of the energy is rising in a parallel way. One of the other major concerns is global warming phenomenon, that carbon emissions released by the utilization of fossil fuels can expedite its process. Thus adopting a more ecologically friendly and energy efficient lifestyle is a must for the survival of the planet Earth and due to this fact all the countries around the world are aiming toward setting policies for using rather renewable energy sources than fossil fuels, and also trying to use the energy in a more efficient way to reduce the total energy consumption.

Several sectors in today's societies are responsible for major energy consumptions e.g. transportation, industry and construction. According to (Energy Information Administration EIA, 2015), 41% of the U.S. energy consumption was related to buildings in residential and commercial sectors in 2014, so that among these major sectors contributing to total energy consumption, it can be inferred that construction sector, by almost half of the energy consumption of the whole nation has the potential of contributing to energy consumption reduction to a large degree.

Policy makers have already realized the potentials that construction sector have and begun setting some governmental goals to prevent harming the environment and decreasing fossil fuel consumption. General policies of many countries are towards decreasing the contributions of built environment to climate change phenomena by feasible means of a shift to low energy and carbon buildings powered by renewable energy systems (Kibert & Fard, 2012).

As an energy dependent country, Turkey has also set some energy oriented policies in which sustainability issues in Turkish built environment are also gaining attention (Özeke, 2013). As a result of the economic development, Turkey witnesses a rampant urbanization of rural areas and also rising expectancy of living conditions so in parallel with all development plans, sustainability issues in construction sector should not be underestimated.

In order to be able to move towards our objective of sustainability, we should have a clear definition of what is called as a green and sustainable building, as it is defined by the US. Environmental Protection Agency (EPA), "Green building is the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's life-cycle from siting to design, construction, operation, maintenance, renovation and deconstruction. This practice expands and complements the classical building design concerns of economy, utility, durability, and comfort. Green building is also known as a sustainable or high performance building" (EPA, 2014).

Since recently most of the developed countries have already begun to implement the sustainability policy in their countries and made new regulations to change the conventionally practiced administrative patterns in construction sector, the number of claims related to sustainability feature of the construction projects has been growing ever since. Construction contracts are playing a critical role in preventing these types of legal risks that can lead to claims. So that consequently, these changes have caused a need for some alterations in industry's contractual practices. With the new demand, organizations publishing standard forms of contracts for construction sector, have begun forming new standard forms of contract specially designed for sustainable projects.

These global changes in the industry's contractual practices can also affect the other developing countries in the near future, and Turkey as an energy dependent country will also be a part of this new sustainable trend in the next couple of years.

1.1. Research Objective and Questions

Growing number of green building claims in the world, mostly stemming from contractual aspects of green projects has led to some alterations in the conventional construction contracts used in this sector. There are many contractual and other legal risks associated with green projects which are preventing the widespread adoption of these projects. If these types of risks can be identified, proper risk mitigation strategies can also be sought for and be implemented, so that sustainable projects implementations can be encouraged within the societies. The aim of this study is to take steps in identifying these possible contractual and other legal risks from the Turkish construction sector point of view and to offer proper risk mitigation strategies to prevent possible future claims in this regard.

The critical questions which are aimed to be answered:

- To what extent are (or will) construction contracts be affected as a result of the green building movement in Turkish construction sector?
- Which types of construction contract & delivery method can be considered as the most suitable approach for sustainable projects?
- What are the possible future legal risks regarding green construction practices in Turkey?
- How critical can the role, green construction contracts play in mitigating those risks? How can "green features" of these contracts handle green related risks?

The purpose of this thesis is to answer the above mentioned questions by using a questionnaire survey, since the best possible method is to get a better understanding of current situation of sustainability trends within Turkish construction sector through Turkish professionals and practitioners in this area. In order to be able to predict possible future contractual and legal risks associated with green projects, this research aims to collect a comprehensive information from Turkish construction industry's professionals about foreseen possible legal risks and also find out the possible ways of diminishing those risks.

The outcomes of this thesis study shall benefit government, investors and other market participants involved in green building projects in order to support green building market by understanding possible risks associated with this particular type of projects and suggesting proper risk mitigation techniques.

1.2. Thesis Structure

This thesis on the future of green building contracts in Turkey is organized in five chapters as follows:

Chapter 2 contains existing information from the literature review about evolution of green building movement, international policy and Turkish government policy towards sustainability issues, implemented green strategies, construction contracts and some standard contract forms which are designed for sustainable projects and the most proper project delivery methods for sustainable projects. Moreover a discussion about various professionals' liabilities, possible claims related to sustainable projects and other contractual and legal concerns were presented. Finally possible risk mitigation strategies for sustainable projects were discussed.
Chapter 3 consist of a brief information of the research methodology and data collection. The questionnaire survey data are examined and an outline of the critical risks of green projects and contractual risk mitigation strategies are specified.
Chapter 4 summarizes the Turkish construction sector's expectations, perceptions, and thoughts about the future of green building movement in Turkey and green buildings' contractual and other legal risks. Possible methods of risk mitigation for identified sustainable projects' risks is also discussed and recommendations for both government and researchers are offered.
Chapter 5 concludes the results of the research. Limitation of the study and possible future research subjects are illuminated in order to promote implementation of sustainable projects in the future.

CHAPTER 2

LITERATURE REVIEW ON SUSTAINABILITY

A profound literature review of the current thesis work was directed to investigate current flow of sustainable development and its effects on contractual agreements among contemporary societies in the world. Initially, definition of sustainability and green building is illuminated and then the effects of sustainability movement on construction and design contracts are elaborated in detail. Finally the current barriers for green contract risk management is traced from a legal point of view.

2.1 Sustainability and Green Buildings

Introduction of the problem

Because of the economic shock triggered during the two oil crises in the 1970s, the obligation of developing building energy performance was initiated. Moreover, environmental and economic concerns played an important part in defining the policies related to the issue.

During the first half of the 20th century, extreme energy preservation actions were implemented which affects social life and economy in most of the European countries. Because of the two world wars and the economic depression resulted from them, energy became a priceless commodity (see Figure 1). At the end of the 20th century, during 1990s, most of the energy preservation actions taken (Papadopoulos, 2007).

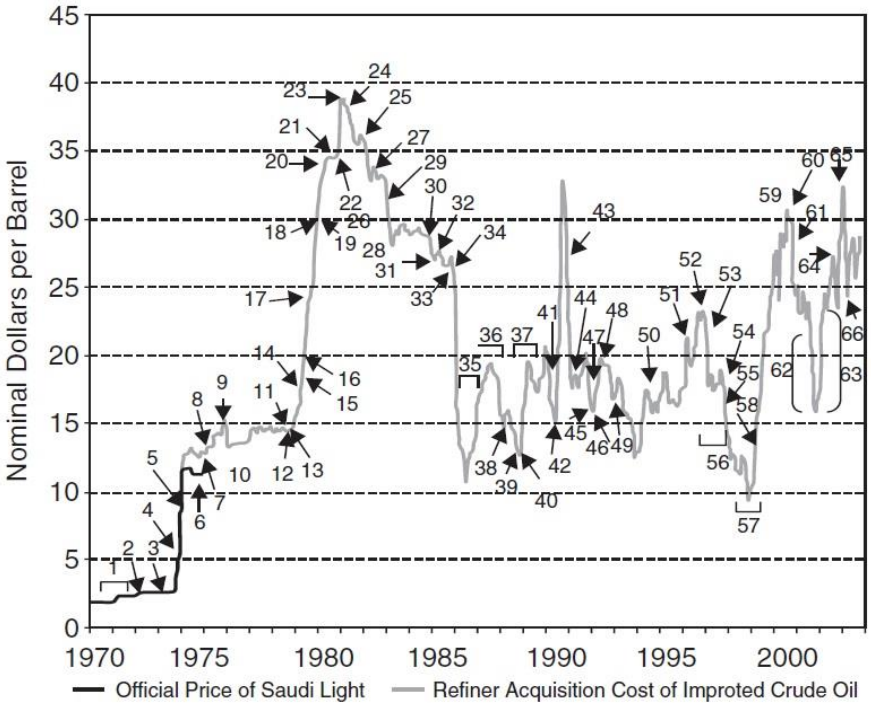

Figure 1. Development of oil prices since 1970 (Energy Information Administration (EIA), 2006)

The effect of growing energy costs on the regulation of buildings energy performance has been the key mainspring behind most of the jurisdictive actions applied by national governments and international organizations and institutions. In the 1990s environmental problems was the main concern, both in terms of air pollution reduction and sustainability (Papadopoulos, 2007).

Throughout the last twenty years, primary energy use has increased by 49% and Carbon emissions by 43%, with an average annual increase of 2% and 1.8% respectively (see Figure 2).

Recent estimations display the fact that this increasing trend will remain approximately the same. The energy consumption of the countries with developing economies (Middle East, Southeast Asia, Africa and South America) will increase at an average yearly rate of 3.2% and by 2020 will exceed that for the developed countries (North America, Western Europe, Japan, Australia and New Zealand) at an average rising rate of 1.1% (see Figure 3) (Pérez-Lombard, Ortiz, & Pout, 2008).

These statistics approve the bond linking energy use with the growth of population, the economic development, and global policy attempts which intend to reverse this trend by increasing energy efficiency and developing renewable energy systems.

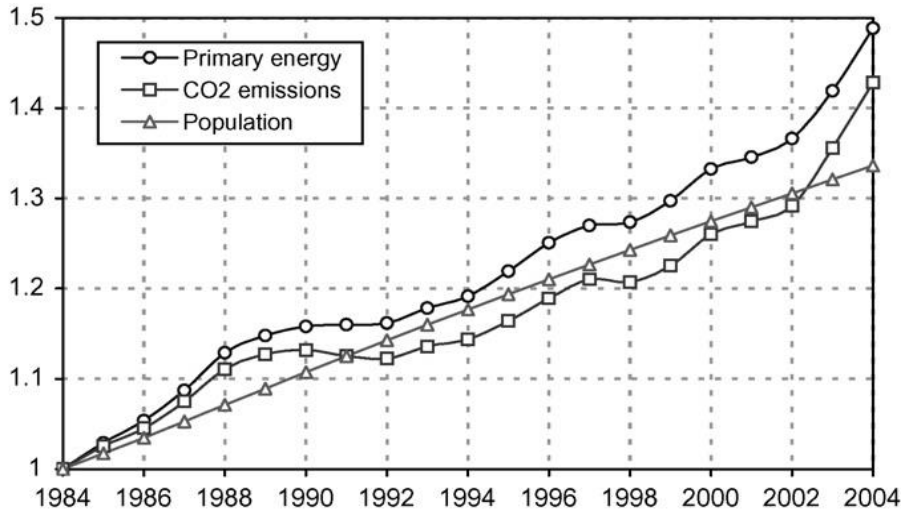

Figure 2.Primary energy consumption, CO2 emissions and world population. Source: International Energy Agency (IEA).

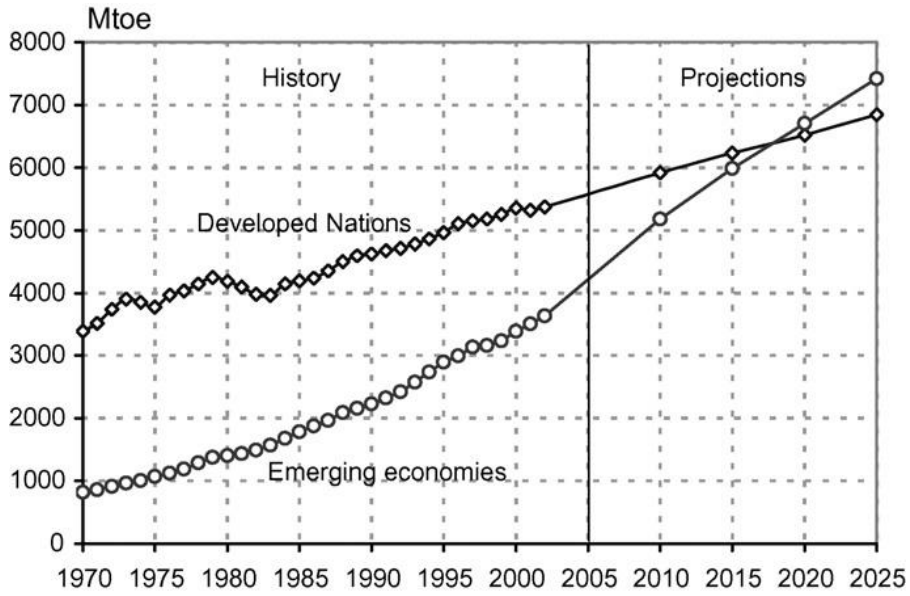

Figure 3. World energy use by region. Source: Energy Information Administration (EIA).

Developing solutions

These new series of environmental problems brought up new concerns and the key to these problems came to be described in the terms of sustainable development, resulting from the report of the World Commission on Environment and Development (1987). Environmental protection, and methodologies used for other social challenges, were depicted again in economic terms, after the report of the World Commission on Environment and Development in 1987. The environmental discourse, was restructured in a manner which is more constructive, or reformist (Jamison, 2001).

The "sustainability" term came into use since societies became aware of "global warming". In 1987, the definition of the "sustainability" according to The World Commission on Environment and Development is "meeting the needs of the present without compromising the ability of future generations to meet their own needs." Its goal is to create stability between social and economic developments while protecting the environment, called "triple bottom line" (see Figure 4) (Gündoğan, 2012).

Figure 4. Triple bottom line

Construction activities at the end aims to reach some economic profits on the one hand, while on the other hand it is creating some severe environmental and social effects on the community. Consequently, the triple bottom line method (i.e. social, environmental and economic sustainability) has gradually been accepted in the construction sector in order to support sustainable practice with the purpose of keeping the balance of the economic, social and environmental impacts of construction activities so that they will enhance the wellbeing of the societies (Shi, Zuo, & Zillante, 2012).

The implementation of the European Instructions on the Buildings Energy Performance (2002/91/EC), appears to offer an integrated regulatory tool for the first time, allowing the simultaneous consideration of the energy, economic and environmental factors of building sector (EU Parliament & the Council of the European Union, 2003; Papadopoulos, 2007).

In conclusion the Value of an energy conservation program is much higher today when comparing to the past since the material, waste, labor, emissions, and risk savings are more valuable in the world's economy today, and of course a "carbon diet" is a driving action in the energy conservation movements among different sectors in which building and construction sector has a great contribution (Eric A. Woodroof Ph.D. and CEM, 2009).

2.1.1 Energy & Atmosphere, Climate Change

Nearly one decade ago, the ideas of climate change and global warming were just a theory that may affect future of the planet. However, the leading changes in the global climate now is the global warming phenomenon. The events caused by global warming in Asia can be seen as, increased floods in Malaysia and famines in parts of the Australia, at the same time there are events such as more and more extreme summer heat waves in Europe, and melting glaciers which lead to sea level rise in the poles (Yau & Hasbi, 2013). All of these events are the signs of increased

temperature of the atmosphere. Climate variation observations during the last years designate that the effects of climate change have a growing impact on society. These influences will also affect the construction sector.

According to Y.H. Yau, the definition of climate change is basically a shift in climate due to the people's activities which are modifying the percentage of natural greenhouse gases in the atmosphere near the Earth's surface. The climate change phenomenon follows generally the economic development and society's actions in today's modern life. The main reason among the anthropogenic forces is certainly the greenhouse gas emissions (Yau & Hasbi, 2013).

Concentrations of carbon dioxide, methane and nitrous oxide in the atmosphere have increased noticeably as a result of many human actions since 1750 (see Figure 5) especially after the Industrial Revolution in the 18th century which introduced a new era in human civilization path. All these increased emissions cause the natural greenhouse effect to intensify and result in changing the earth's global climate (Alley et al., n.d.) .

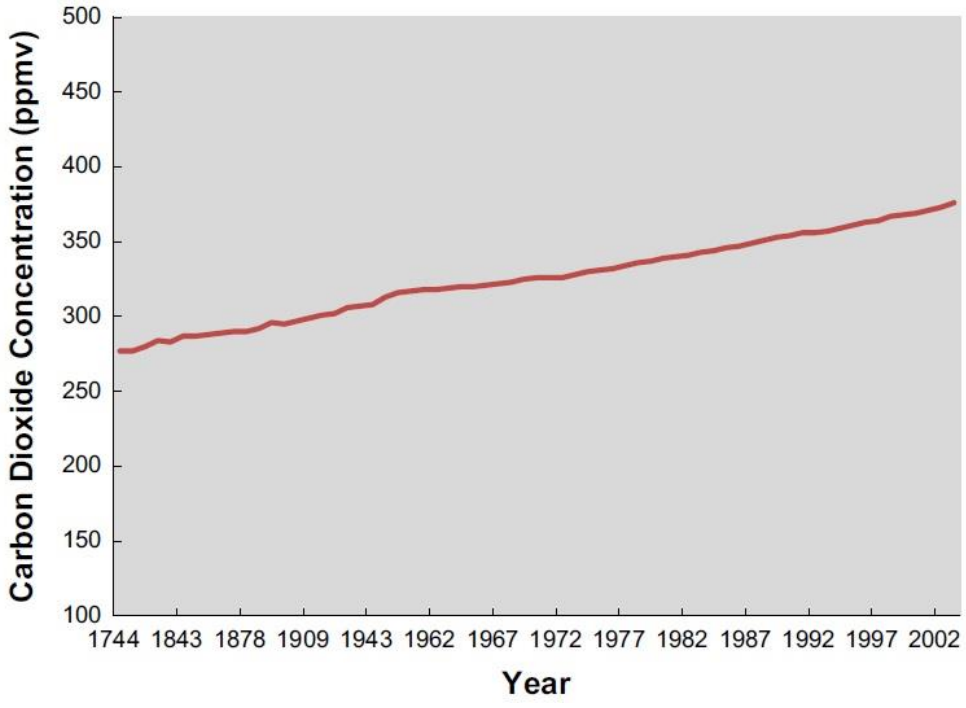

Figure 5. Global carbon dioxide concentration (parts per million by volume)

(Yau & Hasbi, 2013)

The warming trend of this century time scale, plus persistent temperature increase since the mid-1970s, has been linked with the main global climate forcing, particularly human made greenhouse gases. The global average surface temperature is rising because of the increase of carbon emissions. During the previous several decades all the succeeding decades have been significantly warmer compare to the former decades (see Figure 6).

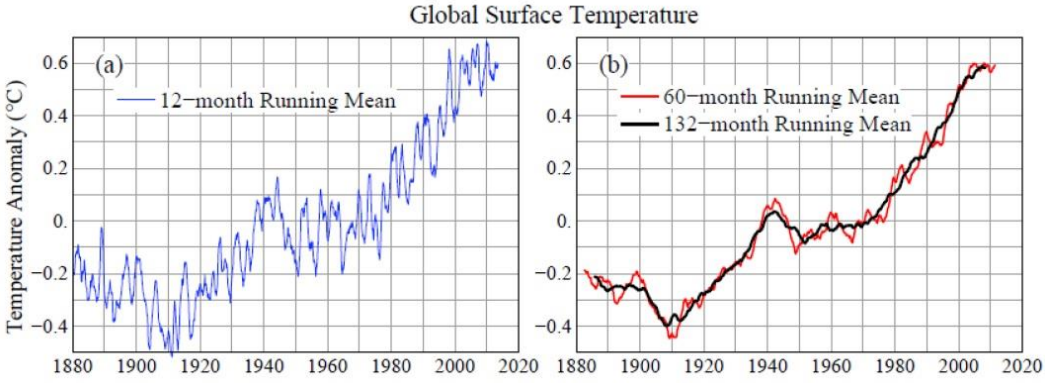

Figure 6. Global surface temperature relative to 1951-1980 mean for (a) 12-month running mean, and (b) 5-year and 11-year running means.(Hansen, Sato, & Ruedy, 2014)

2.1.1.1 The Buildings Contribution to Global Warming

According to United Nations Environment program, buildings are responsible for more than 40% of global energy consumption and almost 30% of global greenhouse emissions both in developed and developing countries.

The process of fossil fuels combustion for electricity production is the main source of these emissions. Furthermore the construction sector is also responsible for other forms of greenhouse emissions, like non CO2 greenhouse gases such as halo carbons which is found in some insulation materials, chlorofluorocarbons (CFCs), hydro fluorocarbons (HFCs) and hydro chlorofluorocarbons (HCFCs) since they have great applications in cooling devices. The reports shown that in 2004 buildings were accountable for 1/3 of the global greenhouse gases and 60% of

halo carbon emissions in the atmosphere (United Nations Environment Programme, 2009).

Major greenhouse gas emissions are similarly made through building materials, especially materials used for insulation, and air conditioning systems. Generally energy is spent during the below mentioned phases:

- production of building materials
- Transportation of the materials from the factories to construction sites
- During the Construction
- Operation of the building
- Demolition of the building

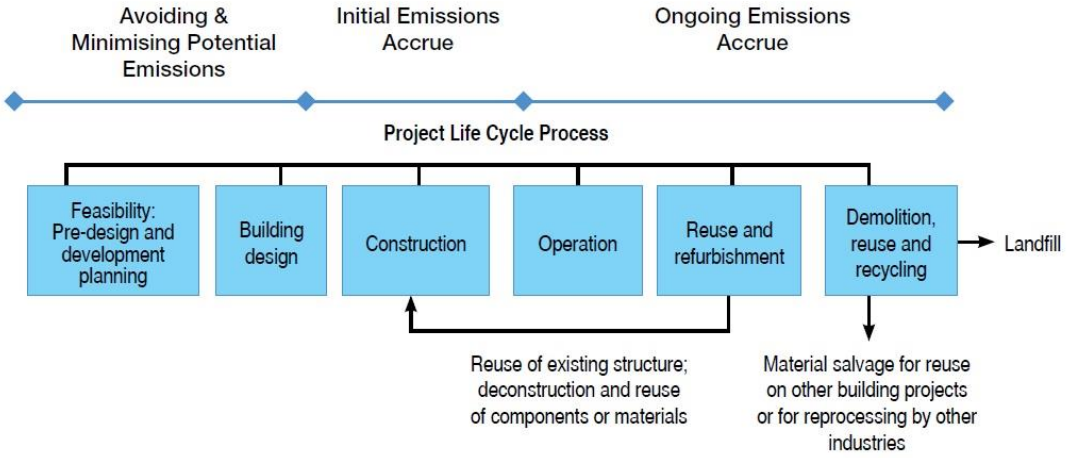

Figure 7. Life Cycle Phases of Buildings (United Nations Environment Programme, 2009)

2.1.1.2 The Impacts of Climate Change on Buildings and Their Energy Use

Since usual life span of a building is assessed around 60 to more than 100 years, therefore different climate change scenarios should be taken into account in advance to allow the society to adjust their living spaces to these new changes of climate in the future. Variations in local climate have considerably affected the buildings' performance all over the world.

Certainly, variations in the local climatic conditions have caused some physical damage to buildings and all other manmade structures. For example, buildings are unprotected against degradation and damage because of the increased speed of wind, precipitation cycles, exposure to the sun and changes in the local temperature. Water and moisture also has a significant role in damaging the structures.

Other factors like increased summer heat has led to the increased in air conditioners usage, which lead to another phase of additional energy use and add to global warming trend even further. The key climatic changes which define the amount of required energy for ventilation in the buildings are solar radiation, night sky radiation, air temperature of local vicinity, wind and the amount of precipitation (Yau & Hasbi, 2013).

The most obvious and major effects of severe climatic variability on usage of electricity in buildings are the cooling and heating energy consumption. Presently, growing request for suitable thermal comfort throughout cold winters and hot summers is leading to the rise in building energy consumption and increased carbon emissions.

2.1.1.3 Evolving Solutions of Construction Sector for Climate Change

According to United Nations Climate Change Conference in Copenhagen 2009, (United Nations Framework Convention on Climate Change (UNFCCC), 2009), international action for CO2 emissions reduction announced to be essential in order to be able to keep the expected global temperature increase under 28C by the year 2100, but this action for the time being is left to every nation separately to make locally mandatory obligations to greenhouse gas (GHG) emissions reduction, essentially CO2 emissions which has a huge effect on global warming (Newton & Tucker, 2011).

Zero carbon buildings (ZCB) are considered as a critical method in decreasing the carbon emissions linked to the construction sector. Yet, in spite of major policy drivers, the application of this approach has been very low globally.

Policies supporting the application of zero energy buildings (ZEB) can effectively diminish the high amounts of carbon emissions associated with the manmade structures. However, there are some vague points in understanding the clear definition for the terms used to describe zero energy building (ZEB) approaches which limits the application of these techniques which will result in sustainable construction.

National policies of the Europe and the United States have set some requirements for newly constructed buildings and retrofits for existing buildings which designed to accomplish high energy performance goals, especially during the past decades. Although their policies have differences in specifications, the main goal is to moderate the contributions of built environment to climate change by changing the energy consumption patterns to renewable energy sources instead of fossil fuels and improving the building energy performance (Kibert & Fard, 2012). The reorganizing of the Energy Performance in Buildings Directive (EPBD), 2010 asks from the EU countries to confirm that "by December 31, 2020, all new buildings are nearly zero energy buildings (ZEBs) and after December 31, 2018, new buildings occupied and owned by public authorities are nearly ZEBs." Likewise, in the United States, the Energy Independence and Security Act of 2007 allows that the goal of net zero energy for all new commercial buildings be supported by the Net Zero Energy Commercial Building Initiative, by the year 2030. It requires a zero energy goal for 50 percent of the commercial buildings in the United States by 2040 and net zero for all the commercial buildings by 2050 (Pan, 2014).

Researches shown that there are some important challenges which prevent the uptake of zero energy building methods. The challenges can be summarized as the lack of clear understanding of the ZCB strategies and inconsistent ZCB practices, uncertain ZCB policies and incompatible ZCB priorities in the management process. All of these challenges arise due to the lack of knowledge in theoretical aspects of ZCB.

Zero carbon buildings are considered as intricate social and technical systems which should be well examined by clearly defining their limits. All carbon reduction strategies include political, economic, technical, social and behavioral aspects which link multiple participants such as practitioners, occupants and researchers in this field.

A study conducted by Concerted Action in support of the Energy Performance in Buildings Directive (EPBD) in 2008 categorized 17 different terms which are used to describe low or zero carbon buildings and zero energy buildings and also there are 23 different terms for describing "high performance buildings" which are used among different European Union members. All of these terms, could generally be regarded as terms referring to low energy consumption, low emissions or sustainable or green structures (Pan, 2014).

2.1.1.4 International Policy towards ZCB

The development of a basis for net zero energy definition and net zero carbon buildings has seen major growth over the past years. Many governments are trying to implement regulations to control buildings energy consumption level at or near a net zero energy or net zero carbon performance level, taking into account the anthropogenic climate change factors which is the principal cause (Berry, Davidson, & Saman, 2013).

General policies of many countries are developing that demand for decreasing the contributions of built environment to climate change phenomena by feasible means of a shift to low energy and carbon buildings powered by renewable energy system (Kibert & Fard, 2012).

The discussions to frame an international agreement on global climate protection initiated in 1991 and lead to the adoption of the United Nations Framework Convention on Climate Change (UNFCCC) in May 1992. The objective of the Convention is to stabilize atmospheric concentrations of greenhouse gases at safe levels. In 1998, during the COP-3 (Conference of Parties no: 3) meeting held in

Kyoto, Japan, the Parties which was consisted of 190 countries agreed to a legally binding set of obligations that required developed countries to lower their GHG emissions to an average of approximately 5.2% below their 1990 levels, and the developing countries to try to comply with the suggested standards in a voluntary basis. The emission reduction goal needs to be accomplished over the commitment period of 2008-2012. Which is now extended until 2020.This agreement known as Kyoto protocol (Cheng, C., Pouffary, S., Svenningsen, N., and Callaway, 2008).

Other international and national standards for building sector are developing with a need for integration of supply and demand in the efforts towards zero or low carbon buildings. In this regard United States environmental protection agency (EPA) has established a flexible method which allows reducing substantial amount of carbon emissions. According to EPA estimations, this proposal will decrease CO2 emissions on a national base, 26% below 2005 emissions by 2020 and 30% by 2030 (Natural Resources Defense Council (NRDC), 2012). In Japan, energy efficiency of residential buildings is supported by cross ministry cooperation enforced by the Energy Conservation Law. The strong point of this procedure is that it pursues the promotion of a mix of policies, from compulsory to voluntary actions, while highlighting the potential of public private partnerships. A green building master plan, is also developed in Singapore, by the Building and Construction Authority of the country, with the intention of bringing 80% of the buildings up to the Green Buildings Mark standard by 2030 which will have a direct effect on the country's carbon emission amount (Economic Policy Forum (EPF), n.d.). China, as the world's main carbon emitter, is also setting the country's policy for carbon emission reduction. By the end of 2009, the Chinese government announced that by 2020, China's CO2 emissions per unit of gross domestic product will be reduced by 40-45% in comparison with the 2005 level (Jiao, Qi, Cao, Liu, & Liang, 2013).

In the recast of Energy Performance of Buildings Directive (EPBD) 2010, concerning the energy performance of new and existing structures, sturdier necessities are set for the European Union member states. The recast EPBD specifies that by 2020 all new buildings should fulfill the conditions for 'nearly

zero energy' requirements and also national policies for existing buildings should be particularized to increase the number of nearly zero energy structures (European Parliament, 2010).

Some of the European Union member states already announced national goals in this regard which go beyond EPBD points. According to European Council for an Energy Efficient Economy (eceee), 2011 (European Council for an Energy Efficient Economy, 2011) :

Table 1. EU countries future targets

COUNTRY	TARGET
Denmark	75% by 2020 (c.f. base year 2006)
Finland	Passive house standards by 2015
France	By 2020 new buildings are energy-positive
Germany	By 2020 buildings should be operating without fossil fuel
Hungary	Zero emissions by 2020
Ireland	Net zero energy buildings by 2013
Netherlands	Energy-neutral by 2020 (proposed)
Norway	Passive house standards by 2017
UK	Zero carbon as of 2016 (see box overleaf)

Successfully executed European large scale zero carbon developments until now include: the German Kronsberg scheme which has a 6000 Passivhaus dwellings designed for 15,000 people which mainly use solar and wind energy. A recently completed project of a neighborhood near to Stockholm, Sweden encompassing 10,000 apartment houses for 25,000 residents using 100% renewable energy sources. the Vauban region, located on a former French barrack site with Passivhaus standard implemented buildings (European Association of Local Authorities in Energy Transition, n.d.).

2.1.1.5 Turkish Government Role

As an energy dependent country, Turkey has already set some energy oriented policies in which sustainability issues in Turkish built environment are also gaining attention. If Turkey becomes a party to the Framework Convention of United Nations and the Kyoto Protocol, the country will be qualified to market carbon credits through the Clean Development Mechanism, which set up the necessary base to introduce new technologies and funds to the Turkey by the other developed countries cooperation (Özeke, 2013).

Turkey's high rate in growth of carbon emissions is anticipated to accelerate, with emissions rising from 60 million tons in 2002 to almost 220 million tons in 2020. Carbon emissions intensity in Turkey is greater compare to the average rate of other developed countries. This fast growth in demand is because of the high Turkish economic development (Kaygusuz, 2004).

As a result of the economic development, Turkey witnesses a rampant urbanization of rural areas and also rising expectancy of living conditions so in parallel with all development plans, sustainability issues in construction sector should not be underestimated.

Currently Turkish residential sector is contributing around 35% to energy consumption, which is mostly used for heating the interior spaces, that is why an insulation standard was made mandatory by Turkish government for all newly constructed buildings in 2000 (Kaygusuz, 2004).

There are also some other regulations implemented by the Turkish government in respect of green buildings and energy consumption mitigation, as an example we can mention the 'Energy performance in building, regulation of ministry of public works and settlement, no: 27075 in December 2008' (Başbakanlık Mevzuatı Geliştirme ve Yayın Genel Müdürlüğü , 2008) and 'Documentation of sustainable green buildings and settlings, regulation of Turkish ministry of environment and urban planning no: 29199 in December 2014' (Başbakanlık Mevzuatı Geliştirme ve Yayın Genel Müdürlüğü, 2014) which were published in Turkish Official

Gazette, however these regulations are not imposing any strict demand of sustainability actions upon the industry.

Despite of the critical role of government policies in implementation of the energy performance and sustainability standards, there are no legally enforceable regulations or laws issued by the Turkish government in this regard, until now.

Although there is no legally enforceable regulations implemented in Turkey, many projects are gaining certification in a voluntary basis especially during the recent years according to table 2. This fact shows that in the near future the need for green construction contracts in this country will definitely increase and new forms of contracts for green projects should be used instead of the conventional contract forms which are used today.

Table 2. Number of LEED certified projects in Turkey

Increasing number of certified projects in Turkey	
LEED Certified projects in Turkey	**# of Projects**
2015 (Till September)	102
2014	109
2013	77
2012	76
2011	45
2010	17

2.1.2 Rating Systems

Sustainability has been set as the aim of humanity to guarantee that the fulfillment of present needs does not compromise the future generation's ability to meet their needs. Therefore it is a social goal, which can only be achieved when all parts of the society collaborate in satisfying the accompanying demands. The main prerequisite for sustainable social and economic development is ecological sustainability. In order to be able to take an action for an effective response to this issue, the environmental aspects should be focused on at first. This effort entails a

quantification of the influence of various human activities for accomplishing sustainable development. Without setting rules for sub-targets of different sectors of human activities, it will not be possible to develop in a systematic way for a sustainable society.

The standards for a sustainable construction sector should be set to outline the requirements which should be implemented in buildings and structures as a contribution to achieve a sustainable society. The tolerable impact of manmade structures, in energy need and pollutant load aspect, during various phases like: construction, maintenance and operation and demolition should also be defined. As a result of this, systematic methods of assessing building energy level and sustainability impacts emerged later on (Zimmermann, Althaus, & Haas, 2005).

When it comes to assess the building performance, one should first define the meaning clearly. The exact definition of "building performance" is rather intricate, since different performers in the construction sector have diverse interests and necessities. Distinct ecological indicators were established for the needs of related interest groups. However, Building Research Establishment Environmental Assessment Method (BREEAM), was the first building environmental assessment system which was designed as a comprehensive means to assess a wide range of environmental factors in construction sector and was made in 1990. The number of building environmental assessment systems which support sustainable development of buildings have had an increasing growth after the emergence of BREEAM (Haapio & Viitaniemi, 2008; Lee, 2012).

Environmental assessment systems differ from each other to a great extent according to various aspects. There are a range of various tools, for the whole building assessment or building components. These tools are even designed for different phases of a building and consider many environmental issues. Some of these tools are global, some national and, in some other cases, there are local tools. Some of the national environmental assessment tools can also be used as global tools just by altering the national databases. These environmental assessment systems are designed for different purposes, for instance, repair and maintenance, academic research, consultation and decision making. Every one of these issues

correspond to different users, such as architects, engineers, academic staff, consultants, landlords, residents and other authorities.

Among the wide variety of assessment tools used in different areas, BREEAM from the United Kingdom and LEED from United States are clearly the most widely accepted, means they're not restricted to the place of their origin; they are the most commonly used methods currently implemented across the world and have a great influence on the development of more recently set schemes (Lee, 2012).

Almost all different building environmental assessment schemes are classified by (Haapio & Viitaniemi, 2008) :

- The assessed building itself
- The users of the assessment tools
- The phases of the building
- The database of the tools
- The forms of the outcomes

CHAPTER 3

LITERATURE REVIEW ON CONSTRUCTION CONTRACTS

According to P.S. Gahlot et al, "In construction, it is universal practice for the contract to be formalized in the form of a written document. Its main purpose is to define exactly the rights and obligations of each party (i.e. owner, contractor and society). It describe precisely the legal, financial and technical provisions of the work. It usually contains clauses that specify completion time of the project, liquidated damages, particulars concerning payments to the contractor, scope and nature of the work etc. the contract document is signed by both parties (owner and contractor). It is an agreement which is reached by the acceptance of an offer made by one party to do something for the other for a certain consideration. In engineering contracts, the offer usually takes the form of a proposal (also called a bid or tender) by a contractor to do the work specified by the owner for a monetary consideration, under certain conditions laid down by the owner. The elements of a contract, therefore, are the offer, monetary consideration and acceptance" (Gahlot, 2002).

In general, the contracts are of high importance due to their function in creating the bonds among different parties in professional interactions and their critical role in construction risk management. The function of construction contracts according to (O'Reilly, 1999) are:

- Specification of the work which is expected to be done by the contractor or subcontractor, specifying the required time of completion and the quality of the work.
- Defining the amount and method of payment by the owner, how any extra or reduced payments are supposed to be calculated, and the time of payments.

- Specifying each party's responsibilities outside of his/her direct control, e.g. bad weather, local authority restrictions, changes in regulations, etc.
- Definition of responsibilities for various administrative works or dispute resolution condition which may be required.

3.1 Contract Types

Construction contracts are categorized according to their payment methodology. Diverse contract types give different incentives to the contractor or consultant in accordance with the method of payment and also affect the cost, delivery time and the performance.

The guiding aspect for contract type selection, is to pick a type of contract that is mostly expected to realize the project goal. As a result the ultimate choice varies from project to project, depending upon promoters wish for speed, quality, economy, flexibility, experience or other goals (Wearne, 1989).

According to D. Carmichael, Contracts are consisted of two groups (see Figure 8) categorized according to the form of the payment in return of the services by the owner to the contractor. (Carmichael, 2000):

- Where in the payment method, either some of money covering all the specified work or a set of monetary rates covering the constituents of the work, the contracts referred to as fixed price contracts.
- Where the contractor is rewarded the cost of the work together with an added amount of money as the profit of the contractor, the contracts are referred to as prime cost contracts.

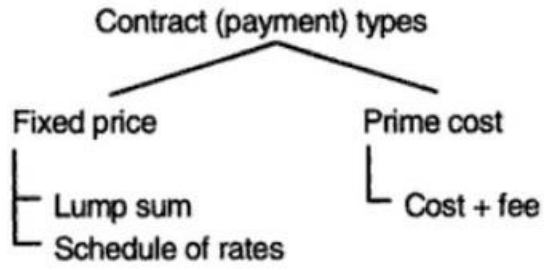

Figure 8. Contract payment types

Additionally, it is also possible and common for contracts to be set as a combination of fixed price and prime cost components. General procedure might label the contract in accordance with the major form of payment type use in the contract, though different payment types might appear in one contract. Convertible contracts initiate as one payment type and change to another competitive tender, or the one contractor may perform all the work, if a satisfactorily good bond exists between the owner and the contractor (Carmichael, 2000).

There are a series of factors depending on various situations that determine which contract payment type or other combination of contract payment types is the most proper one. A common belief is that the developer should define the work as carefully as possible beforehand, regardless of the type of contract which is supposed to be used. This act mainly can reduce the risks to all parties involved.

The transfer of financial risk from contractor to the owner is increasing from the top to the bottom of the following list. As the owner takes more risk, a reduction in the contract price could be expected. A general saving to the owner may be expected by accepting some risk. Mostly Owners are expecting that contractors should tolerate some risks, although some owners are exaggerating the situation and (through choice of conditions of contract, by payment type, and delivery method) ask contractors to accept basically all risk (Carmichael, 2000).

Fixed price:

- Lump sum
- Schedule of rates (Unit price)

Prime cost:

- Cost plus
- Fixed fee
- Percentage fee

3.2 Standard Contract Forms

There are not any strict instructions that rule the content of the documents which structure a construction contract. Eventually it is a matter for the contracting groups to choose which documents are supposed to have contractual force. Due to the legal and technical intricacy of many construction contracts, mainly contracts for large projects, the documents structuring such a contract are often broad and complex. The construction contract document usually contain some or all of the following types of legal and technical documents, which are interpreted as a whole framework of the contracts (Philip Loots, 2009):

- Form of agreement
- General conditions of contract
- Special conditions of contract
- Technical specification
- Drawings
- Bills of quantities
- Schedules

Each construction contract is unique in some different aspects, at least due to the identity of the contracting parties, the location of the construction site and the schedule of the works to be executed in the project. On the other hand, there are a large number of standardization ways applied in the provisions of contracts of a

specific type, since the contracting parties are not interested in reinventing the whole process from the beginning and additionally to gain the financial advantages of a foreseeable contractual environment which decreases the contract costs of negotiating and entering into a contract.

This standardization of contractual terms has initiated the development of a number of standard form contracts, arranged by various organizations. A standard form contract is usually refers to general conditions of contract set by an organization independent of the contracting parties, with the aim of being used by numerous parties for a wide range of construction contracts of a specific type. The project, party, site and construction specific legal documents are normally detailed in the section which is referred to as the special conditions (or particular conditions) of a standard form contract, which is commonly prepared by lawyers. One of the important aspects of evolution of standard form contracts during the last 20 or 30 years is that the industry has realized the need of different types of construction contracts which have noticeably different requirements, and as a result of that the standard form contracts should be arranged accordingly. However previously, only one single form contract was advocated for construction work. Currently standard form contracts precisely designed for each type of construction contract are available, so that it is needless for users to make new alterations to the general conditions (Philip Loots, 2009).

3.2.1 Standard Contract Forms and Sustainability Issues

To keep up pace with the global green building movement some of the standard contract forms have introduced additional specificity for green building services in separate contractual riders as references for the industry.

The following examples are among the ones which somehow integrating the sustainability provisions:

Fédération Internationale des Ingénieurs-Conseils (FIDIC)

Some standard contract forms do contain provisions that can reflect sustainability provisions, FIDIC form of contracts is also among this group. As it is mentioned in Clause 4.18 of the FIDIC Red Book, "Protection of the Environment" is demanded:

"The Contractor shall take all reasonable steps to protect the environment (both on and off the site) and to limit damage and nuisance to people resulting from pollution, noise and other results of his operations. The Contractor shall ensure that emissions, surface discharges and effluent from the Contractor's activities shall not exceed the values indicated in the Specification, and shall not exceed the values prescribed by the Applicable Laws."

This clause shows the need to obey local legislation and the requirements of sustainable construction. Moreover it brings up the key problem that you encounter when drafting contracts to include sustainability provisions (Tolson, 2011).

The International Federation of Consulting Engineers (FIDIC) published the Project Sustainability Management Guideline (PSM I) in 2004 to offer the industry, a methodology in developing project specific indicators. Recently, in March 2012, a policy statement was issued on climate change topic, and a report about sustainable infrastructure, with a focus on decision making, was published in September 2012. This report contained a global overview of existing sustainability tools for infrastructure. The consulting industry is engaged in a proper way to deal with these progresses and changes and explain the issues, so that engineering consultants can offer the best services that match with present and future demands from owners and from the society (FIDIC & EFCA, 2013).

FIDIC’s Project Sustainability Management Guidelines were made to support project engineers and other stakeholders in establishing sustainable development goals for their projects which are accepted by the society. The practice is also planned to let the alignment of project objectives with local conditions and priorities and to support project managers to quantify and verify their growth. The

PSM Guidelines are organized with Themes and Sub Themes under the three major sustainability titles of Social, Environmental and Economic (Clare Lowe, 2009).

BE Collaborative Contract

The BE Collaborative Contract which is UK based, is a new form of contract for construction projects that supports collaborative work. The contract has been issued by BE (Collaborating for the Built Environment). BE is the largest independent association for companies throughout the supply chain in the UK, dedicated to the investigation, design and delivery of sustainable built environment. The Collaborative Contract is a new contract framework which is designed for the successful delivery of construction projects (International Bar Association (IBA), 1999).

The Joint Contracts Tribunal (JCT)

JCT Building Contracts:

Three years ago, the Joint Contracts Tribunal (JCT) decided to expand the sustainability provisions inside its contracts. Since JCT is the most widely used standard form contract for UK building projects till now, we shouldn't underestimated its influence on the sustainability credentials of the construction industry. The revision 2 suite of contracts cover a number of sustainability provisions (Tolson, 2011).

A glimpse at the Contract Particulars in the 2009 suite shows a series of voluntary provisions which influence sustainability. This issue refers to Schedule 8 which exposes the following duty placed on the contractor:

"The Contractor is encouraged to suggest economically viable amendments to the Works which, if instructed as a Variation, may result in an improvement in environmental performance in the carrying out of the Works of the completed Works. The Contractor shall provide to the Employer all information that he

reasonably requests regarding the environmental impact of the supply and use of materials and goods which the Contractor selects".

The first fact to note is that the provision is optional so that the Contract Particulars should be completed to clarify the point whether or not it applies. The second fact to keep in mind is that the contractor is not incentivized to suggest any environmental developments to the works, other than the fact that he receives his price increase on the variation of cost (Tolson, 2011).

JCT Framework Agreement:

Likewise the JCT Framework Agreement 2007 contains a number of sustainability provisions. A framework agreement is a kind of an agreement which is consent to by the two parties to cover a long-term cooperative plan. Framework agreements are used, characteristically, where an employer has a long-term plan of work in mind and is intending to establish a process to govern the individual construction or supply suites which can be necessary for the duration of that framework term. (Tolson, 2011).

The American Institute of Architects (AIA)

The 2007 AIA B102 form obliges the architect, throughout the schematic design phase and as part of the initial services, to talk over the viability of including environmentally responsible design methodologies into the project. The architect must think through sustainable design options, such as orientation and material of the structure, to the degree such alternatives are consistent with the owner's objectives, schedule, and financial plan, and are suitable for the project. Sustainable design approaches must only be taken into account and their implementation is not essentially required for any project under the AIA B102 provision. Additionally, broad design alternatives demanded by the owner, such as in depth study or Leadership in Energy and Environmental Design (LEED) certification, are among additional services allowing the architect to ask for additional compensation (Jeffrey L. Alitz, Esquire and Ben N. Dunlap, 2008).

ConsensusDocs

The ConsensusDOCS 310 Green Building Addendum which was published in November 2009, is the first standard construction contract document in United States that comprehensively encompass green building construction aspects. The document illuminates and sets the roles, duties and processes for green buildings to ensure the successful delivery of green building goals. The document that is consisted of 10 pages, is planned to be added to each project participant's contract agreement. As well as matching up with the ConsensusDOCS family of contract documents, the ConsensusDOCS 310 can be successfully added to other standard documents and original agreements. It addresses (Geoffrey Washington, 2010):

Terminology and general principal: Describes key terms and codes so that everyone make similar interpretations.

Green status: Illuminates the owner's preferred project goals.

Green measures: Sets the required physical and routine measures.

Green building facilitator: Organizes various contributors' roles and responsibilities to complete Green Measures and Green Status. Assigning the responsible people who will be in charge of document collection and submission, and if necessary resubmission.

Implementation: Defines how the parties combine and refine green measures into the plans and specifications, and determining potential differences.

Risk allocation: Makes legal responsibilities clear.

3.3 Various Professionals' Liabilities

3.3.1 Proper Definition of the Scope of Services and Work

According to ENR Magazine, in its June 23, 2008 issue, the Green Building movement is without exaggeration, what appears progressively to set up the massive change in construction industry and still there is no one globally accepted definition of Green Building (Augustine, 2009). A green contract should state what each party means by 'green' and assign responsibility for completing and maintaining those goals. Sometimes 'green' means acquiring third party certification. It is also possible to include green features into the design without investing the time and money needed for third party certification. Furthermore in an increasing number of jurisdictions, some green goals are enforced externally by development codes and other legal obligations (Circo, 2011). If there are specific design features that you consider necessary, regardless of how the contract describes 'green,' they should be openly stated in the contract (Carruthers, 2008). One of the most significant aspects of a green project is to contractually guarantee that the design and construction of a project will really result in a green building that fulfills the Owner's requirements and expectations. In order to achieve the desired result, clear explanation of specific provisions in the contracts, among key parties in the green building process is essential. Some lawyers also recommend particularly entitling some parties to be liable for keeping up with changes in any applicable green building legal necessities.

Even if some early green building contracts just note the planned LEED certification level as part of the technical specifications for the project, that method basically ignore the key questions about contractual responsibilities and procedures. Who will do what? Since success depends on the cooperative work of several contributors, the contract documents should also term those who will identify the steps of the project to be followed and who will organize all of the activities. These concerns necessitate that all of the related contracts satisfactorily

define the scope of professional services or construction work assigned to each project participant involved in realizing the green building goals (Circo, 2011).

3.3.2 Parties' Liabilities

People who are involved in providing services and work necessary to meet the project's green building standards are equally concerned with properly specifying the duties of each group. Designers, prime contractors, subcontractors, and suppliers depend on contracts that openly and broadly describe the services, work for which they will be held responsible. Contractual scope provisions not only let different parties name the price for their services and work properly, but also they can manage the risk associated with their work. Each party can only evaluate its exposure to legal liability, govern its insurance requirements, and then manage its business risks by knowing the scope of its contractual liabilities. Although this is crucial for all participants involved in every kind of construction project, it is particularly vital on green building projects since industry customs and practices are still developing for these specific kind of projects. Up till now recognized industry patterns do not exist for defining and allocating all of the special activities and duties involved. Consequently, it is advised that every project participant involved in green building contracts, pay attention to the extra responsibilities and risks it may face on a green project (Circo, 2011).

Likewise, as green projects necessitate wide collaboration, many authorities also suggest that a central role for one project participant who will have main responsibility for stipulating the green criteria for the project and for guaranteeing the necessary coordination, should be defined in the contracts. These responsibilities need expert professional services, comprising proper designs incorporating applicable green details into the plans and other technical specifications, in addition to focused administration in order to implement and supervise an effective process to organize the cooperative activities of several participants (Circo, 2011).

With the purpose of effectively executing a green project, there are various risks that project owners, designers and contractors need to take into consideration. Therefore, each participant in a green building project needs to evaluate its risk and somehow diminish its effects.

3.4 Project Delivery Methods

A project delivery method is a structure planned to realize the successful completion of a construction project from beginning to occupancy. Any one or more contracting formats can be used by various project delivery method to succeed the delivery (The Construction Management Association of America (CMAA), 2012). Sometimes the project delivery method may also include the operation and maintenance phase of the project, some examples will be discussed later on (Touran, 2009).

At the initial phase of the project, the developer should consider various aspects to pick up the appropriate project delivery system. These aspects may include: the management of the project, perhaps the necessity of hiring a contractor who will be in charge of managing the whole process or the design to be prepared by the designer and then be completed by the contractor. Each of these considerations make an alternative delivery method possible for the owner to choose (Dykstra, 2011).

Owner's Requirements

The following criteria indicate some of the key concerns for the owner while developing a construction program (Peck, n.d.):

- A realistic and properly estimated budget for the project
- A proper design in accordance with the owner expectations
- A realistic schedule and continuous monitoring of the process
- Risk assessment and risk allocation

Owner's Level of Expertise

The owner's knowledge with the construction procedure and the level of the management capability of the owner's organization will have a great effect over the amount of external assistance necessary during the project. This issue can also guide the owner in selecting the suitable project delivery method (Dykstra, 2011). All the above mentioned owner's considerations and the choices made by the owner will determine the project delivery method. There are numerous delivery method types each signifies a different approach for organizing a project. Before talking about, different delivery methods however it would be useful to first focus on some of the matters on a construction project which are determined by the delivery method selection. They include (Dykstra, 2011):

The phase of the project at which the contractor gets hired: It can be before or after the completion of design.

The contract numbers that the owner executes: For most of the projects the owner has two distinct contracts, one of them with the designer and the other one with the general contractor. But different delivery methods work with different contractual relationships.

The roles and responsibilities of the project participants and how the project will be directed: In some circumstances construction manager confirms that the contractor is acting according to the contract requirements. In some other delivery methods the architect manages the contract between the owner and the contractor.

The speed with which the project can be finished: A project with a delivery method that hires the general contractor at the end of the design can be more time consuming to finish than a project that hires the contractor during design.

3.4.1 Types of Construction Delivery Methods

Design Bid Build (DBB)

This method is also known as the traditional delivery method. In this method of delivery, firstly the designers design the project. Then construction firms submit their bids in accordance with the finished plans and specifications. Then, the owner chooses the main contractor usually based on the price, the schedule is the secondary consideration in this type of delivery method, and the scope of the project is also well defined (Gibeault, 2005).

The DBB project delivery method is consisted of three parties, including the owner, designer, and contractor. Two contracts are signed in this type of delivery method, one between the owner and the designer for design services and another one with the contractor for construction services.

For most of the 20th century public work projects, the DBB delivery method is used (AIA-AGC Project Delivery Primer Task Force, 2011). The structure of DBB delivery method sets the minimum requirements for coordination among the owner, consultant, designers, and the main contractor during the project (Lehtiranta et al., 2011).

Design Build (DB)

During recent years this method of delivery has gained popularity mutually in the private and public sectors of the industry. The main reason for this interest in DB delivery system is the owner's wish for a single source of liability for design and construction. In the DB method for project delivery, there is only one contract between the owner and a single entity, the design build entity, for design and construction at the same time (AIA-AGC Project Delivery Primer Task Force, 2011). late owner decisions cannot be applied in this delivery method and it is

required to trust on the contractor's skills to produce promising solutions in reasonable range of price (Lehtiranta et al., 2011).

Although some of the other delivery systems often may increase disputes among various project members, with the owner acting as arbitrator, in DB many of these kinds of disputes are internal DB team problems which may not affect the developer (The Construction Management Association of America (CMAA), 2012).

Construction Management (CM)

Construction management is a particular delivery method in which the owner can get managing services before construction has initiated or a general contractor has been employed. The construction manager is a part of the project group early in the design stage and supports the owner during the whole construction process. Sometimes the construction manager works only as a consultant, in some other circumstances, his role is to be a consultant throughout design and to act as a contractor during construction. So that there are two different types of CM delivery methods: agency CM and CM at risk (Dykstra, 2011).

- **Agency construction management (Agency CM)**

One type of CM is called agency CM, occasionally referred to as pure CM in the engineering and construction industry. In this method the CM is a company other than the owner's organization which has the role of the owner's agent. The agency CM company does no design or construction work but helps the owner in choosing one or more design organizations and one or more contractors to construct the project. The agency CM firm is under no risks since all the contracts for project completion are signed among the owner the designers and contractors. In general the agency CM is remunerated by a fee (Oberlender, 2000). The owner has usually three distinct contracts in this type of delivery method: one with the designer, one with the construction manager, and one with the general contractor. The general

contractor is liable for the construction of the project and employs the subcontractors (Dykstra, 2011).

- **Construction management at risk (At risk CM)**

This delivery method is like the design bid build delivery method in many aspects, in which the construction manager at risk is also the general contractor. So that the construction manager is also liable of construction performance and he guarantees accomplishment of the project for a negotiated fee that is regularly set when the design is almost 50% to 90% developed (The Construction Management Association of America (CMAA), 2012). The construction manager at risk has contractual relationships with subcontractors who complete their part in the construction. In this method of delivery, these individuals are contractually bound only to the construction manager at risk. It should also be mentioned that there is no contractual bond between the designer and the construction manager at risk (AIA-AGC Project Delivery Primer Task Force, 2011). In at risk CM delivery method, the owner is signing two contracts: one with the designer and the other one with the construction manager at risk (Dykstra, 2011).

Integrated Project Delivery (IPD)

While buildings have become more multifaceted, as a response, the construction industry has become more specialized, separating a process that was formerly performed from the beginning to the end by one master builder. Construction management method of delivery was introduced to the industry in the 1960s as an answer to these problems ever since. But has not changed the fundamental problem of disjointed project teams and information. In the 1990s, design build delivery method was introduced. Through the same time that design build delivery system was being established in the United States; a delivery method recognized as project alliancing was being used effectively for a number of projects in Australia. This delivery method was trying to achieve improvements in project results by a

collaborative method of aligning the motivations and objectives of the project participants. Project alliancing delivery system is the source of a new project delivery method that has lately developed in the United States, referred to as integrated project delivery (IPD). Among other delivery methods, IPD has appeared to be a delivery method that can most efficiently enable the use of building information modeling (BIM) for construction projects (Kent & Becerik-Gerber, 2010). The team of integrated project includes people from diverse parties who have various expertise and information (Zhang, Ph, He, & Zhou, 2013).

Although it has many advantages the adoption of IPD delivery method is rather slow among the industry professionals. One of the reasons for this slow adoption is high level of concern about risk allocation in IPD delivery. The close partnerships introduced via IPD delivery method necessitates a new legal frameworks to deal with new IPD approaches (Kent & Becerik-Gerber, 2010). The key causes of disputes in the industry have always been time and cost overruns and quality imperfections, causing a tense connection among diverse project parties. This is principally because of the conflicts of interests among different project participants that lead each party to follow local optimization instead of the project as a whole. Traditional contracts inflexibly restrict duties of each party with much elaboration on the penalties of failure. These contracting methods support a self-protective behavior and cause distrust. Given the argumentative nature of contracting, there are advices for supporting cooperation through integrating relational qualities in contracting and shaping an integrated project team that encourages teamwork (Zhang et al., 2013).

Engineer Procure Construct (EPC) or Turnkey

In an EPC delivery method, an EPC contractor will usually be liable for the design, construction and commissioning of a facility. An EPC contract is like a design build contract, under both contracting methods, the contractor provides a complete project from design. But, the EPC contracting model is characteristically related with developing an operational facility, eg: a processing factory, power plant or

wind farm, instead of a building without special operative purposes (Cullen & Higgins, 2011).

An EPC contract alike DB contract offers a single point of liability, the EPC contractor. As a result, an EPC contractor usually take responsibility of time, cost and quality risks for the project. The single point of liability makes the EPC contracting method an attractive choice for developers in the case of any arising disputes (Cullen & Higgins, 2011).

Build Operate Transfer (BOT)

According to this method of dellivery, a private sponsor funds, designs, and constructs the project and then operates it for a definite period of time. During this period, the sponsor gathers profits by operating the project to compensate its investment and earn an extra income. Finally the ownership of the project is reassigned to the granting authority (Schaufelberger & Wipadapisut, 2003). The key point of using BOT is to lessen the costs from governments' finances by looking for capital from external investors particularly on large scale projects.

Project members in this type of delivery method comprise the granting authority, usually a government organization; the project financer; and usually one or more financial institutes (Schaufelberger & Wipadapisut, 2003).

3.4.2 Sustainability Achievement Through Various Delivery Methods

Several important features distinguish the delivery of a sustainable building from a traditional one. The delivery process for sustainable buildings is more multifaceted than customary construction and requires superior planning (Swarup & Riley, 2011). As shown in the Figure sustainability issue is an extra criterion for all project (Cattano, 2010).

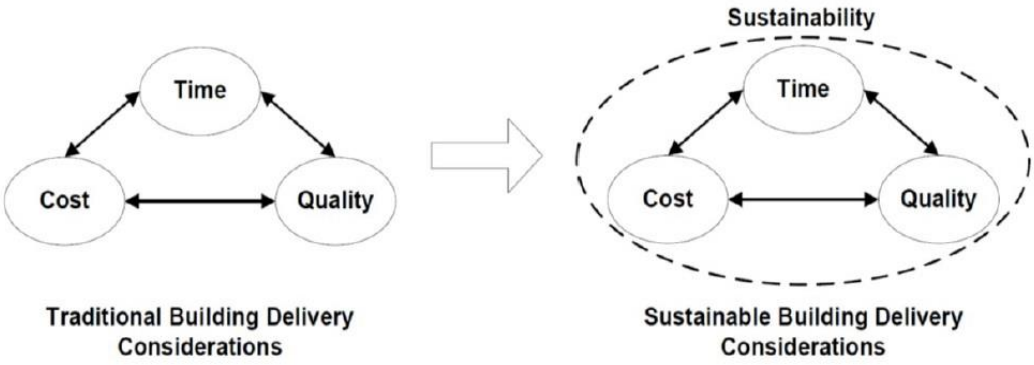

Figure 9. Traditional vs. sustainable building delivery

Another aspect in which the sustainable buildings delivery differs from traditional buildings is the level of collaboration among various participants. The delivery of traditional buildings is normally organized in a linear and vertical order where one process leads to the net one. The sustainable buildings delivery is organized in a cross functional and horizontal way in order to enable a collaborative environment for team work. Projects of sustainable buildings usually use design charrettes to guarantee strong interdisciplinary cooperation between project participants. These design charrettes are meetings held early in the project delivery among the participants to assist decisions that improve the project on a comprehensive level (Cattano, 2010). Such kind of projects need a nonlinear process with high multidisciplinary contribution to accomplish improved results (Swarup & Riley, 2011).

According to the research made by Swarup et al. the owner commitment, contract conditions, and integration in the delivery process are major project delivery characteristics affecting the project results such as cost, time, quality, and particularly sustainability goals. The findings of the group also suggest that strong owner commitment to sustainability issues, early participation of contractor in the project delivery process, and early inclusion of green policies to the project are critical to the sustainable delivery process for successful results (Swarup & Riley, 2011).

Other issues affecting the results of the project sustainability are increased contractor commitment towards sustainability and the project, former familiarity of the team participants with each other, design charettes, and project team procurement.

In most of the contractual conditions for typical sustainable projects, the cost plus fee contractual term is applied for the project contributors such as the designer, contractor, or design builder. In model projects LEED Accredited Professionals are directly signing the contract with the owner. If the LEED Accredited Professionals are directly contracted to the owners, who are the main decision makers, it would increase the significance of including green policies for the project team, so that it is reflected as an owner priority (Swarup, 2010).

Understanding the importance of cross disciplinary thinking and expertise are fundamental basics of green building implementations. Perhaps the most critical characteristic of IPD delivery system is supporting the effective cooperation which makes it the most suitable delivery method for sustainable projects. Open and uninterrupted ways of communication are vital during the green project life. IPD design charrettes are providing this opportunity for the team members. So that, green buildings that greatly depend on a multidisciplinary and cooperative team can get benefit of a delivery method whose team associates make choices together based on a common vision and a full understanding of the project (Yang, 2014).

By adopting building information modeling (BIM) into IPD delivery system, architects, engineers, contractors and owners can simply create organized, digital design information and documentation, and use that data to precisely envision, simulate, and examine performance, appearance and price of the projects, and also deliver the green projects much quicker, more economically and with less environmental impacts (Yang, 2014).

Among traditional methods of delivery, projects implementing DB method of delivery regularly accomplish high levels in the success results. Projects implementing construction management at risk method of delivery revealed medium level of success in project performance (Korkmaz, Riley, & Horman,

2010). This method of delivery lets the whole team to invent and evaluate alternative methods and materials with exact pricing info (Russ, n.d.).

The DBB delivery method shows medium and low level of success in project's sustainability achievements (Korkmaz et al., 2010). There is slight or no teamwork between the design team and the contractor organization in this method of delivery and it often makes an argumentative environment which results to poor communication between project participants. For a sustainable project this non-collaborative atmosphere is not ideal. Since the owner and contractor are mainly concentrated on completing the project within the lowest possible delivered cost, there is less probability that the contractor will obligate its resources to find alternative construction methods that could increase sustainable features and make the building more environmentally friendly (Russ, n.d.).

3.5 Claims Related to Sustainable Buildings

"A claim is simply an assertion of a party's right under the terms of a contract or under law" (Hewitt, 2011). The purpose of the claim is to convince the respondent that on the balance of possibilities, the plaintiff has the right under contract or law to succeed in the realities of the measures on which the claim is based on, and they need to be presented in a reasonable way and to be validated (Hewitt, 2011).

The source of legal liability in the green construction framework will arise mainly through contract and tort legal theories as well as statutory requirements (BCCA, 2011). According to Masters et al. the liability matters in green buildings can consist of different types of claims (Masters & John R. Musitano, 2007):

- Fraud
- Negligence
- Breach of contract
- Breach of warranty

3.5.1 Most Common Areas of Green Building Claims

Even if the claims for conventional buildings and green buildings are mostly similar, there are some new claims that characteristically are relate to green construction. Lack of accurate analysis for the new concepts and technologies linked to green buildings plays a key role in the occurrence of new claims in the construction industry. Therefore, construction professionals should be cognizant of the potential claims that could arise in green construction in order to prevent or to resolve these claims in a proper way if they happened.

Main areas of claim in the green construction literature are (American Arbitration Association® (AAA) & The National Construction Dispute Resolution Committee (NCDRC), n.d.; BCCA, 2011; Circo, 2011; Masters & John R. Musitano, 2007):

- Claims of 3rd party certification
- Claims for energy savings
- Claims of governmental incentives
- Claims for unfair market competition

Each of these areas can consist of different types of liability claims like fraud, negligence, and breach of contract.

3.6 Introducing Risks and Mitigation Strategies for Sustainable Construction

“ Recognize the construction contract as the bedrock of risk management ”(Horkovich & Connolly, 2010).

In order to be able to come up with effective risk management strategies first we need to detect possible risks associated with green buildings. One of the most obvious risks in the construction industry is to be inflexible with the changes and new trends, so that not engaging in sustainable construction services may eventually cause architects, engineers, construction companies etc. become outdated in the near future. Constant upgrading is necessary to keep pace with changes to standards (Durmus-pedini & Ashuri, 2010). The practice of sustainable

building is becoming standard as many international and local jurisdictions are implementing codes and ordinances necessitating that buildings are designed, constructed and operated in an energy efficient way. In the future, numerous buildings will integrate green features (American Arbitration Association® (AAA) & The National Construction Dispute Resolution Committee (NCDRC), n.d.).

3.6.1 Possible Areas of Risks in Green Construction Contracts

For projects that attempt to be in accordance to sustainability standards, the contracts must assign all particular agreement requirements that are related to the work, plus any specifics in the design, construction, commissioning or documentation of the project, to the project participant who is in the best situation to achieve those requirements. Therefore the role of contracts are really crucial for preventing the main risk associated with green construction which is possible disputes (American Arbitration Association® (AAA) & The National Construction Dispute Resolution Committee (NCDRC), n.d.).

There are various issues mentioned in green construction literature, covering possible areas of legal and contractual risks associated with sustainable buildings. In following table, a comprehensive list of these risks are elaborated, as it was discussed earlier most of them are among the main reasons for green construction claims:

Table 3. Contractual and other legal risks of green buildings

Contractual and other legal risks of green buildings	
1.Green building risks associated with standard form contracts	1. Lack of proper green risk allocation & risk mitigation techniques
2. Third party certification risks	1. Costs related to gaining third party certification 2. Failure in Mandatory government codes and regulations

	3. Lost government incentives 4. Decertification
3. Financial risks	1. Limited insurance 2. Limited surety bonds
4. Breach of contract or breach of warranties	1. Elevated standard of care for industry professionals 2. False advertising 3. Damages to professional reputation 4. Unfair market competition risks 5. Construction products liability

Table3. (Continued) Contractual and other legal risks of green buildings. (BCCA, 2011; Dunn & Kofron, n.d.; Durmus-pedini & Ashuri, 2010; Lumpkin & Mastin, 2011; Nutter, 2012; Perkins, 2009b; Perlberg, Gregory, & Orien, 2011)

1. Green Building Risks Associated with Standard Form Contracts

Standard form contracts contain a very limited guidance for the users regarding green features of a project (Lumpkin & Mastin, 2011). Regardless of the rising acceptance of green building in the industry, most standard forms of contracts either totally fail to state or inefficiently address the obligations, duties, and risks related to green building, and also fail to allocate these green risks. the following list contains some, but not limited to the drawbacks of using these forms (Perkins, 2009b):

- The terms "Green", "sustainability" or "green certification," are usually not clear, which cause uncertainty in expectations.
- Parties who are responsible for achieving third party certification or other green goals may not indicated.
- Suitable insurance policies for sustainable building aspects may not be necessary, provided, or available.
- Penalties in the case of decertification may not be clarified in the contract.
- Duty of the parties for due diligence concerning green products, materials and technologies may not be addressed.

- Consequential damages related to green building (e.g. lost tax credits and reduction in property value) may not be addressed.
- The impact of the schedule delays to accomplish a third party certification may not be addressed.

2. Third Party Certification Risks

The widespread use of third party certification systems in green projects increases a complexity layer that can considerably change the scope of liability for all parties. Moreover, the distributed duty of getting credits for a project means that no one partaker can manage all steps for achieving certification. Thus any party offering a warranty of final certification is at a huge risk liability. Claims can be related to consequential damages related to lost sales or reduction in value if a project which fails to get certification. This issue is extremely dependent on contract language (BCCA, 2011).

If the project fails to achieve the anticipated green certification or planned environmental benefits, the project will face (Perlberg et al., 2011):

- The significant reduction in revenue or profit
- The failure to get potential decreases in operating, maintenance, or other intended costs
- The loss of government incentives like: tax or similar benefits or credits
- Loss of marketing opportunities

Costs related to gaining third party certification

Many fans of green buildings claim that the upfront additional costs of them are not considerable and that green building can be realized for the same amount or as little as two percent more than traditional projects. Others say that the additional administrative phases involved with third party certification achievement

unnecessarily adds monetary burden to a green project (BCCA, 2011; Dunn & Kofron, n.d.).

The increasing reputation of third party certifications in public building projects has a positive effect in their growth in construction market (BCCA, 2011).

Failure in mandatory government codes and regulations

According to Circo, In the US, laws, ordinances, and other methods of governmental support for sustainable buildings in general fall into two major classifications, mandatory rules and incentives. Mandatory rules are usually implemented only to public projects and those that use public funding. Although these programs for public projects set important first steps, sustainability in construction sector eventually requires the extensive adoption of green building standards similarly by the private sector. (Circo, 2007).

In the previous years, numerous communities all over the world have struggled to implement a combination of existing codes, standards and third party rating systems to collect their own countries' policies for progressing in green buildings field in their own communities. Until now several countries has adopted new standards in this regard, among these communities are Canada, Australia, US, European Union, Dubai, Egypt, and other growing numbers across the globe (Elfiky, 2011).

Considering the widespread adoption of the green standards an important question arises: "When will we see more green litigation?" This may happen if and when sustainability requirements are a part of new or updated codes and laws, like the International Green Construction Code (IgCC) (Mangold & Kopplin, 2012). AEC professionals have a duty to deliver services that satisfy the necessities of the law and the added requirements of their contracts in the case of green design and construction. Now that the standards are new and a little bit complicated, enough care should be taken (Nutter, 2012).

Lost government incentives

In order to encourage private sector, governments are using certain incentives to promote sustainable buildings. These incentives simply inspire green building options rather than require them. Governmental green building plans targeted the private sector mostly are in this category. A building's failure to gain third party certification can result in a variety of losses, for instance, the owner can lose tax credits or other government incentives (Circo, 2011; Wilson & Barnes, 2011). Sometimes the process of gaining third party certification can be really time consuming and failure to obtain the certification on time is another major cause for lost government incentives (Wilson & Barnes, 2011).

Decertification

An important concern for the parties involved in a project looking for a third party certification is the possibility that even if certification is achieved, it can be canceled after some time. For instance, until very lately, anyone could challenge any existing LEED certified building to the USGBC. Modifications made by the American Green Building Certification Institute on September 2010, put restrictions for starting a challenge for those who have certain personal information about the project and the particular LEED points in 2 years of final certification (BCCA, 2011).

3. Financial Risks

Except in the case proper cost controls are established early, possible cost overruns are an inherent risk. The actual costs are frequently higher than traditional construction practices because of the new technology and equipment used in green buildings (Dunn & Kofron, n.d.).

Pure economic loss which is a financial loss not related to a physical injury can also be the case in sustainable buildings. Under this theory designers might face

liability for negligent misrepresentation of their services, failure of a service performance e.g. assured energy efficiency or environmental benefits, and malfunctioning products (BCCA, 2011). So that claims can be sought for compensation of these losses (American Arbitration Association® (AAA) & The National Construction Dispute Resolution Committee (NCDRC), n.d.).

Limited insurance

According to several sources, the liability insurance policies that building owners, design professionals, contractors, subcontractors, and suppliers usually use are insufficient to cover particular risks related to sustainable projects (Circo, 2011).
A recent survey of insurance companies showed that they commonly give green projects more inspection because of the use of new products or technologies involved. This high level of inspection is the result of the probable incorrect installation of new products, energy systems or other material used by inexpert contractors causing claims of defective workmanship (BCCA, 2011).

Limited surety bonds

Usually some green performance bonds are sought for sustainable buildings because of their anticipated level of performance. Performance bonds are just one type of many surety bonds in the market. They guarantee a contractor will complete the work essential in relation with a contract award (Bradford, 2015).
Similar to insurance, surety bonds offer major risk management advantages for the industry. But traditional construction bonding products do not simply adapt to the new different conditions that green building projects create. Whereas green building bonds can seem feasible concept, the realities of green building construction are in contradiction of a bonding solution in practice. Achieving green building goals usually depends on performance by numerous professionals working under independent contracts and it's not feasible for every project participant to provide separate bonds. There is already a request for green building

bonds. The question is whether the surety industry can offer a pricing and risk analysis techniques to make them available. (Circo, 2011).

4. Breach of Contract or Breach of Warranties

A breach of contract is an act which does not follow the terms of a legally binding agreement. The subjects of a contract can be categorized as representations or terms. Breach of a representation has less harsh consequences in comparison with breach of a term. Terms can be also further classified as conditions, warranties, or intermediate (BCCA, 2011).

Warranties are expressions of a contract reflected a promise and let a claimant to recover full expectation damages for breach of a contract. Expectation damages are considered by the financial position the claimant would have been in if the contract terms had been satisfied. A failure to follow a warranty can result in more harsh penalties compared to a failure to follow a representation (BCCA, 2011).

Elevated standard of care for industry professionals

The standard of care that relates to professionals is both flexible and relative. It changes and adapts to changing conditions of new information and technology. In the past green buildings were not common. At that time, a normal design professional did not have special knowledge in the design and construction standards, products, equipment, and methods of sustainable buildings. Nowadays the industry professionals devote significant attention to sustainable development and modern green buildings standard. Therefore it may result in a modified level of standard of care for professionals (Circo, 2011).

Those with particular education or green building skills can be regarded with a higher standard of care for negligent construction or misrepresentation. On the other hand, a lack of experience with green building products or techniques can similarly increase negligent construction claims (BCCA, 2011).

Damages to professional reputation

If a green building cannot meet the requirements of expected goals of third party certification and energy savings, or any other longer term performance objectives, it can harm the reputation of the company or person behind this failure. Moreover it can affect the professional reputation of the designer and contractor of the project (Nutter, 2012).

False advertising

Construction professionals can face intentional or negligent misrepresentation claims related to marketing claims about the sustainability of the home, for instance:

- Publicity of a building as it is green or certified, when it is not.
- Labeling, imprecisely, building elements or materials as green.
- Incorrectly introducing a building as it is healthier.
- Misleadingly claiming that the structure has a reduced carbon footprint.

Assurances regarding performance can be risky, particularly when the failure of the building in certain aspects is measureable (Masters & John R. Musitano, 2007). Claims from the users of the building is also probable regarding the failure of the promises related to environmental performance or reduced energy costs (American Arbitration Association® (AAA) & The National Construction Dispute Resolution Committee (NCDRC), n.d.).

Unfair market competition risks

Moreover, liability may arise because of applicable legislative regulation of advertising. In Some counties, incorrect advertising is a crime and may result in criminal or civil liability (BCCA, 2011).

In addition the role of the certifying organizations like LEED in the construction bidding procedure must also be taken into account. LEED requirement of a project may influence the owner's consideration of a bid and whether or not such a criterion can rationalize a less competitive bidding process. In these cases LEED experience of a company can be given weight in the determination of a successful bidder (BCCA, 2011).

Construction products liability

Although praiseworthy, the use of new less dangerous building material or new construction systems may give rise to liability as a result of contractor inexperience with installation techniques, lack of long term analysis of green materials or warranties offered inadvertently about the stability or effectiveness of unverified materials or techniques. Product liability issues may increase liability under contract and tort laws (BCCA, 2011). The usage of new and recycled construction products and materials can also generate unpredicted environmental issues as well (Perkins, 2009b).

3.6.2 Green Related Risk Mitigation Strategies

Each contributor on a sustainable project has concerns specific to his role but a failure caused by one participant may result in liability for everyone, a collaborative method can reduce potential issues before they occur (BCCA, 2011). In general there are so many interrelated factors that may cause risks, and also mitigation strategies which can be related to many sources of risks, which makes proper categorization of these factors harder. In the following section possible risk

mitigation strategies are introduced, learned from the present AEC industry experiences with green projects risks.

Table 4. Green construction risk mitigation strategies

Green construction risk mitigation strategies	
1. Consultation	1. A lawyer 2. A professional green building consultant
2. Contract Language	1. Define Terms 2. Define Timelines 3. Assign Liability According to Responsibility 4. Consequential Damages 5. Liquidated Damages 6. Length and Scope of Obligations 7. Industry Standard Forms 8. Promise Only What Can Be Delivered
3. Insurance	1. Potential Exclusions 2. Professional Liability Insurance
4. Project delivery method	1. Design-Build or Integrated Project Delivery (IPD) - Building Information Modelling (BIM) 2. Project Team members - Coordination Among Project Participants - Experienced Team - Participants knowledge
5. Third party certification	1. Early establishment of certification goals 2. Early planning

	3. Proper and regular documentation 4. Appropriately assigning responsibilities
6. Product liability	1. Use of LEED suggested materials 2. Test the new products 3. Check the availability of the material

Table 4 (continued). Green construction risk mitigation strategies

1. Consultation

- **Lawyer**

Consulting an experienced construction lawyer for considering important green subjects related to the project, in bid evaluation and contract award decisions can be critical point (Martin, 2009).

Industry's standard form contacts should not be used without an experienced construction lawyer consultation. Their instruction for necessary alterations and proper allocation of green building risks is needed. There are important modifications to be made to these contracts (Martin, 2009).

Seeking counseling for likely litigation subjects is also recommended, for instance performance issues or new materials (Durmus-pedini & Ashuri, 2010).

- **A professional green building consultant**

Even though many of the risks associated with green buildings are interrelated, consulting a risk manager specialized in green construction issues can be very helpful for eliminating those risks (Sentman & Percio, n.d.). these green consultants can be selected among LEED AP (Accredited Professional) (Durmus-pedini & Ashuri, 2010).

Involvement of a green consultant can be a method for better communication and documentation of the mutual understanding, anticipations and duties of the parties regarding the sustainable aspects of a project (American Arbitration Association® (AAA) & The National Construction Dispute Resolution Committee (NCDRC), n.d.).

Owners who are also trying to control the high costs of green buildings should employ a green building cost consultant for cost assessments, budgets, technical feedback on construction methods, and scheduling the project. This consultant can be a contractor who has the experience of green building projects (Dunn & Kofron, n.d.).

2. Contract Language

- Define Terms

Imprecise terms such as 'green' or 'sustainable' should be avoided in contracts unless defined clearly (Martin, 2009). The lawyers of each participant in the project can assist their clients by clarify their expectations so that the ultimate contract signifies a true meeting of the minds (Lumpkin & Mastin, 2011). The contracts must explain which specific third party certification and which version of that certification is the expected objective of the project (Perkins, 2009b).

The contract terms is the main point to be specific about. In any scope or price dispute occurs, the first reference point in the court is the contract itself (Perlberg et al., 2011).

- Define Timelines

The issue of timeline is an essential point for the incorporation of 3rd party certification systems in green projects. Most of the certification systems requires

long period of time to certify a building, this timeline is mostly about 3 years from initial registration to final certification of the project. By defining the timeline of green projects in an accurate manner, including extra time for proper documentation and material obtaining, unforeseen delays and related disputes can be prevented. If all participants are aware of the additional steps required to get third party certification then there will be less probability of a delay (BCCA, 2011).

- **Assign Liability According to Responsibility**

Green building contracts should openly outline the expectations of the all participants related to particular design, construction, commissioning, documentation, warranty and submission necessities for the project (American Arbitration Association® (AAA) & The National Construction Dispute Resolution Committee (NCDRC), n.d.).

The party liable for certain steps in relation to reaching green goals should be delineated in the contracts clearly and specifically as an example for gaining specific categories of LEED points, preparation of essential documentation or involvement in the certification process (Martin, 2009).

- **Consequential Damages**

In most of the industry standard forms of contract, there exists a mutual waiver of consequential damage provisions. Usually the owners with green projects should object and oppose these waivers because of the following reasons (Dunn & Kofron, n.d.).

- The risk of damages waived by the parties is not actually mutual, this clause is in favor of designers and contractors.
- 'Consequential damages' term is open for interpretation in court and not clearly defined.

- The waiver assigns risk to the participant who is least able to manage it.
- The waiver precludes reasonable compensation to owners.
- It limits owners' rights to recover damages and partially eliminates the need of designers' or contractors' requirement to buy insurance.

Available insurance for green projects should be considered and obtained against such damages. Exactly explain what happens if the expected certification level is not obtained (Martin, 2009).

Mutual consequential damages waiver also prevent claims for recovery of losses caused because of the other third parties, such as buyers or users of the building. An owner to whom achieving LEED certification is important may want to modify these clauses in the contract to safeguard against failure to achieve certification (Martin, 2009).

- **Liquidated Damages**

The usage of liquidated damages can be a more feasible substitute to the inclusion of a mutual waiver of consequential damages in the contract. Since owners are not eager to waive their option to recover the losses related to green projects and Contractors are not interested in being exposed to consequential damages, liquidated damage provisions in the contract can be a good alternative for both parties. Liquidated damages can be a middle ground where parties can agree on rational assessments of potential losses as a consequence of failing to accomplish all the green aspects of a project. These provisions in the contract can help parties plan ahead for potential liability and purchase insurance (BCCA, 2011).

So that sharing some of the economic risks with other parties involved in the project by contractual agreement or preventing the risks with the use of insurance policies is a logical way to avoid possible risks (Durmus-pedini & Ashuri, 2010).

- **Length and Scope of Obligations**

It is essential to outline the duration and scope of services that each party is anticipated to provide in a project. This includes identifying the risks associated with any guarantees or warranties about achieving final certification for the project. Since third party rating systems are not bound to any project participant, they are not obliged to deliver any certification for a project.

Nevertheless, contract terms should clearly mention whether a designer or contractor is obliged to stay on a project until certification is acquired or not. This must also take account of the likelihood that once certification is achieved, it is possible that it will be revoked after a period of time. If a Designer or Contractor is expected to offer their services up until certification is gained then the scope of work anticipated to correct deficits that preclude certification should also be openly expressed plus the cost of such services if there are any (BCCA, 2011).

- **Industry Standard Forms**

The construction industry is evolving, with a growing emphasis on energy efficiency and developing technologies. Design build (DB), integrated project delivery (IPD), and building information modeling (BIM) are more and more common among the industry participants, and energy efficient buildings are also growing fast. Despite these progresses, the traditional industry standard forms of contract have been slow to issue forms addressing the diverse risk and scope concerns raised up by these developments (Perlberg et al., 2011). But these aspects can be controlled through contract supplementation. There is no magical "green paragraph" to include all the numerous extra concerns that green construction projects impose to industry members, but every set of contracts should accurately assign risks predicated on that project's specifications. Hence, green building contracts must be supplemented by experienced professionals to address the green issues, in order to reduce the risks of disputes, claims, and litigation or arbitration (Perkins, 2009b).

- **Promise Only What Can Be Delivered**

Developers should not make any advertisement or representations regarding a building certification by a third party until it actually obtains certification (Masters & John R. Musitano, 2007). Regarding green services and products, making any verbal, written, or internet based representations and advertising must be verifiable, exact, and clear. A green contractor must not misrepresent its experiences in sustainable projects. Confusing statements or inaccurate advertising claims that cannot be supported or proved can be considered fraud. Performance claims while advertising certain material or products can be interpreted as part of a warranty by courts (Perkins, 2009b).

According to Tulacz, standard of care for professionals participated in a green building project, seeking LEED certification should be outlined in the contract documents (Tulacz, 2008). As it was mentioned before, third party rating systems are not bound in contract to any industry members to issue any certifications. So it is not possible for any party to guarantee the results of any certification (BCCA, 2011).

3. Insurance

- **Potential Exclusions**

A contractor undertaking the responsibilities for a green project should make sure that green building requirements are not excluded by the builders' risk insurance policy (Perkins, 2009b).

Various parties in a green project must make sure that they have acceptable insurance coverage given the specific concerns mentioned beforehand, with regard to changing standards of care, misrepresentation or wrong advertising and developing green supplies and building methods. A comprehensive review of possible insurance exclusions should be carried out and a plan for alleviating these

risks should be planned (BCCA, 2011). The partakers in AEC industry should demand insurance firms to provide green building risk specific policies (Durmus-pedini & Ashuri, 2010).

- **Professional Liability Insurance**

If standard professional liability insurance is inadequate for the range of green aspects of a project then some effort should be made by all participants to reach a middle ground as a nonexistence of insurance coverage can extremely damage all, this can be made possible with the inclusion of a liquidated damages provision in the contract. A disappointed owner won't be able to reimburse his losses and the contractor or designer will be bankrupt in the occurrence of a large claim for damages. It is still unclear whether an elevated standard of care will be applied to parties who market themselves as green specialists, if so then they can be excluded from their standard professional insurance (BCCA, 2011).

The number of insurers who are now introducing policies aimed at green buildings is increasing. Underwriters are addressing the green building subjects in different methods. Thus it is essential that precise policy language is carefully reviewed. There is an insurer who offers coverage to avoid gaps in traditional policies, like: property or builders' risk, and comprehensive general liability "CGL". Other insurers has introduced a builders' risk green endorsement, with additional coverage, including restoring air quality, costs associated with building commissioning, fees for recertification and registration, additional expenses related to public utilities, and recycling expenses. Another insurance company has lately provided two new green endorsements to CGL policies: one for green reputation coverage, and another for green indoor environment coverage. Since the number of green buildings claims increases, more green insurance policies are offered in the market (Perkins, 2009b).

4. Project Delivery Method

- **Design Build or Integrated Project Delivery**

As indicated before, communication between project participants is critical on green projects seeking certification due to the distributed responsibility of gaining credits. Following a design build (DB) delivery method can ensure that the designer and contractor have a shared plan for reaching project goals (BCCA, 2011). An Integrated Project Delivery method is also one of the preferable methods of delivery as discussed in detail earlier in this chapter (Durmus-pedini & Ashuri, 2010).

- **Building Information Modelling (BIM)**

The use of BIM can improve a collaborative approach by the means of shared models of expected energy use or other performance criteria of a building earlier than construction, building information modeling is mostly used in integrated project delivery method (BCCA, 2011).

- **Project team**

Although success in construction industry depends on teamwork, collaboration, and coordination more than any other industry, it is unluckily the most argumentative and litigious matter as well (Perlberg et al., 2011).
Stating the responsibilities of each party clearly can mitigate risk and increase the chance of a successful project (American Arbitration Association® (AAA) & The National Construction Dispute Resolution Committee (NCDRC), n.d.).

- **Coordination among Project Participants**

Because of the shared duties of a green project, coordination among members is critical to evade liability and effectively attaining the desired level of certification. One possible approach is to have a "Green Facilitator" clearly identified in the contract who will be in charge of organizing the various documentation requirements related with accomplishing certification. The green facilitator can be contractually bound to the Owner or General Contractor and help for decreasing misperception about who is responsible for which part of the green features of the project (BCCA, 2011).

- **Experienced team**

Since accomplishment of the anticipated certification involves many parties, a knowledgeable and experienced green team is an essential part of these kind of projects (Perkins, 2009b).

The involvement of teams familiar with the processes of the third party rating system can be very effective in achieving the sustainability goals of a given project. If any LEED certification is going to be achieved then the use of LEED AP (Accredited professional) consultants, contractors and designers is really essential for the project's success (BCCA, 2011).

- **Participants knowledge**

Though the green building movement is quickly developing, it is still a fairly new idea and practice for many professionals. Therefore it is critical that each party in a green project be familiar with sustainable design, green building rating systems, green materials and products and systems, the certification process, and the applicable green building laws. Without designers, contractors, subcontractors, consultants, and material suppliers with broad green building knowledge, a sustainable project has a higher risk of failure (Perkins, 2009b).

It can be really helpful to develop processes to make sure that project team is fully informed with current regulatory requirements, especially since these regulations are changing rapidly (Martin, 2009).

5. Third Party Certification

- **Early establishment of certification goals**

Developing a written general strategy and comprehensive plan early in the project for getting any third party certification is crucial. Similarly early examination of potential effects of green goals on the whole project schedule is important. Taking into account the use of new methods and implications of the certification process is also critical (Martin, 2009). If there is a desired third party certification for a project it should be clearly stated in the contracts and the steps for its achievement should be clarified and assigned to each party early enough in the project to get the most out of its chances (Perkins, 2009b).

- **Early planning**

Saving a project after it was unsuccessful to qualify for a third party certification is expensive and ineffective. Cautious advance planning is vital to maximize the probabilities of meeting green goals. All the single contracts which affects the project, including the loan contract, design services contract, construction management contract or construction services, the subcontracts, and the contract for property management services, all needs to make clear the steps that each project participant is required to take for delivering and maintaining the desired certification for the project. The certification necessities must be stated properly and consistently in each of these forms of contracts along with the particular duties of each party in achieving those necessities (Lumpkin & Mastin, 2011).

- **Proper and regular documentation**

The necessity for third party certification of green projects has also formed the necessity to document the compliance efforts constantly from site development to finishing point of the project to enable following verification by the certifying organization (Lumpkin & Mastin, 2011).
Some certification credits can be difficult to achieve after project finishing point, mainly those credits related to waste management, construction management, and material related credits (American Arbitration Association® (AAA) & The National Construction Dispute Resolution Committee (NCDRC), n.d.).

- **Appropriately assigning responsibilities**

It is crucial that the contract form assigns the resposibility of the registration of the project for green certification and the management of the certification process to a certain party. This party can be the architect, the engineer, the contractor, or a third party certification manager (Perkins, 2009b).

6. Products Liability

- **Use of LEED suggested materials**

The potential impacts on the project as well as legal liabilities associated with the use of new products, designs, technologies and construction methods should be taken into consideration in green projects (Martin, 2009).
The responsibility of the materials used is not only the designer's. Some third party organizations like LEED offers points for using local materials because of the decreased amount of carbon footprint of lesser transportation path; Therefore, the parties must to be aware of which materials can be bought locally. LEED also has

some points for recycled construction waste materials, so that chances for recycling materials should be assessed and recognized (Lumpkin & Mastin, 2011).

- **Test the new products**

Contractors who are going to use certain new materials should make sure that indicated green products have been effectively tested. Contracts should also address who is in charge for due meticulousness about green products and technologies, the architect, contractor or the other parties (Perkins, 2009b)?
Parties should consider more time in the schedule and financial plan for the time related to use of new resources and techniques, increased designer checkups and approvals, and enhanced quality assurance advancement. Also consider essential training for construction workers regarding new materials and procedures. (Martin, 2009).
It is also suggested to use tested green resources to avoid future litigation (Durmus-pedini & Ashuri, 2010).

- **Check the availability of the material**

Contractors need to make sure that stated green products are available in the market (Perkins, 2009b). Unpredicted delays or litigation can be avoided by ensuring that all parties understand the effect of nonconformities from chosen material use can have on successful third party certification achievement (BCCA, 2011).

CHAPTER 4

RESEARCH METHODOLOGY

To achieve the main goal of this study, which is to take steps in identifying possible contractual and other legal risks of sustainable projects from the Turkish construction sector point of view and to offer suitable risk mitigation strategies to avoid possible future claims, a questionnaire survey is used. This survey helps to recognize the perception of the Turkish industry's professionals on this specific topic. In this chapter the thesis research methodology is elaborated.

4.1 Research Methodology

An online questionnaire was used, to obtain the views of Turkish construction industry experts on the topic of green building contracts in Turkish construction sector.

An easier and more flexible technique is developed for obtaining responses from the questionnaire participants by means of drop-down menus and checkboxes in the digital platform. The advantageous aspect of online questionnaires is that the turnaround of data gathering process and the analysis is much faster and easier since the provided information is already in digital format (Harwell, 2011).

The questionnaire survey was distributed among professionals who have experience about Turkish green building market. This questionnaire survey was directed between July 2015 and August 2015.

The outline of the whole research process is presented in figure 10.

Figure 10. Research Outline

A brief explanation of each step is provided to understand the overall methodology followed in this research:

4.1.1 Problem Introduction

The problem was defined as: "As a result of green building movement, construction industry is experiencing new kinds of legal claims due to the added green features and technologies. With properly designed contracts, these types of claims can be effectively reduced in construction sector since contracts can encompass proper solutions for predicted risks. Therefore we need to identify these potential risks associated with sustainable projects to be able to mitigate green building risks to prevent future claims."

4.1.2 Scope & Objective Definition

Thereafter the scope and objective of this thesis research was set to limit the range of study for this research so that it was not very broad in nature. In order to achieve this objective, geographically the research area was decided to be bound to Turkey.

4.1.3 Literature Review

A literature review was conducted to define the current situation of legal claims in the green construction sector and to analyze the potential kinds of present as well as future risks that can be mitigated with the help of some alterations in conventional construction contracts.
The literature review also was used to examine the strategies that had already been offered by other experts.

4.1.4 Survey Questionnaire Development

The research method selected for this research was descriptive and experimental research through data gathered from an online questionnaire survey directed through Google Forms. A copy of the questionnaire survey is provided in Appendix A.

4.1.5 Data Collection

The questionnaire was distributed to respondents through different means such as email invitation, and distribution through the professional social online network, LinkedIn. The potential respondents for the purpose of this research were the Turkish professionals who were involved in green building projects such as architects, engineers, green building consultants, owners, contractors, material vendors and so forth. A more detailed explanation about data collection is provided later on in this chapter.

4.1.6 Data Analysis

Collected data were examined to get the results of this research. Details about the various tests used for data analysis and the results are presented in Chapter 4. Research Methodology & Data analysis.

4.1.7 Research Findings

After data analysis was conducted, the results and findings of the research was discussed in chapter 5.

4.1.8 Recommendations & Conclusion

With the help of results achieved from the analysis, conclusions were drawn. At the end of this research, limitations of this research are discussed and some recommendations for future research areas are stated to guide other researchers who wants to expand the research.

4.2 Questionnaire Development

Firstly a deep literature-based review was conducted by analyzing the available sources such as journal articles, books, academic documents, thesis, and web pages.

Thereafter a questionnaire was designed based on this comprehensive literature review findings. The review was conducted through various previous studies to discover the possible contractual and other legal risks and the main issues that may lead to claims related to sustainable projects. The review was also aiming to find out the possible risk mitigation strategies which were suggested in previous studies.

Identified green building contracts' risks are categorized as green building risks associated with standard form contracts, third party certification risks, financial risks, breach of contract or breach of warranties which may lead to claims.

4.2.1 The Structure of the Questionnaire

The questionnaire survey consists of five parts:

1st section: general information about the participant

2nd section: general information about the participant's green building knowledge

3rd section: general perception about green projects and green construction contracts

4th section: general perception about green projects' legal risks

5th section: general perception about the contractual risk mitigation strategies

The questionnaire has a series of close-ended checkbox question types (each question having an "other suggestions" section), and also a series of likert scale question types, such as scale of agreement or importance of the question subjects. This technique for questionnaire design was employed as it limits the number of variations in possible responses. By using Google Forms as the main tool, an online questionnaire was prepared and sent to Turkish industry's professionals involved in green building projects. Before sending out the survey, a couple of pilot tests were carried out to determine the required time for its completion, to ensure that the questions were not vague, and to check that the instructions were clear. A copy of the questionnaire used in the research is provided in appendix A.

4.2.2 Data Collection

In order to reach Turkish professionals who have experience in green building area, firstly the questionnaire was distributed among the members of Turkish Green Building Association. Later on, professionals who are LEED Accredited or BREEAM Assessors in Turkey were found from the USGBC and GreenBookLive websites. The other way to reach to Turkish professionals was through LinkedIn website. Meanwhile a petition for sending an email to members of chamber of architects, chamber of civil engineers, chamber of mechanical engineers, chamber of electrical engineers in Turkey and Turkish ministry of environment and urban planning was approved. Then, an e-mail for survey participation was sent to them with a description of the research. Consequently, 82 successfully completed questionnaires were received.

The number of direct Email invitations and LinkedIn group announcements is shown in the table 5. The return rate of the Questionnaire survey invitations sent by the author is calculated as 0.38 %, however the actual return rate cannot be exactly calculated because of the unknown number of Professionals' chambers'

members and the number of professionals who was reached through Turkish ministries, so that we can say the maximum return rate of the questionnaires sent is 0.38 %.

Table 5. Return rate of Questionnaire Survey Invitations

Return Rate of Questionnaire Survey Invitations	
Direct email invitations	511
LinkedIn Group Announcements:	
Mimar ve Mühendisler Grubu (Architects & Engineers Group)	7709
T.C. Enerji ve Tabii Kaynaklar Bakanlığı LinkedIn Group	4047
Solarbaba/Turkish Solar Energy Society	2785
Güneş Enerjisi / Solar Energy	2307
Yeşil Ekonomi	1991
Sustainability in Turkey / Türkiye'de Sürdürülebilirlik	740
ÇEDBİK - Çevre Dostu Yeşil Binalar Derneği - Turkish Green Building Association	586
Akillisebekeler.com LinkedIn group	426
Enerji ve Tesisat	205
Total:	21307
Return rate (max):	0.38%

4.3 Statistical Analysis Methods

The data collected in this survey is qualitative data which were later on coded according to the importance rank which were to be rated by the participants in the 5 point likert scale used in the questionnaire survey. 1 = The least important / Strongly disagree to 5 = The most important/ Strongly agree.

Mainly the analysis of the survey is based on the frequency and the mean ratings of the ranks given by industry professionals. In the most critical section of the survey which is focusing on the risk mitigation strategies, some nonparametric statistical tests were conducted to measure the level of significance of each strategy.

4.3.1 Hypothesis Testing Methodology

Statistical hypothesis testing usually begins with some theory, or claim about a particular parameter of a population.

- The null hypothesis (H0), signifies the present circumstances or the current belief in a situation.
- The alternative hypothesis (H1), is the opposite of the null hypothesis and signifies a research claim or specific suggestion you would like to prove.
- If we can reject the null hypothesis, then we have statistical proof that the alternative hypothesis is correct.
- If we cannot reject the null hypothesis, we have failed to prove the alternative hypothesis.
- However the failure to prove the alternative hypothesis does not mean that you have proven the null hypothesis (David M. Levine, David F. Stephan, Timothy C. Krehbiel, 2008).

The region of rejection contains the values of the test statistic that are improbable to occur if the null hypothesis is correct. These values are more probable to occur if the null hypothesis is incorrect. Hence, if a value of the test statistic appears in this region of rejection, you reject the null hypothesis since that value is improbable if the null hypothesis is correct.

To make a decision concerning the null hypothesis, you first determine the critical value of the test statistic. The critical value divides the non-rejection region from the rejection region (David M. Levine, David F. Stephan, Timothy C. Krehbiel, 2008).

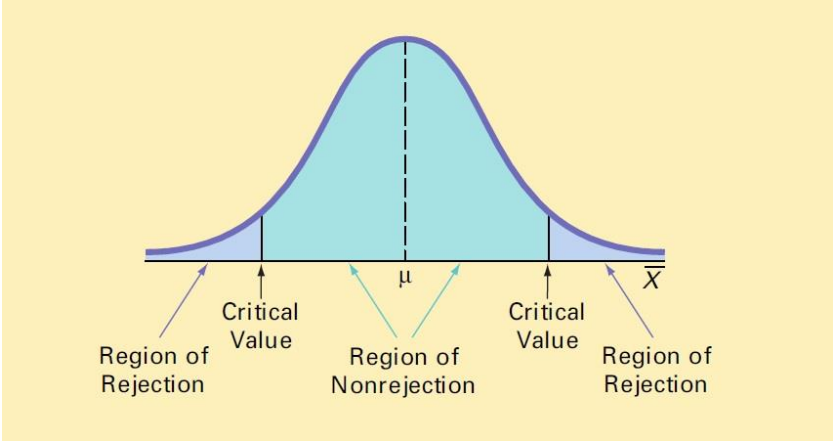

Figure 11. Regions of rejection and non-rejection in hypothesis testing

While proving a hypothesis, an Alpha value of significance level is defined. The significance level Alpha is yielded by confidence level. The confidence levels which are usually chosen for testing statistical hypothesis are: 90% ($\alpha = 0.1$), or 95% ($\alpha = 0.05$), or 99% ($\alpha = 0.01$) (Perez, 2014). In this Research the α value is equal to 0.05.

4.3.2 Wilcoxon Rank Sum Test

When there are two independent populations and the data are non-parametric, Wilcoxon rank sum test is used to perform the statistical analysis which tests the difference between the median of two group of population, with sample size n1 and n2. The Wilcoxon rank sum test does not depend on the assumption of normality for the two populations. The null hypothesis which is tested by Wilcoxon rank sum test is

Null hypothesis: H0: M1= M2

&

Alternative hypothesis: H1: M1≠ M2

For performing this analysis, the data has to be ranked unless the data contains ranks originally. Rank 1 is given to the smallest value of the total data combining both the groups. If more than one data has the same values, each should be

assigned the average of the ranks. The highest rank will be rank n given the n is the total number of data and is given by n = n1 + n2. The accuracy of the ranking can be checked by using:

$$T_1 + T_2 = \frac{n(n+1)}{2}$$

Where, T1 = Wilcoxon rank sum test statistics equals sum of ranks assigned to the n1 values in the smaller sample

T2 = rank sum test statistics equals sum of ranks assigned to the n2 values in the larger sample

For larger sample size (n1 and n2 both ≥ 10), the test statistic T1 is approximately normally distributed, with the mean, μt1 and the standard deviation, σt1, which are given by:

$$\mu_{T1} = \frac{n_1(n+1)}{2}$$

$$\sigma_{T1} = \sqrt{\frac{n_1 n_2(n+1)}{12}}$$

Standardized Z test statistic which approximately follows a normal distribution is then calculated using the following equation in order to be compared with the significance level σ and conclude in rejecting or not rejecting the test hypothesis:

$$Z_{STAT} = \frac{T_1 - \frac{n_1(n+1)}{2}}{\sqrt{\frac{n_1 n_2(n+1)}{12}}}$$

4.3.3 Kruksal-Wallis H Test, Nonparametric Analysis for the One Way ANOVA (Analysis of variance)

Kruksal-Wallis H test is an extension of the Wilcoxon rank sum test and compares the difference of medians among more than two groups as opposed to Wilcoxon rank sum test which compares medians between two groups.

The null hypothesis which is tested by Kruksal
H0: All M are equal
Against the alternative hypothesis i.e.
H1: Not all M are equal

In order to perform Kruksal Wallis H test, the data should be given some rank. Combining the values of all groups in an ascending order each data should be ranked from the least to the most starting from 1. Rank 1 is given to the smallest value, the highest rank will be n supposed that the total number of data is N. If more than one data has the same values, each should be assigned the average of the ranks assigned to them.
Kruksal-Wallis test statistic 'H' is calculated according to the following formula (Field, 2009):

$$H = \frac{12}{N(N-1)} \sum_{i=1}^{k} \frac{R_i^2}{n_i} - 3(N+1)$$

Where:
n = total number of values over the combined samples
n_i = number of values in the Ith sample ($i = 1,2,\ldots\ldots,c$)
R_i = sum of the ranks assigned to the Ith sample
R^2 = square of the sum of the ranks assigned to the Ith sample
K= number of groups

CHAPTER 5

RESEARCH FINDINGS & DISCUSSIONS

In order to analyze the data provided by the questionnaire participants, as it was discussed in the previous chapter, several statistical analysis methodologies are used to obtain meaningful conclusions. Furthermore data related to the participants background and their degree of involvement in green building projects is also discussed in this chapter.

5.1 General Information about the Participants

5.1.1 Data Distribution According to Participants` Profession

As it was mentioned previously the questionnaire survey was prepared in five sections, each focusing on a special topic. In the first section data related to the background of professionals who participated in the survey was collected. The survey shows that people who took part in the questionnaire have a wide variety of professions. From the figure 12 we can see that they are mostly engineers, followed by architects, green building consultants, construction managers, owners and attorneys. Moreover almost 11% of the participants have different professions other than the groups mentioned. The other section includes energy experts, carbon sales trading advisors, city and regional planners, BREEAM Assessors and LEED Aps and energy law experts.

Later on it was asked from the participants to state approximately, to what extent their job is focused on green projects so that we can differentiate the answers provided by those who are entirely working on green building projects in

comparison with the rest of respondents, for more detailed analysis. The figure 13 is showing the degree of concentration of participants on green building projects.

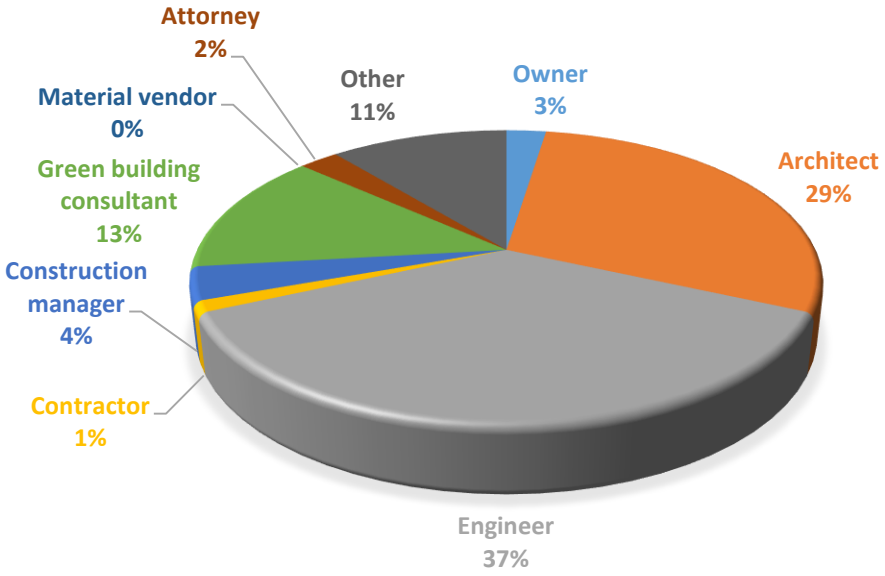

Figure 12. Participants' professions.

Since the concept of green building is rather new in Turkey and only in recent years some sustainable projects were conducted, it is expected that not all the professionals' job is completely focused on green projects and from the chart it can be inferred that most of the professionals' job is not fully concentrated on green projects.

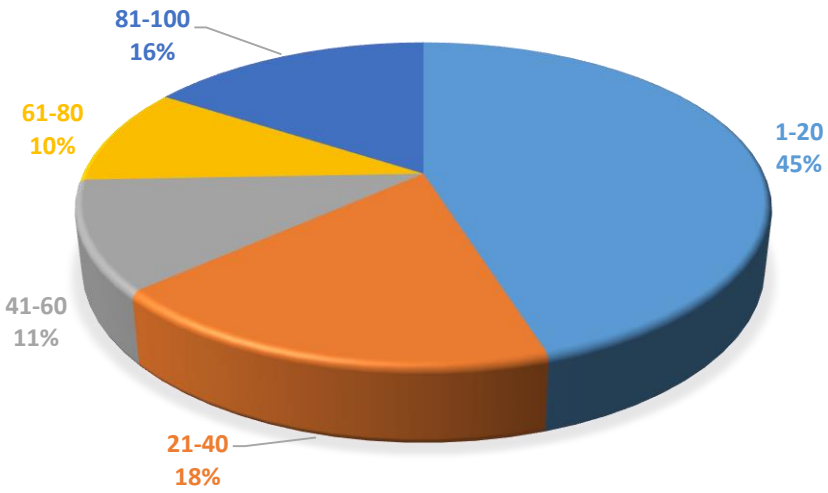

Figure 13. Approximately what percent of your job is focused on green building projects?

Only 16 % of the whole participants are entirely working on sustainable projects, followed by another 10 % who mainly work on green projects. 11 % of the participants are working on green projects almost as half of their work load. This rate changes to 18 % for the people who are to some extent dealing with green projects and to 45 % who are slightly involved in green projects.

5.1.2 Data Distribution According to Participants` Level of Experience

It can be concluded from the information provided by the respondents that more than half of the participants' work experience in sustainability field exceeds 4 years. Professionals with 3 to 4 years of experience in green projects are comprising 13 % of the sample population, followed by 10 % of the people with job experience of 2 to 3 years, 9 % with 1 to 2 years of experience and 17 % less than 1 year. Although more than half of the respondents are quite experienced, almost a quarter (26 %) of people with less than 2 years of experience are just beginning their professional experience in Turkish green building industry.

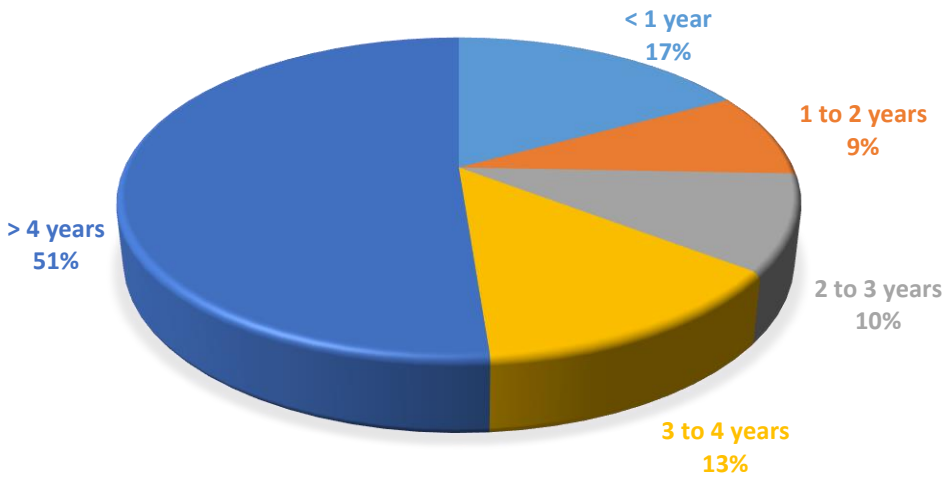

Figure 14. How long have you been working in the green building field?

The number of green building projects that the respondents were involved is shown in the figure 15. The chart has two peaks with 32 % of population who were involved only in 1 green building projects and 28 % of the population who took part in more than 4 green building projects and are quite experienced in this regard. From another perspective we can also conclude that almost half of the respondents were participating in less than 2 projects (51 % of professionals) and in comparison the other half of the population were involved in more than 3 projects and they can be considered more experienced.

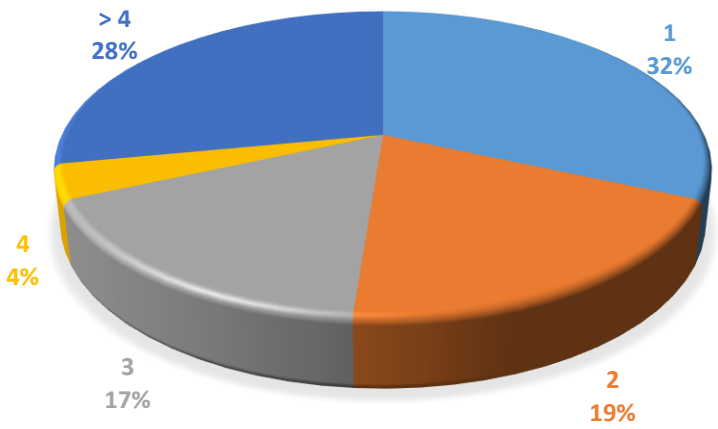

Figure 15. How many green building projects have you been involved with?

As shown in the figure 16 respondents mentioned various ways of their green building knowledge acquisition, including: Attending conferences, reading trade publications, internet research, working with green building consultants, sharing knowledge with their colleagues, taking courses about green buildings. From the graph it is obvious that in general these categories are almost equally weighted. There is also another section for the other methods of gathering green building knowledge which includes seminar, webinars, E-books and university degree.

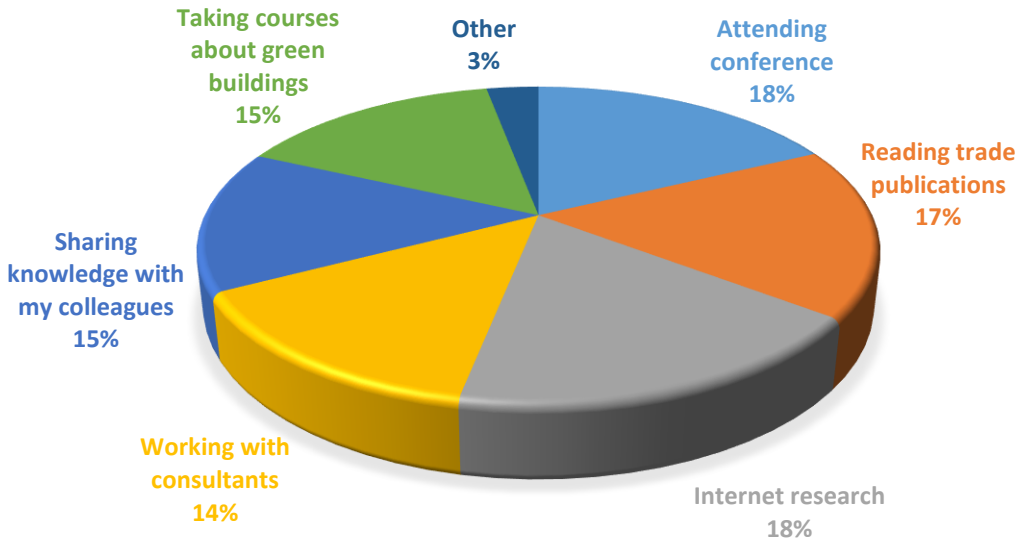

Figure 16. How did you gain green building knowledge?

5.2 General Perception of Turkish Professionals about Green Buildings Topic

5.2.1 Turkish Construction Industry Inclination towards Sustainable Projects

According to the survey almost half of the professionals agree that the Turkish construction market has a positive inclination towards green building projects, therefore it is foreseen that with the support of the government and investors, green buildings can be widely adopted in Turkish community.

The main reasons for investing on these projects are shown in table 6, and figure 17 where we can see that the most important reason for building green is financial benefits according to the mean ratings of the professionals, and the second very important reason is energy crisis and since Turkey is an energy dependent country, this factor is also of high concerns. It is also stated in the article by Issa et al. that the cost benefits of the green buildings is the main reason to build green (Issa, Rankin, & Christian, 2010).

Another important factor for building sustainable projects according to the chart is gaining reputation. Indoor environmental quality doesn't have a very high level of importance, this argument is also supported by Issa et al. who argues that industry practitioners are skeptical about healthy indoor environment and increased productivity of such projects. So it can be expected that almost 60 % of Turkish practitioners also have doubts about its effectiveness (Issa et al., 2010). It is also stated that if these projects will be supported by government incentives, getting advantage of these incentives will be the next very important issue for investors to build green.

It can be inferred from the chart that the least effective factors that can encourage investors to invest in green projects is the climate change phenomena.

Table 6. What can be among the main reasons of building green in Turkey?

	Very Important	Important	Neutral	Unimportant	Very Unimportant
[Financial benefits]	35.71%	35.71%	21.43%	7.14%	0.00%
[Indoor healthy environment]	14.29%	21.43%	57.14%	7.14%	0.00%
[Climate change]	0.00%	14.29%	42.86%	35.71%	7.14%
[Energy crisis]	21.43%	42.86%	21.43%	14.29%	0.00%
[Getting benefit of governmental incentives]	28.57%	42.86%	0.00%	14.29%	14.29%
[Gaining reputation]	50.00%	21.43%	28.57%	0.00%	0.00%

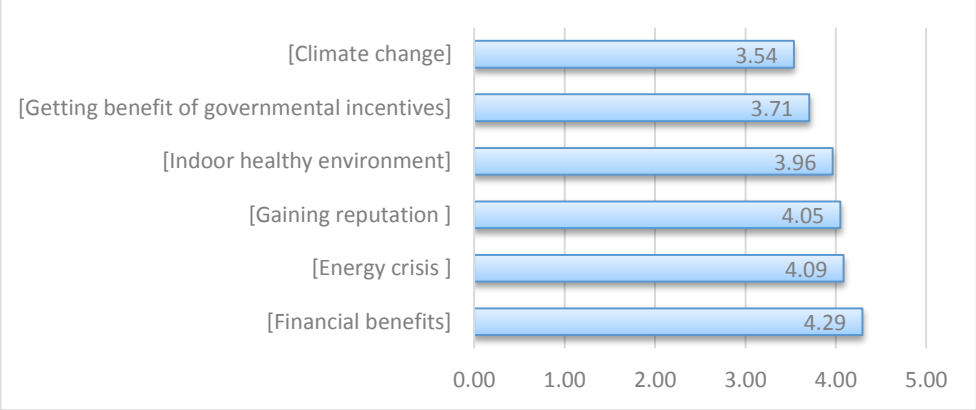

Figure 17. Mean ratings of the main reasons of building green in Turkey

There are several other reasons for building green in Turkey which are suggested by the professionals. These reasons can be:

- Obligations from foreign investors
- For being more competitive among other companies (somehow related to gaining reputation)
- Higher property value (Financial benefits)
- Raising social awareness & education for succeeding generations
- Increasing the quality of living conditions and more comfort & high welfare

5.2.2 Main strategies to make green buildings more widespread in Turkey

The main strategies which can have a great impact on widespread implementation of sustainable projects by Turkish community are listed in the table 7 and figure 18. Although almost all the factors are counted important by Turkish professionals, there are some main factors among them which can be counted as the most important ones. As it is depicted in the table, social awareness, education and government incentives can be the most critical factors. So apart from that government has the critical role of policy making for introducing some incentives to encourage sustainable projects, they should also make an effort to first introduce sustainability attitude to the culture. This act can be mainly supported by the Turkish media and introducing sustainability topics in the educational curriculum of Turkish schools, in order to increase the social awareness of the Turkish community.

The other factor which is also counted as really important is legal enforcement by Turkish authorities. Although it is not suggested as much as governmental incentives, but it can also be among powerful strategies to affect wide adoption of green projects. It is quite obvious that promoting a positive attitude towards implementation of green projects through voluntary means is much more preferred. The next important factor is increased market value which should be taken into account.

Among all the factors listed in the table 7, the only one that almost one fifth of the professionals have doubt about is putting restrictions for companies which are intending to enter bidding process of green projects.

There are also some other strategies which can be helpful in this regard, as it was suggested by the participants, private sector incentives can also have a positive effect in encouraging sustainable projects.

Apart from private sector incentives, it is also suggested that all governmental incentives doesn't have to be in the form of financial aid, in some cases government can also provide services during construction phase so that the total cost of construction will decrease.

Table 7. What are key strategies making green practices more effective and widely adopted?

	Very Important	Important	Neutral	Unimportant	Very Unimportant
[Society awareness]	65.85%	29.27%	3.66%	1.22%	0.00%
[Education]	63.41%	30.49%	6.10%	0.00%	0.00%
[Increased market value]	34.15%	56.10%	7.32%	2.44%	0.00%
[Legal enforcement]	56.10%	32.93%	3.66%	3.66%	3.66%
[Government incentives]	64.63%	28.05%	3.66%	0.00%	3.66%
[Restrictions in competitive bidding process]	32.93%	43.90%	19.51%	1.22%	2.44%

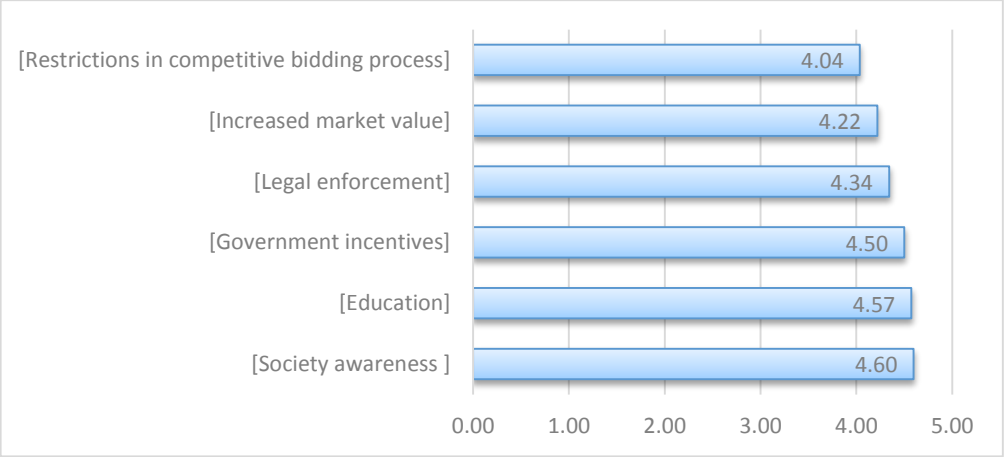

Figure 18. Mean ratings of the key strategies for spreading sustainable projects

As it was discussed earlier in the literature review chapter, Turkish government has two regulations in regard of sustainability issues and green buildings, one of them is: 'Energy performance in building, regulation of ministry of public works and

settlement, no: 27075 in December 2008' (Başbakanlık Mevzuatı Geliştirme ve Yayın Genel Müdürlüğü , 2008) and the other is: 'Documentation of sustainable green buildings and settlings, regulation of Turkish ministry of environment and urban planning no: 29199 in December 2014' (Başbakanlık Mevzuatı Geliştirme ve Yayın Genel Müdürlüğü, 2014) which were published in Turkish Official Gazette, however these regulations are not imposing any strict demand of sustainability actions upon the industry, so that they cannot be counted as the government legal enforcement. In order to find out the level of effectiveness of these regulations on conducting green building projects, Turkish professionals view was asked in the survey, and according to the table 8, and figure 19 it can be inferred that neither of these regulations are considered as totally effective as governmental support for green building projects, although the second regulation by Turkish ministry of environment and urban planning can be counted as to a moderate extent effective, in comparison to the first regulation of ministry of public works and settlement which is only to some extent effective. As a result we can conclude that there is a need for better regulation and legislation in regard of sustainable projects in Turkey, so that they be conducted in a more extensive way.

There are some other suggestions from Turkish professionals that Turkish standard TS 825 (Thermal insulation requirements for buildings) should be revised and all energy simulations in Turkey should be based on the new standard.

Although there were some modifications done to this standard as it is stated in Official Gazette 'Modifications of obligatory standard of (TS 25) thermal insulation requirements for buildings, regulation of Turkish ministry of public works and settlement no: 27291 in July 2009' (Başbakanlık Mevzuatı Geliştirme ve Yayın Genel Müdürlüğü , 2009), it seems that there is still need for further modifications to this standard.

It is also suggested that government should also invest in energy simulation research field in the universities otherwise even after setting regulations there will be lack of knowledge and experiment in this regard. In general people believe that instead of legal enforcement, government should offer incentives and support these projects to be able to successfully spread out green buildings in Turkey.

Table 8. Do you agree that the following regulations are sufficient as governmental support for building green in Turkey?

	To a large extent	To a moderate extent	To some extent	To little extent	Not at all
[1st regulation (2008)]	6.10%	26.83%	35.37%	21.95%	9.76%
[2nd regulation (2014)]	2.44%	37.80%	29.27%	18.29%	12.20%

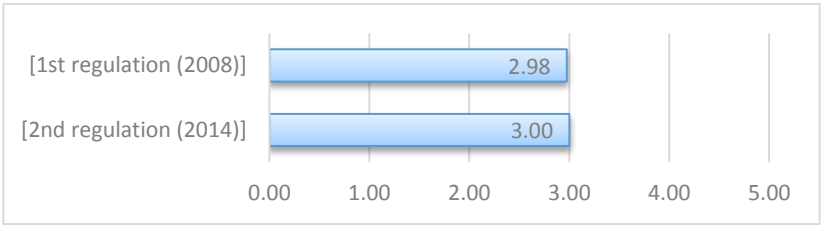

Figure 19. Mean ratings of the effectiveness level of Turkish government regulations for green projects

5.2.3 Decision Makers in Turkish Construction Industry

The main decision makers to build green in Turkish community are mentioned in the table below. As it can be expected, majority of the professionals assume that the most important decision making factors is government policy, which should get enough attention by policy makers to be promoted effectively in Turkey.

According to the table 9, and the mean ratings of these factors depicted in figure 20 the role of the owner and the architect also affect the decision making process the most. Since usually the architect of the project is in communication with the owner from the first steps of the project, it is somehow the architect's responsibility to introduce pros and cons of sustainable projects and try to convince the owner to build green. According to Issa et al. the final decision to build green, most of the times made by owners (Issa et al., 2010).

Table 9. Please rate the importance of the following parties in making decision to build green?

	Very Important	Important	Neutral	Unimportant	Very Unimportant
[Government policy]	73.17%	17.07%	6.10%	1.22%	2.44%
[Society]	31.71%	43.90%	19.51%	3.66%	1.22%
[Owner]	60.98%	29.27%	7.32%	1.22%	1.22%
[General Contractor]	15.85%	41.46%	37.80%	3.66%	1.22%
[Architect]	39.02%	52.44%	7.32%	1.22%	0.00%

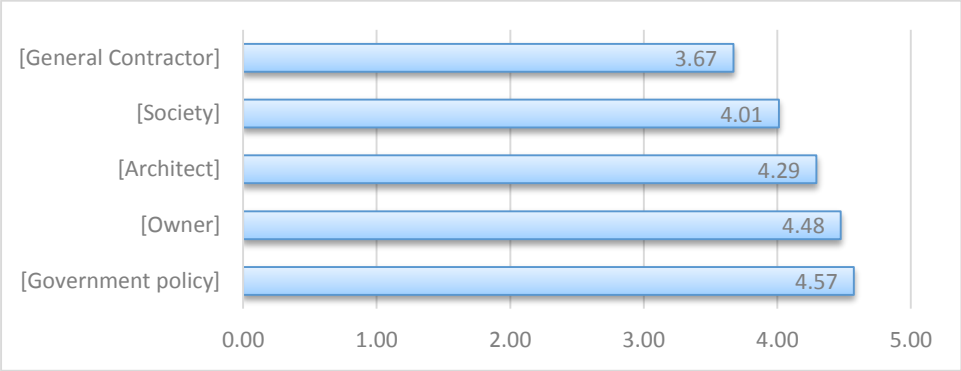

Figure 20. Mean ratings of the importance of various parties in making decision to build green

There is another very significant aspect that is needed to be clarified and that is, the critical responsibility of each group of professionals to achieve the green goals of a project.

Table 10. Which of the following professionals has the most critical responsibility in order to achieve the green goals of a project?

	Very Important	Important	Neutral	Unimportant	Very Unimportant
[Engineers]	54.88%	40.24%	4.88%	0.00%	0.00%
[Architects]	75.61%	21.95%	2.44%	0.00%	0.00%
[Contractors]	46.34%	35.37%	13.41%	4.88%	0.00%
[Material vendors]	28.05%	47.56%	20.73%	2.44%	1.22%
[Construction manager]	32.93%	46.34%	15.85%	4.88%	0.00%
[Green building consultant]	51.22%	41.46%	4.88%	2.44%	0.00%

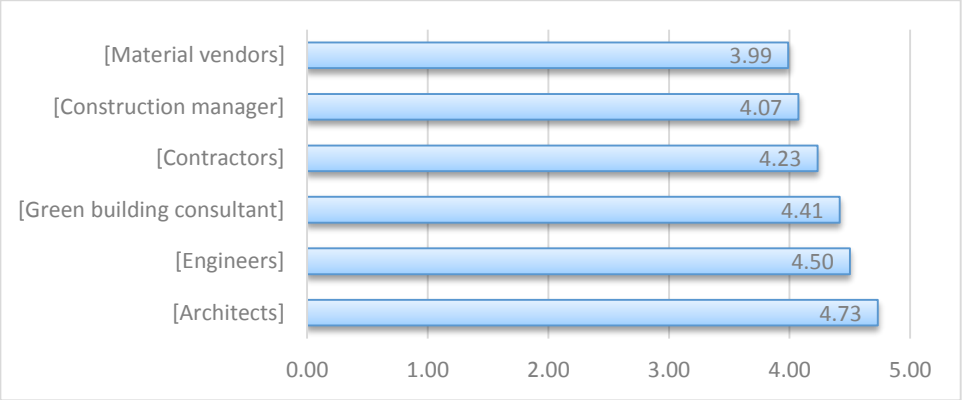

Figure 21. Mean ratings of the most responsible professionals for sustainability goals achievement

Although there are several professionals involved in the whole process of each project, and they all play significant roles in achieving the final results, according to Turkish professionals' opinion (table 10 and figure 21) architects has the most effect in achieving the final green goals of a project. According to their effective role signified by the respondents, engineers and green building consultant has also critical roles in realizing green projects accordingly.

It is also suggested that there should be a research and development (R&D) platform between the architect and green building consultants while working and a specific project, so they can cooperate simultaneously to achieve the expected goals, since the most critical phase in these type of projects are design phase.

There are also other comments provided by the professionals. It is also mentioned that official authorities and inspectors whose role is to check the process of construction and to issue the license for the projects have also a very effective role for achieving sustainability goals of a project. It is also specified that the owner has also a critical role for achieving the final results by clarifying all the expected specific green goals of the projects. The other parties who has an effect in this aspect are chambers of architects, engineers and consultants.

5.3 General Perception of Turkish Professionals about Green Projects and Green Construction Contracts

In this section, the topic of contracts and their influence in successful green building projects is discussed from Turkish professionals' point of view.

Almost 80 % of Turkish professionals believe that specifying green goals of a project and parties' responsibilities in contracts in an obvious way will increase the chance of a positive outcome in green building projects, in comparison with conventional contracts which doesn't include such specifications. In the support of this statement, Martin is also mentioned that imprecise terms such as 'green' or 'sustainable' should be avoided in contracts unless defined clearly (Martin, 2009).

Table 11. Benefits of specifying green goals of a project in contracts

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Specifying green goals of a project in contracts	28.05%	53.66%	10.98%	3.66%	3.66%

5.3.1 Proper Contract Types for Green Projects

In Turkish professionals' opinion, the type of contracts which can be more suitable for sustainable projects and have a positive effect in the whole process are listed in table 12. From the table 12, and the mean ratings from figure 22, it can be concluded that the mostly preferred contract type which is considered as the most useful contract type for green building projects is incentive contracts, and the second most useful contract is cost plus fee type of contracts. Among all types of contracts mentioned in the table, lump sum contracts are considered not so effective almost half of the participants believe that these types of contracts are neither useful nor useless.

It is also suggested that contracts should contain certain punishment clauses which can be enforced in the case of ignorance of responsible parties.

Table 12. What types of contracts would be most useful for managing and financing green building projects?

	Very Useful	Useful	Neutral	Useless	Very Useless
[Lump sum contracts]	4.88%	24.39%	47.56%	13.41%	9.76%
[Unit price contracts]	15.85%	40.24%	35.37%	6.10%	2.44%
[Incentive contracts]	57.32%	30.49%	9.76%	2.44%	0.00%
[The Guaranteed maximum price contract]	17.07%	40.24%	35.37%	4.88%	2.44%
[Cost plus fee]	35.37%	40.24%	15.85%	7.32%	1.22%

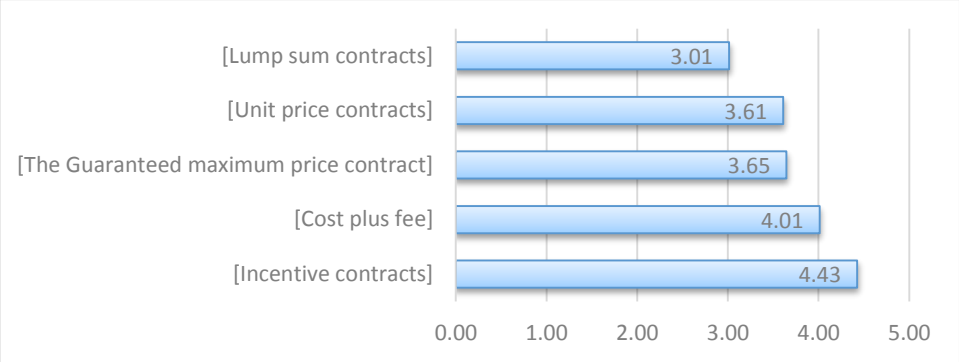

Figure 22. Mean ratings of the most useful type of contract for green projects

As it was predicted that the incentive type of contracts can have a positive effect in this particular type of projects, further on the type of incentives which might affect the contract for better results was discussed. From Turkish professionals opinion the incentives which can have a positive effect are accordingly weighted in the table 13, and also shown in figure 23.

Table 13. In incentive contracts, what type of incentives and clauses should be added to the contracts to promote sustainable features of the final design or construction?

	Very Important	Important	Neutral	Unimportant	Very Unimportant
[Incentives for cost reduction]	42.68%	40.24%	10.98%	4.88%	1.22%
[Incentives for time reduction]	17.07%	39.02%	32.93%	9.76%	1.22%
[Incentives for certain level of performance]	73.17%	19.51%	6.10%	1.22%	0.00%

Figure 23. Mean ratings of the most useful type of incentives in incentive contracts

As it is shown in the figure 23, incentives for certain level of performance is counted as the most effective incentives for green building projects. Incentives for cost reduction also plays an important role in decreasing the cost of sustainable projects, specifically because it's assumed that the construction cost of these projects are higher compare to the other conventional projects.

the type of incentive which is not considered especially important for green projects are incentives for time reduction in green projects, since reducing the time of project in Turkey doesn't affect any certain outcomes.

Time reduction incentive for green projects could be really effective on the condition that as a result of achieving a successful green building project, the owner were supposed to benefit from any governmental incentives, like tax reduction. So that there was an urgent need to finish the project as early as possible not to lose the probable deadlines. Since there are no governmental incentives introduced in Turkey to support sustainable projects, from Turkish professionals' point of view time reduction incentives in the contract are not playing a critical role for these particular type of projects.

Other comments from professionals also suggest that Research and Development (R & D) department between the companies also should be encouraged to create a platform that they can exchange ideas and their experiences.

5.3.2 Standard Form of Contracts for Green Buildings

As it was explained earlier in the literature review chapter, with growth of green building movements in recent years, organizations publishing standard forms of contracts for construction sector, have begun forming new standard forms of contract specially designed for sustainable projects.

In Turkey there is no standard form of contract used specifically for green building projects. The most common international standard form of contract which is also used in Turkey is FIDIC (The International Federation of Consulting Engineers) which is mostly mentioned by participants, the second most common standard form of contract used by professionals in Turkey is AIA (The American Institute of Architects). The other standard form of contract which is used only to some extent among Turkish professionals is JCT (The Joint Contracts Tribunal). The other standard forms that also have green building standard forms of contracts, e.g. BE collaborative (Collaborating for the Built Environment) & ConsensusDocs (the ConsensusDocs Coalition) are used to very little extent in Turkey.

5.3.3 Proper Delivery Methods for Green Projects

As it was predicted according to the literature review the most useful project delivery method for sustainable projects is Integrated Project Delivery (IPD) method on which almost 63 % of the professionals strongly agree. The other two almost equally weighted project delivery methods which are considered as being useful for green projects are Construction Management (CM) method and Design Bid Build (DBB) method from Turkish professionals' point of view. As it was concluded from literature review as well, according to Korkmaz et al. construction management at risk method of delivery shows a medium success level in green building projects. The Design Bid Build (DBB) delivery method actually shows an average to low level of success in project's green aspects accomplishments (Korkmaz et al., 2010). So it was unexpected that on the contrary to what was

concluded after the literature review, Design Bid Build (DBB) project delivery method is counted as one of the useful project delivery methods for sustainable projects, although previously it was explained that since the process of design and construction are done with different groups of professionals coordination process among these groups is much harder and is one of the main limits for sustainable projects that demand close cooperation (Russ, n.d.).

The other two categories of project delivery methods which are believed not to have any special effect on the outcome of sustainable projects are Engineer Procure Construct (EPC) or Turnkey project delivery method and the other is Build Operate Transfer (BOT) delivery method.

It's also suggested by the participants that all the parties should be in cooperation and in contact with each other. The most successful method will be the one in which sub-contractors and main contractors are closely working together otherwise there is a high chance of having problems especially in green building projects.

Table 14. What type of delivery methods would be most useful for managing and implementing green building projects?

	Very Useful	Useful	Neutral	Useless	Very Useless
[Design bid build (DBB)]	23.17%	51.22%	14.63%	10.98%	0.00%
[Design build (DB)]	14.63%	51.22%	28.05%	6.10%	0.00%
[Construction management (CM)]	23.17%	50.00%	24.39%	2.44%	0.00%
[Integrated project delivery (IPD)]	63.41%	32.93%	3.66%	0.00%	0.00%
[Engineer Procure Construct (EPC) or Turnkey]	17.07%	31.71%	32.93%	10.98%	7.32%
[Build Operate Transfer (BOT)]	13.41%	35.37%	34.15%	9.76%	7.32%

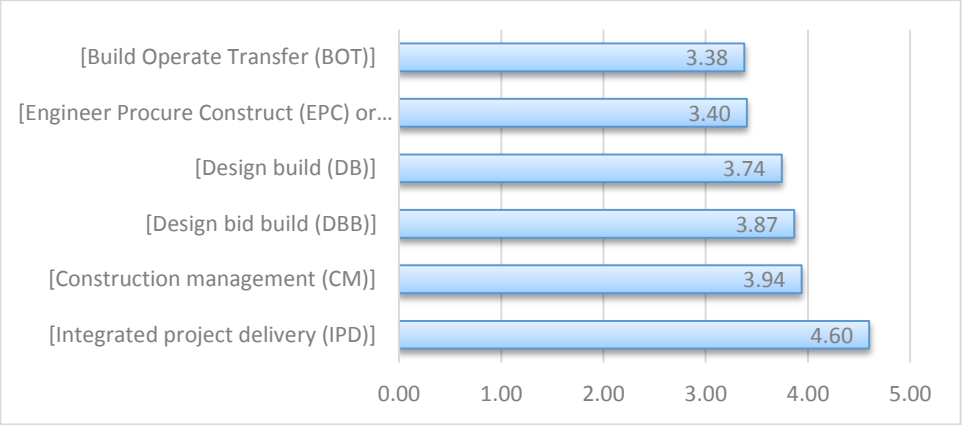

Figure 24. Mean ratings of the most useful coordination and project delivery method

5.4 General Perception of Turkish Professionals about Green Projects' Legal Risks

As it was discussed earlier, main areas of claim in the green building projects' literature are (American Arbitration Association® (AAA) & The National Construction Dispute Resolution Committee (NCDRC), n.d.; BCCA, 2011; Circo, 2011; Masters & John R. Musitano, 2007):

- Claims of 3rd party certification
- Claims for energy savings
- Claims of governmental incentives
- Claims for unfair market competition

Later on, possible Contractual and other legal risks of green buildings were categorized as following main groups which are also classified by other subcategories:

- Green building risks associated with standard form contracts
- Third party certification risks
- Financial risks
- Breach of contract or breach of warranties

The aim of this section is to analyze the importance of the above mentioned risks from Turkish construction professionals' point of view and introduce other foreseen risks which are foreseen in Turkish green building industry.

5.4.1 Perception of Turkish Professionals about General Risk Issues

In order to be prepared for any risks that may occur, it is very critical to have an idea about the phases of the project in which some legal claims may arise. From Turkish professionals' point of view, table 15 & figure 25, it can be inferred that they predict that if there will be any claims in green building projects, it most probably occur during the construction phase of a project or while trying to get a third party certification. The second most important phases which are almost equally rated by the participants are operation and later on reuse and refurbishment phases of a project in which some legal claims may be faced. The least probable phases in which some legal claims may arise are design and predesign phases of a project from Turkish professionals' opinion.

Table 15. In which phases of a project, are legal issues most probably encountered?

	Very probable	To some extent probable	Neutral	To some extent improbable	Improbable
[Pre-design & preliminary assessments]	14.63%	10.98%	17.07%	26.83%	30.49%
[Design]	14.63%	19.51%	24.39%	34.15%	7.32%
[Construction]	29.27%	48.78%	15.85%	3.66%	2.44%
[Gaining 3rd party certification (e.g. USGBC)]	34.15%	31.71%	20.73%	9.76%	3.66%
[Operation]	25.61%	32.93%	26.83%	13.41%	1.22%
[Reuse and refurbishment]	25.61%	24.39%	28.05%	17.07%	4.88%

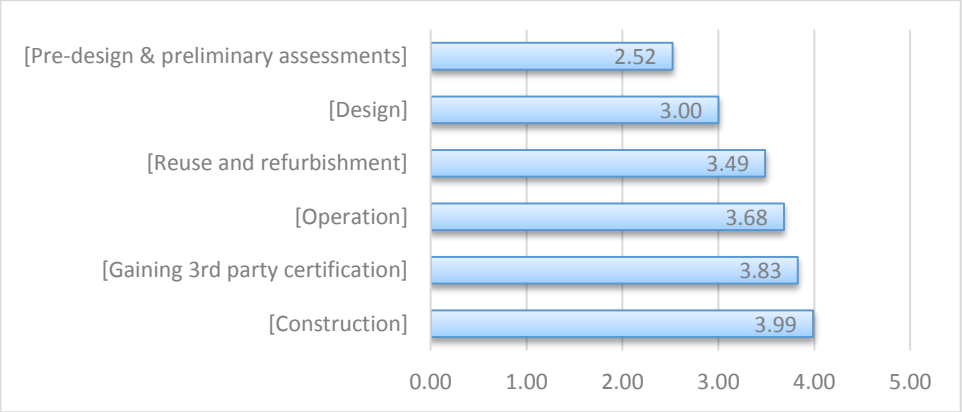

Figure 25. Mean ratings of the most critical phases of the projects regarding claims

In order to be prepared for green building risks it is also very important to have an idea about the level of responsibility of each group of professionals who are involved in green projects and the probability of legal claims occurrence against them.

According to the table 16, and the mean ratings of Turkish practitioners, figure 26, it is predicted by almost half of the respondents that green building consultants have the most critical role in green building projects and in the case of any problem, they are the group who may face legal claims. This belief is also supported by Edward B. Gentilcore, who said a green building consultant and coordinator is similar to the "conductor of the grand green orchestra", so this entity has the most critical role especially in sustainable projects and is prone to several green related claims and must definitely be protected by professional liability insurances (Greenwald, 2012).

The second group who is prone to legal claims are contractors according to mean ratings in figure 26 are contractors. The other important groups are architects and construction managers whom are almost equally rated as the third most likely people who may encounter claims. According to Prum et al. architects are usually the connecting point between the project owner and the contractor in a project. As a result of that, these design professional are also one of the most legally vulnerable participants in a project, whom they can be targeted of a lawsuit led by owners, contractors, or others (Darren A. Prum, 2009).

The most unlikely group of professionals who may face these kind of problems are material vendors according to table 16 and figure 26.

Table 16. Who are the most likely professionals that may face green project claims?

	Very Likely	Likely	Neutral	Unlikely	Very Unlikely
[Engineers]	12.20%	37.80%	30.49%	13.41%	6.10%
[Architects]	24.39%	35.37%	23.17%	13.41%	3.66%
[Contractors]	31.71%	41.46%	10.98%	13.41%	2.44%
[Material vendors]	13.41%	21.95%	35.37%	19.51%	9.76%
[Construction manager]	23.17%	31.71%	29.27%	9.76%	6.10%
[Green building consultant]	51.22%	21.95%	13.41%	7.32%	6.10%

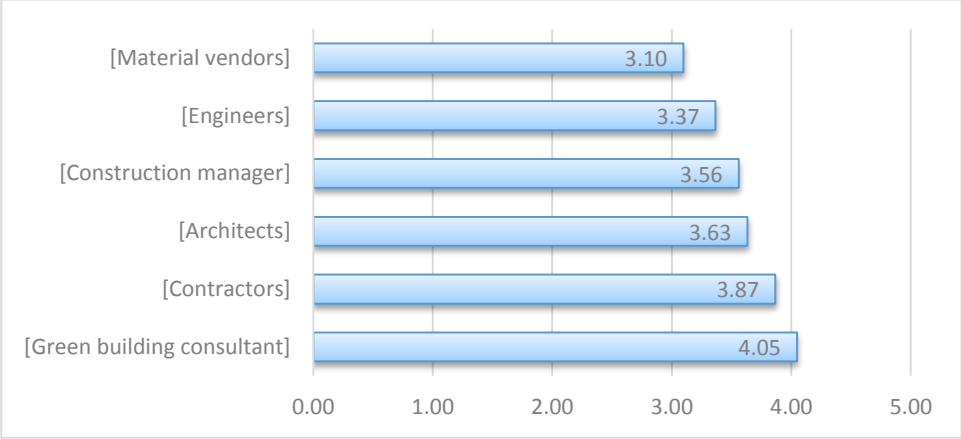

Figure 26. Mean ratings of the most likely professionals that may face green project claims

So to what extent, the professionals who take part in green building projects in Turkey are aware of the legal issues that may arise due to the sustainable features of these projects? This question is answered by the survey participants and according to table 17 and figure 27 it is expected that green building consultants have a higher level of awareness about legal issues associated with green building projects compare to the rest of the professionals.

According to the results of the survey, architects are assumed to be the next group of professionals who are more aware of these legal issues. It is shown in the charts that the rest of the groups have almost the same amount of knowledge about green

buildings' legal risks, except of material vendors who are assumed to have a moderate level of awareness about such issues.

It is suggested by the respondents that responsible organizations like chambers of architects, engineers and consultants should inform the professionals of various risks through different means, so that these types of risks can be foreseen and prevented.

Table 17. Professionals' level of awareness of legal issues which may arise due to the nature of the green construction approach for a project.

	To a large extent	To a moderate extent	To some extent	To little extent	Not at all
[Engineers]	42.68%	31.71%	21.95%	3.66%	0.00%
[Architects]	47.56%	34.15%	13.41%	4.88%	0.00%
[Contractors]	37.80%	32.93%	13.41%	8.54%	7.32%
[Material vendors]	17.07%	51.22%	18.29%	10.98%	2.44%
[Construction manager]	40.24%	39.02%	14.63%	6.10%	0.00%
[Green building consultant]	67.07%	25.61%	4.88%	2.44%	0.00%

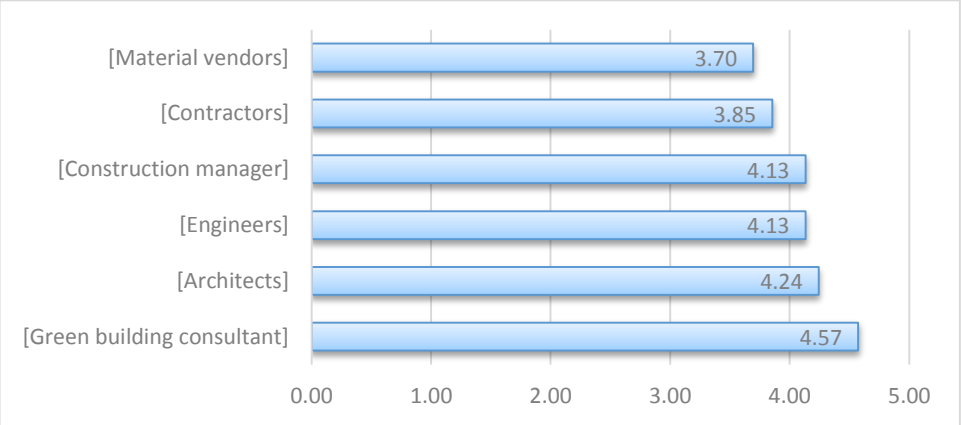

Figure 27. Mean ratings of professionals' level of awareness of legal issues

5.4.2 Perception of Turkish Professionals about Legal Risks & Claims

The importance of various major areas of claim in the green building projects are rated by Turkish participants as it is shown in table 18, then the mean ratings were calculated and depicted in figure 28. According to Turkish professionals almost all

of the various types of claims listed are considered important but the highest rated factors are claims of lost governmental incentives and claims for energy savings. Although a majority of the respondents believe that claims for unfair market competition are also important, almost a quarter of people are not certain if these types of claims are important or not, and also almost 11 % also believes that these types of claims are unimportant.

Table 18. Which of the following issues can be the most critical reasons for the possible future claims regarding green projects?

	Very Important	Important	Neutral	Unimportant	Very Unimportant
[Claims of 3rd party certification]	21.95%	48.78%	23.17%	6.10%	0.00%
[Claims for energy savings]	32.93%	36.59%	21.95%	6.10%	2.44%
[Claims of governmental incentives]	29.27%	46.34%	20.73%	3.66%	0.00%
[Claims for unfair market competition]	24.39%	39.02%	25.61%	10.98%	0.00%

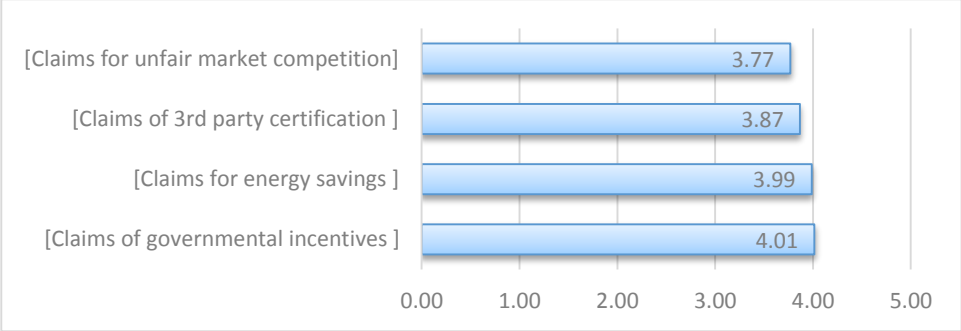

Figure 28. Mean ratings of the most critical reasons for the possible future claims

As it was earlier mentioned the following categories of risks special for green building projects can impose serious problems and it is needed to be further on investigated to prevent future claims.

- Third party certification risks
- Financial risks
- Breach of contract or breach of warranties

In accordance with the responses collected from Turkish green building professionals, all the factors pointed out in table 19 are among quite important third party certification risks, among which firstly failure in achieving third party certification and secondly lost incentives due to certification failure are considered as the most critical ones according to figure 29.

Table 19. What can be the most critical 3rd party certification risks in green projects in your opinion?

	Very Important	Important	Neutral	Unimportant	Very Unimportant
[Failure in achieving 3rd party certification]	52.44%	39.02%	6.10%	2.44%	0.00%
[Decertification]	36.59%	48.78%	10.98%	2.44%	1.22%
[Lost incentives due to certification failure]	51.22%	30.49%	13.41%	3.66%	1.22%

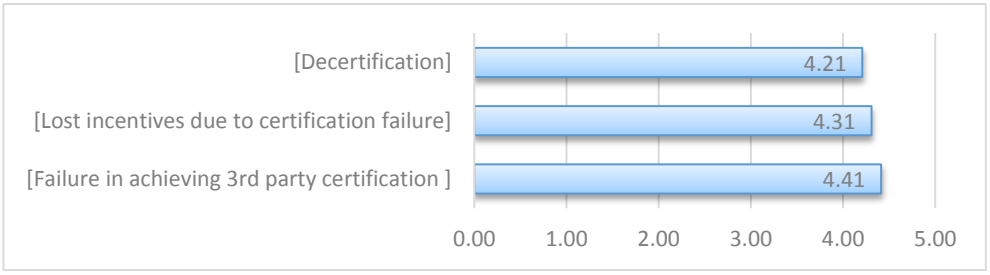

Figure 29. Mean ratings of the most critical 3rd party certification risks in green projects

The next category of risks are related to financial issues. As it is shown in table 20, in Turkey it seems that the issue of lack of insurance for green projects, along with the low payback rate of the green buildings during operation time which is due to energy efficiency of the structure is considered one of the most important factors which is almost rated equal to the first factor. Until recently there was no serious issues regarding the surety bonds issued for green projects in Turkey. Although restrictions for providing surety bonds for these specific type of projects can have an important effect in these kinds of projects, also from the figure 30 it can be seen that this factor is not as important as the other factors.

The importance of professional liability insurance is also mentioned in the comments from Turkish professionals as an issue which is usually taken for granted and should be more focused on in green building projects in Turkey.

Table 20. What can be the most critical financial risks in green projects in your opinion?

	Very Important	Important	Neutral	Unimportant	Very Unimportant
[Lack of insurance for green projects]	31.71%	50.00%	13.41%	4.88%	0.00%
[Limited surety bonds for green projects]	28.05%	43.90%	23.17%	4.88%	0.00%
[Low payback rate]	34.15%	42.68%	17.07%	6.10%	0.00%

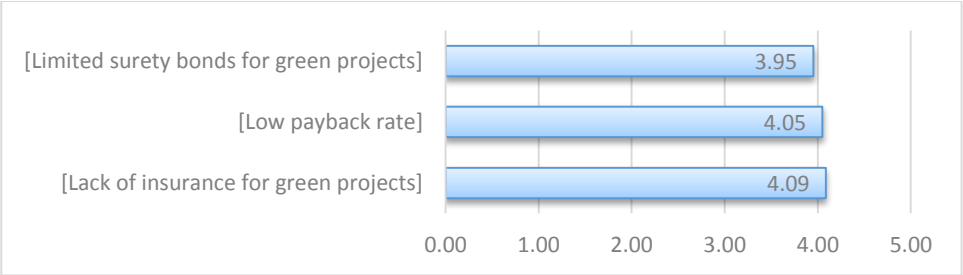

Figure 30. Mean ratings of the most critical financial risks in green projects

The other very important risks that may occur during the process of green projects is due to breach of contract or breach of warranties due to the more complicated and more technical aspects of sustainable projects. Although in general almost all of the factors in following charts are considered quite important, the top four most critical ones are: breach of warranties made before the project begins, elevated standard of care for professionals involved in green projects, damages to professionals' reputation and false advertising. Each of these factors mentioned are among the main reasons for probable future legal claims.

It's mentioned by the participants that these risks won't change until a system of punishment and reward is considered for green building project partakers. Especially if the owners or investors as well as the occupants have a higher level of knowledge about their rights and expected final outcomes of the sustainable projects, then the industry professionals will face major problems regarding legal claims.

One of the other main factors which is suggested by the participants is that the duration of execution of different phases of these projects should be well estimated during the planning period, otherwise it is very probable that the project

construction may be delayed. This issue is among one of the most important reasons that if green building goals of the project are not stated in the contract from the beginning of the project, these green aspects are usually taken for granted.

Likewise there should be an authority which restricts the companies without sufficient knowledge and experience in green building projects. So that we can prevent the risks of false advertising and unfair market competitions.

Table 21. What can be the most critical contractual risks regarding breach (violation) of contract in green projects?

	Very Important	Important	Neutral	Unimportant	Very Unimportant
[Breach (violation) of warranty]	36.59%	51.22%	9.76%	2.44%	0.00%
[Elevated standard of care]	39.02%	42.68%	14.63%	3.66%	0.00%
[False advertising]	37.80%	40.24%	20.73%	1.22%	0.00%
[Damages to professional reputation]	32.93%	53.66%	10.98%	2.44%	0.00%
[Unfair market competition risks]	21.95%	48.78%	21.95%	6.10%	1.22%
[Construction products liability]	20.73%	46.34%	24.39%	7.32%	1.22%

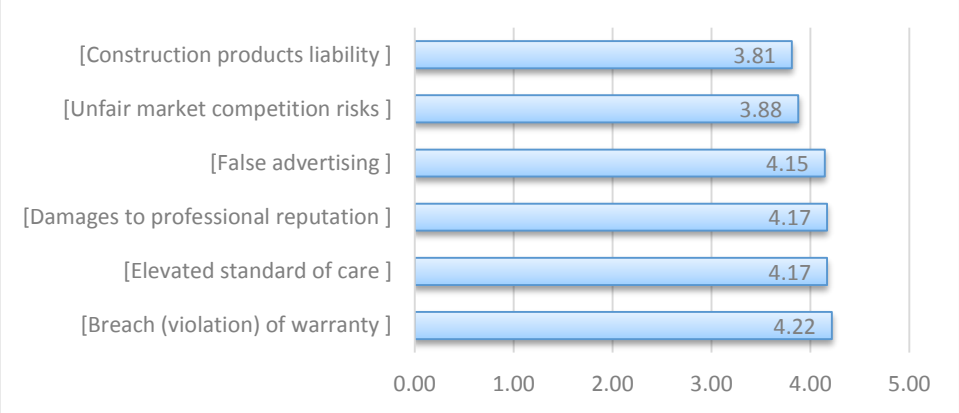

Figure 31. Mean ratings of the most critical contractual risks regarding breach (violation) of contract

5.5 General Perception of Turkish Professionals about Major Contractual Risk Mitigation Strategies

All together there are so many interrelated factors which may impose risks as previously discussed, likewise mitigation strategies should be investigated and

related to these risks in order to prevent them in the future. In this section, possible risk mitigation strategies are analyzed and also other possible solutions which are recommended by Turkish professionals are elaborated.

Previously in literature review chapter, proper risk mitigation strategies which are corresponding to various aspects of green building projects were discussed. These strategies include:

- Contractual Language
- Consultation
- Insurance
- Proper project delivery method
- Recommendations for third party certification
- Product liability prevention

In this section we are assessing and analyzing these strategies from Turkish professionals' point of view. Further on other suggestions provided by the participants are discussed in detail.

Contract Language

As Horkovich et al. mentioned " Recognize the construction contract as the bedrock of risk management " (Horkovich & Connolly, 2010), the most useful and effective means of risk mitigation for every kind of project is truly the contract. It is the contract content which encompass all the requirements, expectations, deadlines and the conditions for rewards and also punishments and in the case of any legal claims, it is the first and most important point of reference for all the parties. So it has a very critical role for minimizing all the possible future risks and should be designed wisely.

Since green building concept is introduced quite recently in construction industry compare to other types of projects, there are limited cases in the whole world which have faced legal claims. So that the contract language for these types of projects is still evolving since there are not sufficient number of conflicts to learn from, but

still there are few suggestions made mostly by attorneys from the countries that green building implementations are mandatory. In the literature review chapter a comprehensive list of risk mitigation strategies was introduced. In this section we are assessing these strategies and other suggested strategies from Turkish professionals' point of view.

According to figure 32 almost all of the strategies are considered to be important and effective, but in general Turkish professionals believe that the most important factor which should be considered while preparing the contract is assigning liability according to the responsibility of the professionals and specification of length and scope of obligations of the parties. Green building contracts should specify the expectations of all professionals related to particular design, construction, commissioning, documentation, warranty and submission necessities for the green building project (American Arbitration Association® (AAA) & The National Construction Dispute Resolution Committee (NCDRC), n.d.).

The second most important factors are inclusion of consequential damages and liquidated damages clause while designing the contract. Although it was previously mentioned some contracts includes mutual waiver of such clauses for all parties of contracts, which are considered extremely dangerous for the owner and investors. Mutual consequential damages waiver also prevent claims for regaining of losses caused by other parties, such as buyers or users. An owner to whom achieving LEED certification is vital may want to modify these clauses in the contract as a safety measurement against failure to accomplish certification (Martin, 2009).

The third important issue which should be kept in mind is defining sustainability related terms in an obvious understandable manner in the contract, so that all parties can have a same understanding by what is meant by green or sustainable. When we have clear goals to achieve in the project, these goals will become more easily achievable.

According to Circo, a green contract should define what is meant by 'green' so that everyone will have a mutual understanding and moreover assign responsibility for completing and those green goals. Sometimes 'green' means acquiring third party

certification. It is also possible to include green features into the design putting so much effort to obtain a third party certification (Circo, 2011). Regardless of how the contract describes 'green,' if there are any special requirements for our project, they should be explicitly mentioned in the contract (Carruthers, 2008).

From Turkish professionals' opinion although defining timelines and also promising or warranting only what can be achieved are important, these terms are not specifically critical in green building projects. Firms should not make any false advertisement or representations regarding a building certification by a third party until it actually obtains certification, this is one of the main issues causing claims (Masters & John R. Musitano, 2007).

The least agreed upon issue is providing amendments while using industry standard forms. Almost a quarter of people are not so sure about the necessity of such amendments in industry standard forms in Turkey. Although according to Perkins, regardless of the increasing number of green building projects in construction industry, most standard forms of contracts either totally fail to state or inefficiently address the obligations, duties, and risks related to green building (Perkins, 2009a). A list of some drawbacks that these standard forms of contracts have is provided in the literature review chapter.

Table 22. Strategies regarding contractual language

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
[Defining sustainability related terms]	32.93%	48.78%	10.98%	6.10%	1.22%
[Defining the timelines]	24.39%	53.66%	20.73%	1.22%	0.00%
[Assigning liability according to responsibility]	45.12%	32.93%	17.07%	3.66%	1.22%
[Inclusion of consequential damages clause]	41.46%	39.02%	13.41%	6.10%	0.00%
[Inclusion of liquidated damages clause]	39.02%	36.59%	19.51%	3.66%	1.22%
[Length and scope of obligations]	45.12%	37.80%	8.54%	6.10%	2.44%
[Amendments to industry standard forms]	13.41%	48.78%	25.61%	9.76%	2.44%
[Promising (warrantying) only what can be achieved]	26.83%	46.34%	15.85%	8.54%	2.44%

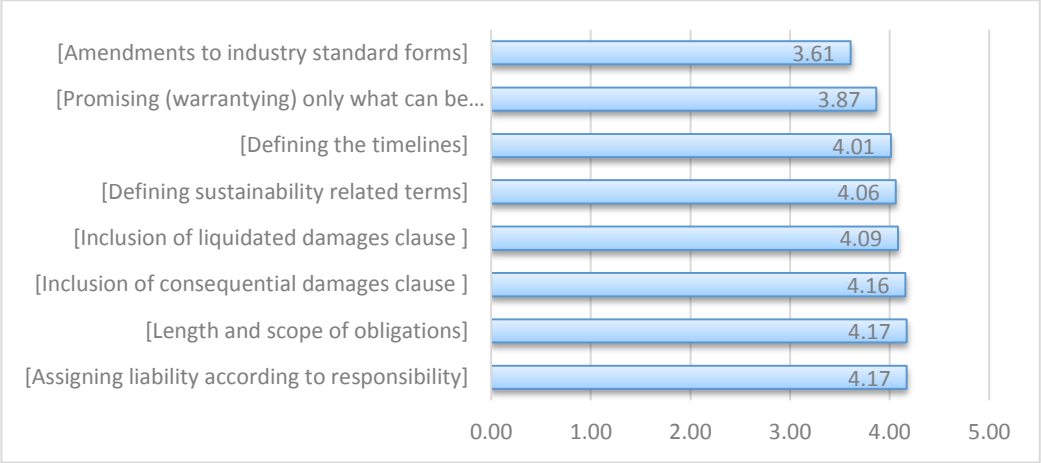

Figure 32. Mean ratings of strategies regarding contractual language

Consultation

In order to prevent any future problems, it is also advised to consult with lawyers and professional green building consultants. As it is shown in the table 23, and figure 33 although most of the Turkish professionals believe that it is useful to consult to lawyers and green building consultants, almost 60 % of them strongly agree with the idea of consulting green building consultants prior to green building projects. This argument is also supported by other researchers who claims that involvement of a green building consultant can be a method for better communication and documentation of the mutual understanding, expectations and responsibilities of the project participants regarding the green aspects of a project (American Arbitration Association® (AAA) & The National Construction Dispute Resolution Committee (NCDRC), n.d.).

Even though many of the risks associated with green buildings are interrelated, consulting a risk manager specialized in green construction issues can be very helpful for eliminating those risks (Sentman & Percio, n.d.).

It is also inferred from the chart that only 30 % of the professionals strongly suggest consultation with an attorney and almost 16 % of them have doubts about this issue. However prior to the research, from the literature review it was expected

that a need for attorney consultation is quite important (Durmus-pedini & Ashuri, 2010; Martin, 2009; Perkins, 2009b)

To the contrary of what is assumed by most of the professionals among Turkish community, some green building consultants themselves strongly suggest a consultation with an attorney and quite honestly specify that since they are mostly aware of the legal risks, while entering to contracts most of them will try to protect themselves against possible claims, while revising the contract terms.

Table 23. Strategies regarding consultation

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
[With an attorney]	31.71%	48.78%	15.85%	2.44%	1.22%
[With a professional green building consultant]	58.54%	31.71%	7.32%	0.00%	2.44%

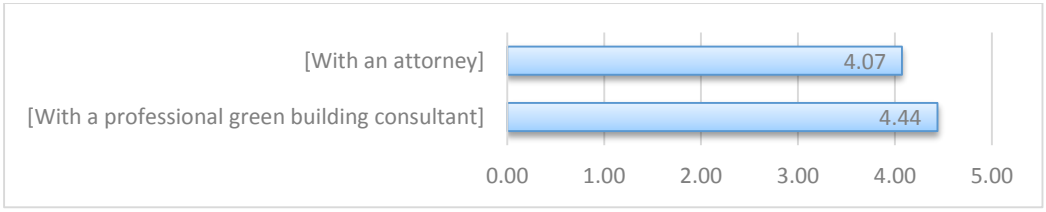

Figure 33. Mean ratings of strategies regarding consultation

Insurance

The other issue which is globally of high concern is the matter of insurance. Due to high risks of green building projects industry's professionals face serious problems with getting proper insurance for these types of projects. The insurance companies prefer not to insure these types of projects, and finally after years of demand gradually some insurance companies began to provide limited insurance policies for sustainable projects.

As it was also elaborated in detail in literature review chapter, construction lawyers strongly suggest having professional liability insurance for the professionals taking part in green building projects.

According to the table 24, although in Turkey most of the professionals strongly agree with the importance of acquiring a professional liability insurance, almost one fifth of the population are not sure about its necessity. According to Greenwald, use of professional liability insurance is a must for all the professionals who are taking part in green building projects, especially in the case that the project performs under certain performance levels which was required, they may face claims and must be protected (Greenwald, 2012). Likewise being aware of the exclusions of insurance policies that are purchased in Turkey is also playing a critical role, especially those ones which are explicitly exclude green building projects risks. But still almost a quarter of professionals believe that it is not of such high importance.

Table 24. Strategies regarding proper insurance

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
[Use of professional liability insurance, including green building risks]	32.93%	46.34%	18.29%	2.44%	0.00%
[Be aware of potential insurance exclusions]	26.83%	48.78%	24.39%	0.00%	0.00%

Figure 34. Mean ratings of strategies regarding proper insurance

Proper Coordination & Project Delivery Method

The other very important aspect of a project is the type of delivery method of a project which sets up all the contractual relations among different project parties and also has a huge effect in cooperation among these parties. As a result of the literature review a list of important suggestions for setting up the relations and selecting and assigning various professionals was achieved which is shown in table 25 and figure 35.

In Turkish professionals' opinion use of Integrated project delivery method is the most useful way of coordinating project members. Coordination of the project members through a professional green building coordinator is also strongly suggested as a good strategy. Participation of well informed and experienced professionals in green building projects along with their coordination through Building Information Modelling (BIM), are all almost equally rated as important factors. According to Yang, the key features of green building are the advanced systems that require a good cooperation and coordination among various parties involved in a project. By adopting BIM into IPD, architects, engineers, contractors and owners can easily create coordinated, digital documents which everyone can access easily and create the best platform for working of green building projects (Yang, 2014).

The least agreed upon method is use of Design Build (DB) project delivery method, although it may have advantages since all the project is done by one entity, but still a quarter of Turkish professionals have some doubts about its effect. As a matter of fact this attitude is also supported by Muldavin et al. who argues that design build approach doesn't have necessary incentives for building performance, and especially if not explicitly stated in the contract, green features are ignored (Scott R. Muldavin, CRE, 2010).

Table 25. Strategies regarding proper project delivery method

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
[Design build delivery method (DB)]	17.07%	45.12%	26.83%	10.98%	0.00%
[Integrated project delivery method (IPD)]	57.32%	29.27%	12.20%	0.00%	1.22%
[Project team members coordination through building information modeling (BIM)]	41.46%	42.68%	9.76%	4.88%	1.22%
[Project team members coordination through a professional green building coordinator]	45.12%	43.90%	8.54%	0.00%	2.44%
[Experienced team]	42.68%	42.68%	13.41%	1.22%	0.00%
[High level of knowledge of professionals regarding green projects]	42.68%	45.12%	9.76%	0.00%	2.44%

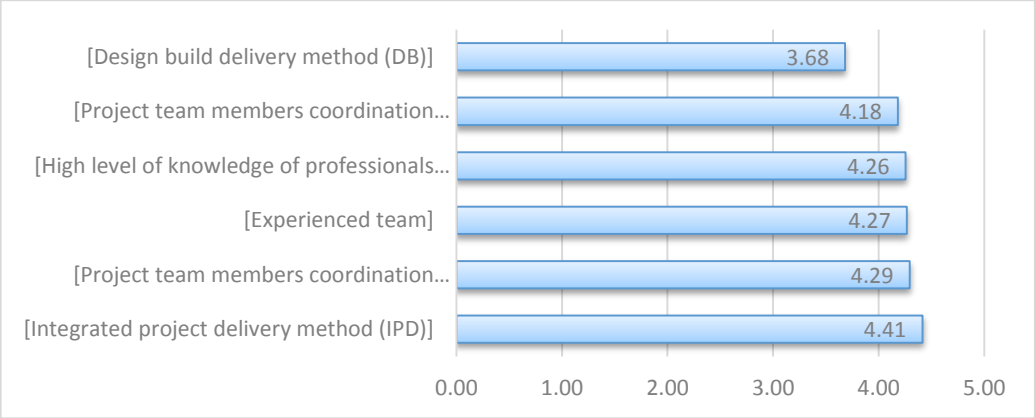

Figure 35. Mean ratings of strategies regarding proper project delivery method

Recommendations for Third Party Certification

Some strategies that may help professionals to be successful in obtaining third party certification easily are listed in table 26 and figure 36. Almost all of these strategies are considered to be quite effective and important. According to the responses collected from Turkish professionals (70 %), early planning for achieving green goals of a project is the most important issue that may increase the chance of having a successful outcome. The next very important aspect is establishing the certification goals of the project if they are going to get any. A very supportive statement of Bates about critical effect of early establishment of the certification goals and early planning to achieve third party certification on the final outcome, is also clarifying the importance of this issue (Bates, 2008).

The other aspect which should be taken into account is proper and regular documentation, otherwise while trying to get the certificate, the project may face some troubles, since these documentations are prerequisite of most of these third party organizations.

Table 26. Strategies regarding third party certification

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
[Early establishment of certification goals]	67.07%	24.39%	3.66%	2.44%	2.44%
[Early planning for achieving green goals]	70.73%	20.73%	6.10%	1.22%	1.22%
[Proper and regular documentation]	53.66%	36.59%	6.10%	3.66%	0.00%

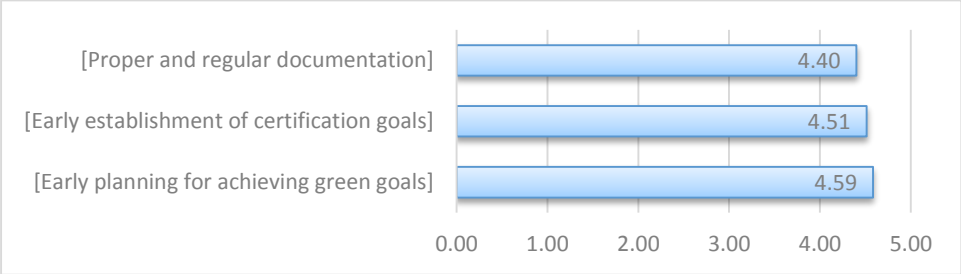

Figure 36. Mean ratings of strategies regarding third party certification

Product Liability Prevention

Since the reason of failure of some green goals of sustainable projects is due to products and materials which are used during construction, it is also wise to seek for strategies which can be effective to secure professionals against product liability. In the following table, some possible strategies are introduced, and the opinion of Turkish professionals are collected accordingly.

Almost all the strategies suggested are considered to be effective, especially use of already tested materials and products for green projects. The other issue of concern which is also very important is checking the availability of certain materials and products in the market and almost half of the participants agree on that. Contractors should make sure that required green building products are available in the market or not (Perkins, 2009b). Unforeseen delays or litigation can be evaded by ensuring that all parties understand the effect of nonconformities from chosen material use can have on successful third party certification achievement (BCCA, 2011).

But it seems that Turkish professionals believe that there are some drawbacks in testing the new products and materials, almost one fifth of professionals are not sure or disagree with the idea of testing new materials.

Table 27. Strategies regarding product liability prevention

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
[Use of tested materials and products]	52.44%	39.02%	6.10%	1.22%	1.22%
[Testing the new materials]	39.02%	40.24%	13.41%	4.88%	2.44%
[Checking the availability of the material in the market]	48.78%	42.68%	7.32%	1.22%	0.00%

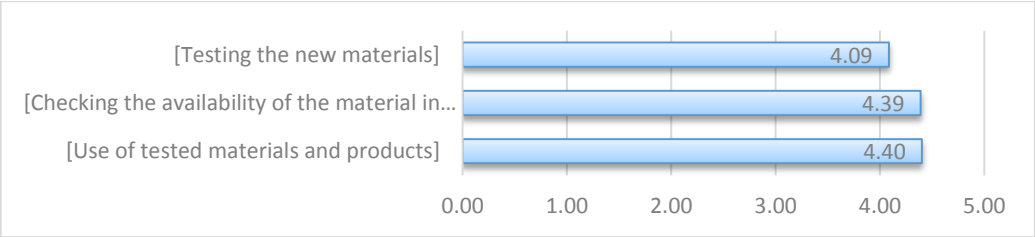

Figure 37. Mean ratings of strategies regarding product liability prevention

5.6 Further Statistical Analysis of Recommended Major Contractual Risk Mitigation Strategies

In order to further on expand the study by a more in depth statistical analysis and a more precise conclusion, the last section of the questionnaire survey which is focused on contractual and other legal risk mitigation strategies are also analyzed using nonparametric statistical tests in order to compare the significance level of importance of each strategy mentioned.

5.6.1 Nonparametric One-way ANOVA Analysis for the Median Comparison of the Various Contractual and Other Legal Risk Mitigation Strategies

In this section, the data collected from risk mitigation section of the survey are analyzed to compare the median rating of each factor's level of importance, according to the respondents' rating. Since the collected data are nonparametric, a non-parametric one-way ANOVA was conducted which is also called Kruksal-Wallis H test. The test compared whether there was any significant difference in

the various factors' level of importance in each group of risk mitigation strategies which were also discussed previously.

If the output of the analysis determines that there is a significant difference among the factors according to the Kruksal-Wallis rank test, a post-hoc analysis was also performed to make the pair-wise comparisons of each suggested factor with every other factors mentioned in that group in order to conclude which two parties' level of importance was significantly different with one another. As a method of post-hoc analysis the Wilcoxon rank sum test was used to make pair-wise comparisons of each factor in groups which was decided to be significantly different as a result of the Kruskal-Wallis H test. The result of the Kruskal Wallis H test and post-hoc tests of Wilcoxon rank sum test can be seen in Appendix B.

The hypothesis of this research which is going to be tested in this section is:

Study hypothesis: There is a significant difference in the level of importance of each factor suggested as risk mitigation strategies for each group.

i.e. H1: At least one of the M is not equal

Null hypothesis: There is no significant difference in the level of importance of each factor suggested as risk mitigation strategies for each group.

i.e. H0: All the M are equal

If the null hypothesis is rejected and there will be at least one significant difference among these factors, post-hoc tests are going to be conducted to detect these significances.

The hypothesis that is tested in pair-wise post-hoc tests of Wilcoxon rank sum test is:

Study hypothesis: There is a significant difference in the level of importance of any two factors suggested as risk mitigation strategies for each group.

i.e. H1: $Mi \neq Mj$

Null hypothesis: There is no significant difference in the level of importance of any two factors suggested as risk mitigation strategies for each group.

i.e. H0: $Mi = Mj$

Contract Language

Kruksal-Wallis H test was performed, at 0.05 alpha level significance, to compare the median rating of all the parties to test the null hypothesis that there is no significant difference in the level of importance of each factor suggested as risk mitigation strategies for each group.
The results of the test are as follows:

P-value = 0.00
$\alpha = 0.05$
P-value $< \alpha$

So the Null hypothesis that there is no significant difference in the level of importance of each factor suggested as risk mitigation strategies for contractual language is rejected. The results of the Kruskal Wallis H test can be reached in Appendix B.
Since there is at least one significant difference among these factors listed as contractual language risk mitigation strategies, post-hoc tests were conducted to detect these significances.
The hypothesis that is tested in pair-wise post-hoc test is:

Study hypothesis: There is a significant difference in the level of importance of any two factors suggested as risk mitigation strategies for contractual language.
i.e. H1: $Mi \neq Mj$
Null hypothesis: There is no significant difference in the level of importance of any two factors suggested as risk mitigation strategies for contractual language.
i.e. H0: $Mi = Mj$

Where, i and j can represent any group among the factors: 1 = Defining sustainability related terms, 2 = defining the timelines, 3 = assigning liability according to responsibility, 4 = inclusion of consequential damages clause, 5 =

inclusion of liquidated damages clause, 6 = length and scope of obligations, 7 = amendments to industry standard forms, 8 = promising (warrantying) only what can be achieved.

After the Wilcoxon rank sum test was performed it was detected that this significant difference in the level of importance among the factors of contractual risk mitigation strategies can be mainly observed between 7th and 8th coded factors, as it is shown in the significance relationship table 28.

Table 28. Wilcoxon Rank Test, relationship result

Factors	1	2	3	4	5	6	7	8
1								
2								
3								
4								
5								
6								
7								
8								

As a result of the mean ranks comparison of the factors 7 and 8 (7 = amendments to industry standard forms, 8 = promising (warrantying) only what can be achieved), from a more accurate statistical point of view, it can be inferred from the data that compare to the rest of the factors listed, these two strategies have rather lower level of significance in comparison with the rest of the factors.

Consultation

Since there are only two factors suggested in this category of risk mitigation strategies, only Wilcoxon rank sum test was conducted to compare the level of significance of the factors mentioned in this category.

The hypothesis that is tested in pair-wise post-hoc test is:

Study hypothesis: There is a significant difference in the level of importance of any two factors suggested as risk mitigation strategies for consultation.
i.e. H1: $Mi \neq Mj$
Null hypothesis: There is no significant difference in the level of importance of any two factors suggested as risk mitigation strategies for consultation.
i.e. H0: $Mi = Mj$

Where, i and j can represent any group among the factors: consultation with an attorney, consultation with a professional green building consultant.

At 0.05 alpha level significance, as a result of the Wilcoxon rank sum test, the null hypothesis that there is no significant difference in the level of importance of each factor suggested as risk mitigation strategies for consultation, is rejected.
The results of the test are as follows:

P-value = 0.00
$\alpha = 0.05$
P-value $< \alpha$
Therefore from statistical point of view there is a significant difference between the importance levels of the two factors suggested in this category. By comparing the mean ranks from the charts it can be concluded that the importance level of consultation with an experienced green building consultant is statistically higher than importance level of consultation with an attorney, from Turkish practitioners' point of view.

Insurance

Likewise since there are only two factors suggested in this category of risk mitigation strategies, only Wilcoxon rank sum test was conducted to compare the level of significance of the factors mentioned in this category.
The hypothesis that is tested in pair-wise post-hoc test is:

Study hypothesis: There is a significant difference in the level of importance of any two factors suggested as risk mitigation strategies for Insurance.
i.e. H1: $Mi \neq Mj$
Null hypothesis: There is no significant difference in the level of importance of any two factors suggested as risk mitigation strategies for Insurance.
i.e. H0: $Mi = Mj$

Where, i and j can represent any group among the factors: Use of professional liability insurance, including green building risks and being aware of potential insurance exclusions

At 0.05 alpha level significance, as a result of the Wilcoxon rank sum test, the null hypothesis that there is no significant difference in the level of importance of each factor suggested as risk mitigation strategies for insurance, is not rejected. So the level of importance of both factors are considered almost equal from a statistical point of view.
The results of the test are as follows:

P-value = 0.303
$\alpha = 0.05$
P-value > α

Proper Coordination & Project Delivery Method

Kruksal-Wallis H test was performed, at 0.05 alpha level significance, to compare the median rating of all the factors to test the null hypothesis that there is no significant difference in the level of importance of each factor suggested as risk mitigation strategies for proper coordination & project delivery method category.
The results of the test are as follows:

P-value = 0.00

$\alpha = 0.05$

P-value $< \alpha$

So the Null hypothesis that there is no significant difference in the level of importance of each factor suggested as risk mitigation strategies for proper coordination & project delivery method is rejected.

Since there is at least one significant difference among these factors, post-hoc tests were conducted to detect these significances.

The hypothesis that is tested in pair-wise post-hoc test is:

Study hypothesis: There is a significant difference in the level of importance of any two factors suggested as risk mitigation strategies for proper coordination & project delivery method category.

i.e. H1: $Mi \neq Mj$

Null hypothesis: There is no significant difference in the level of importance of any two factors suggested as risk mitigation strategies for proper coordination & project delivery method category.

i.e. H0: $Mi = Mj$

Where, i and j can represent any group among the factors: 1 = Design build delivery method (DB), 2 = Integrated project delivery method (IPD), 3 = Project team members coordination through building information modeling (BIM), 4 = Project team members coordination through a professional green building coordinator, 5 = Experienced team, 6 = High level of knowledge of professionals regarding green projects.

After the Wilcoxon rank sum test was performed it was detected that this significant difference in the level of importance among the factors of risk mitigation strategies can be mainly observed between 1st coded factor and all the rest of factors, as it is shown in the significance relationship table 29.

Table 29. Wilcoxon Rank Test, relationship result

Factors	1	2	3	4	5	6
1						
2						
3						
4						
5						
6						

According to the mean ranks of the factors in proper coordination & project delivery method category, it is inferred that the level of importance of Design build delivery method (DB) factor statistically is lower compare to the rest of the factors.

Recommendations for Third Party Certification

Non parametric one-way ANOVA test was conducted, at 0.05 alpha level significance, to compare the median rating of all the factors to test the null hypothesis that there is no significant difference in the level of importance of each factor suggested as risk mitigation strategies for third party certification risks.
The results of the test are as follows:

P-value = 0.091
$\alpha = 0.05$
P-value > α

So the Null hypothesis that there is no significant difference in the level of importance of each factor suggested as risk mitigation strategies for third party certification risks cannot be rejected. This means that statistically all the factors in this category are almost equally weighted and their importance level is at the same degree high according to their mean ranks.

Product Liability Prevention

Kruksal-Wallis H test was performed, at 0.05 alpha level significance, to compare the median rating of all the factors to test the null hypothesis that there is no significant difference in the level of importance of each factor suggested as risk mitigation strategies for product liability prevention.
The results of the test are as follows:

P-value = 0.057
$\alpha = 0.05$
P-value > α

So the Null hypothesis that there is no significant difference in the level of importance of each factor suggested as risk mitigation strategies for product liability prevention cannot be rejected again. This means that from a statistical point of view, all the factors in this category have the same importance level.

CHAPTER 6

CONCLUSION & RECOMMENDATIONS

This chapter attempts to conclude the main results of the research findings and summarize current situation of green building market in Turkey and Turkish industry's inclination towards sustainable projects. Then some aspects of the possible contractual and other legal risks in Turkish green building market is discussed and some suggestions are provided to prevent possible future legal claims. Later on some recommendations provided by Turkish practitioners on this topic is presented. The last section of this section discuss limitations of the study and a number of suggestions for further research in this area.

6.1 A Concise Conclusion of Research Results

6.1.1 General State of Green Building Market in Turkey

Turkish Green Building Industry is relatively new and is currently evolving. Since most of the industry practitioners believe that the Turkish construction market has a positive inclination towards sustainable projects, it is expected to grow further in the near future. The results of the thesis are attempted to draw out a connection between respondents' perception and current real world green buildings' situation regarding legal issues and risks to achieve a more realistic perspective towards the future of green building market in Turkey.

From Turkish practitioners perspective the main reasons to build green building projects in Turkey is financial benefits and gaining reputation particularly because the market of sustainable buildings are quite new and gaining reputation may have a positive effect on competitiveness of the various construction & design firms.

However this process should be more supported by various organization and institutions to be accepted in extensive ranges and get more widespread.

There are many factors of high importance that may affect this issue. Among them social awareness, education, and support of government with various types of incentives are the most effective strategies. The other important strategy which may also have a huge effect is legal enforcement by the government but then again in comparison with incentives it is not so much preferred. Turkish government has already set some regulations to increase sustainable projects, which are considered insufficient from Turkish professionals' point of view, so there is an improvement necessity of these regulations.

For all these strategies to be practicable government has the most critical role. Government is the main organ which can set up standards, regulations and ordinances and also allocate enough budget in order to increase community awareness, and change the culture in a positive way towards sustainability issues by adding sustainability related subjects in the school curriculum and sponsoring various organizations like professionals chambers to set up informative seminars and educational sessions. And also allocate budget to universities' researches to support sustainable approaches.

Among all the others Turkish media can also have a great influence on this matter, by introducing successful green building projects to the society and advertisements or educational programs.

The owner of a project is the one who should make the last decision to build green or not. In this process of decision making government and the architect have the most critical roles. Firstly in order to encourage investors, government should provide financial support or other kinds of incentives, or setting up certain minimum criteria and standards or regulations for issuing permissions for projects. Private sector should be definitely getting governmental support at least in a partial way. Architects also have the important role of informing the owners of sustainability features of the projects, since they are in contact with each other from the early phases of the project, architects have an important effect in decision making process.

It is also inferred from the research that industry practitioners believe that architects has the most important role in achieving the green building expectation and goals and their design decisions have a direct effect in the final outcome. The other professionals with a high degree of influence in the final results of a green projects are green building consultants and engineers who are also taking part in design phase of the project.

Of course the other project participants also affect the success level of the project to some degree, but as mentioned the most important entities are architects, engineers and green building consultants.

6.1.2 Importance of Green Construction Contracts in Turkey

In general necessity of some alterations and modifications to current contractual practices in green construction industry in Turkey was pointed out by Turkish industry practitioners, since in case of any future problems, proper contracts can have an effective influence in solving them. Until recently not many legal issues have occurred in green building practices in Turkey. The main reason for that is voluntary decisions made by the owners, since none of the green buildings in Turkey had any obligations to be built as a green project.

A majority of Turkish professionals believe that specifying green goals of a project and parties' responsibilities in contracts explicitly will increase the chance of a positive outcome in green building projects, since everyone will have a mutual understanding of the green terms.

Incentive types of contracts along with cost plus fee contracts are considered as the most suitable types of contracts which can be implemented in green building projects, particularly incentives for higher performance of the projects is mostly recommended.

International standard forms of construction contracts are not so commonly used in Turkey except of FIDIC (The International Federation of Consulting Engineers) which is also not necessarily used for sustainable contracts. It is also suggested that

some local national standard forms can be organized for the green building projects in Turkey, so that Turkish authorities should take actions in this regard.

6.1.3 General Aspects of Green Building Projects Risks

From Turkish professionals' point of view it is mostly predicted to face legal claims in green building projects during the third party certification phase of construction phase of the project. In such conditions, green building consultants and contractors are among the most vulnerable groups of professionals who may be prone to legal claims and should be well informed about such legal risks.

As it was discussed, Turkish professionals believe that the most well informed and knowledgeable groups regarding legal issues are green building consultants, architects and engineers accordingly.

6.1.3.1 Importance of Contractual and Other Legal Risks

Legal claims in green building projects may occur due to several reasons but there are some main categories of such risks which are all considered as quite important risks which should be definitely taken into account according to most of Turkish professionals. These areas of green building claims is listed below according to their level of importance in Turkish industry:

- Claims of governmental incentives
- Claims for energy savings
- Claims for third party certifications
- Claims for unfair market competitions

There are some other subcategories of the above mentioned risks that may eventually lead to claims. In the following part, these sub-categories of green building risks are listed as it was rated according to their importance from Turkish

professionals' point of view. The most important risks are placed on top and the one with least level of importance at the bottom:

Third party certification risks:

- Failure in achieving 3rd party certification
- Lost incentives due to certification failure
- Decertification

Financial risks:

- Lack of insurance for green projects
- Low payback rate
- Limited surety bonds for green projects

Risks of breach of contract:

- Breach (violation) of warranty
- Elevated standard of care
- Damages to professional reputation
- False advertising
- Unfair market competition risks
- Construction products liability

6.1.4 General Risk Mitigation Strategies for Green Building Projects

All together there are so many interrelated factors which may impose risks as previously discussed, likewise mitigation strategies should be investigated and related to these risks in order to prevent them in the future.

Main groups of strategies targeting most of the above mentioned risks are:

- Contractual Language
- Consultation
- Insurance
- Proper project delivery method
- Recommendations for third party certification
- Product liability prevention

Again each main group of these strategies are subdivided into more practicable sub groups. According to the investigation made in Turkey, a list of all these sub group of strategies which was rated according to their effectiveness is provided below, the most important ones on the top and the one with least level of importance at the bottom:

Contractual language:

- Assigning liability according to responsibility
- Length and scope of obligations
- Inclusion of consequential damages clause
- Inclusion of liquidated damages clause
- Defining sustainability related terms
- Defining the timelines
- Promising (warrantying) only what can be achieved
- Amendments to industry standard forms

Consultation:

- With a professional green building consultant
- With an attorney

Insurance:

- Use of professional liability insurance, including green building risks
- Be aware of potential insurance exclusions

Proper project delivery method:

- Integrated project delivery method (IPD)
- Project team members' coordination through a professional green building coordinator
- Experienced team
- High level of knowledge of professionals regarding green projects
- Project team members' coordination through building information modeling (BIM)
- Design build delivery method (DB)

Recommendations for third party certification:

- Early planning for achieving green goals
- Early establishment of certification goals
- Proper and regular documentation

Product liability prevention:

- Use of tested materials and products
- Checking the availability of the material in the market
- Testing the new materials

6.2 A Brief List of Recommendations Provided by Survey Participants

As it was also pointed out in previous chapter while explaining the research findings, many of the survey participants also provide invaluable comments about survey questions and provide helpful suggestions while assessing the question from their own perspective. In this section a concise list of these recommendations is stated below:

Several other reasons for building green in Turkey:

- Project obligations asked by foreign investors
- In order to be more competitive among other Turkish companies (somehow related to gaining reputation)
- To achieve higher property value (Financial benefits)
- Raising social awareness & education for succeeding generations
- Increasing the quality of living conditions and more comfort & high welfare

Encouraging widespread adoption of sustainable projects:

- Private sector incentives can also have a positive effect in encouraging sustainable projects.
- Apart from private sector incentives, it is also suggested that all governmental incentives doesn't have to be in the form of financial aid, in some cases government can also provide services during construction phase so that the total cost of construction will decrease.
- Government should also invest in energy simulation research field in the universities otherwise even after setting regulations there will be lack of knowledge and experiment in this regard.
- Government should take active part in spreading the sustainable culture among society and help increasing the social awareness level in this regard, by the help of education system, media or other means.
- A certain level of lack of communication between industry practitioners and academic researchers exist in Turkey. Several participants mentioned that they cannot find a way to communicate with academics and express the need for research in some certain areas. There should be some institutions help to solve this problem of communication.
- Setting a national certification institute is also suggested by Turkish participants so that all the conditions will be in accordance with the climate and geographical situation in Turkey.

Government regulations and standards:

- Turkish standard TS 825 (Thermal insulation requirements for buildings) should be revised and all energy simulations for green buildings in Turkey should be based on the new standard. Although there were some modifications done to this it seems that there is still need for further modifications to this standard.
- In general people believe that instead of legal enforcement, government should offer incentives and support these projects to be able to successfully spread out green buildings in Turkey.
- While setting regulations, firstly governmental public buildings should be required to be built as green projects, so that they can be good examples to encourage private sector as well.

Project participants who have critical roles in achieving sustainability goals:

- It is also mentioned that official authorities and inspectors whose role is to check the process of construction and to issue the license for the projects have also a very effective role for achieving sustainability goals of a project.
- It is also specified that the owner has also a critical role for achieving the final results by clarifying all the expected specific green goals of the projects.
- The other parties who has an effect in this aspect are chambers of architects, engineers and consultants. They can inform professionals with conferences and seminars in this topic.

Recommendations for better cooperation and communication:

- All parties should be in cooperation and in contact with each other. The most successful method will be the one in which sub-contractors and main contractors are closely working together otherwise there is a high chance of having problems especially in green building projects.
- It is also suggested that there should be a research and development (R&D) platform between the architect and green building consultants while working

and a specific project, so they can cooperate simultaneously to achieve the expected goals, since the most critical phase in these type of projects are design phase.

- Other comments from professionals also suggest that Research and Development (R&D) department between the companies and various disciplines should also be encouraged to create a platform that they can exchange ideas and their experiences.

Other suggestions for risk mitigation in green projects:

- Responsible organizations like chambers of architects, engineers and consultants should inform the professionals of various risks through different means, so that these types of risks can be foreseen and prevented.
- Likewise there should be an authority which restricts the companies without sufficient knowledge and experience in green building projects. So that we can prevent the risks of false advertising and unfair market competitions.
- It's mentioned by the participants that these risks won't change until a system of punishment and reward is considered for green building project partakers. Contracts should contain certain punishment clauses which can be enforced in the case of ignorance of responsible parties.
- This issue is among one of the most important reasons that if green building goals of the project are not stated in the contract from the beginning of the project, these green aspects are usually taken for granted.
- Especially if the owners or investors as well as the occupants have a higher level of knowledge about their rights and expected final outcomes of the sustainable projects, then the industry professionals will face major problems regarding legal claims.
- Duration of execution of different phases of these projects should be well estimated during the planning period, otherwise it is very probable that the project construction may be delayed.

- The importance of professional liability insurance is also mentioned in the comments from Turkish professionals as an issue which is usually taken for granted and should be more focused on in green building projects in Turkey.
- Consultation to an attorney is a must. To the contrary of what is assumed by most of the professionals among Turkish community, some green building consultants themselves strongly suggest a consultation with an attorney and quite honestly specify that since they are mostly aware of the legal risks, while entering to contracts most of them will try to protect themselves against possible claims, while revising the contract terms.

6.3 Limitation of the Study

The topic of this study is rather new and formerly it has not been examined from the perspective of any engineering discipline. The literature review on this topic is quite limited and mainly is only discussed from a legal point of view by limited number of lawyers working in construction field.

This thesis has fulfilled its original purposes by revealing the importance of green building contracts and their effect in risk management strategies for such projects. A number of existing industry risks and problems were discussed in detail and various risk mitigation techniques which are mainly conducted through green contracts were sought and specified in detail.

However, the thesis has some limitations. First of all, there are not enough number of green building claims happened in Turkey, generally because the green building market is quite new in Turkey.

The data collection effort for the survey was very difficult since the number of the professionals working in green building field in Turkey is quite limited. Several requests were sent to solicit participation of these professionals. Various methods were adopted by this research for asking Turkish green building experts' participation, such as email invitation, distributing the survey via LinkedIn groups, announcement to the members of various professionals' chambers and Turkish ministry of energy and natural resources and Turkish ministry of environment and

urbanization, but still the number of responses from the participants were rather limited. Conducting questionnaires with a larger number of market practitioners would also allow for a more comprehensive and in-depth investigation.

6.4 Recommendations for Further Studies

It is believed by understanding and detecting administrative and legal risks of such projects and implementation of risk mitigation strategies, these types of projects can be more widespread among societies all over the world.

This research field can be further extended in the future by working directly with national green building experts and in close operation with construction lawyers etc. to obtain considerably larger sample size, to get direct information from the existing projects.

Although working at the national level on this subject can be beneficial considering the special circumstances of the community, it can be on the other hand very time consuming as well since many connections is needed to be set within local industry practitioners to make this strategy successful.

It can be also more practicable and useful to compare various international or local standard forms of green building contracts and find out about pros and cons of each form of contracts. As a result of such a research many useful tips for industries professionals can be achieved and it can also result in improvements for organizing such contracts.

More research is needed for understanding and improving the green building movement in Turkey in the following areas.

As a result of an understandable and actionable feedback from academic researchers, policy makers and other stakeholders in the sector can be more encouraged to take steps in sustainability field. So one other important aspects that can be focused on as a future study is assessing the sustainability issue from a global and political point of view. Governments all over the world can have a very effective role in implementation of such projects.

As an effective governmental strategy to support green buildings, it was previously discussed that some various types of incentives are provided. Different types of incentives which can be offered by a government as a form of financial incentive or a service can be also another subject for academic research, since it provides governments and other authorities with practical solutions in this regard.

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APPENDICES

APPENDIX A

A. SURVEY QUESTIONNAIRE

What is the current global situation regarding green construction contracts?

In brief, as a result of green building movement, there have been numerous changes in conventional construction practices during the last two decades. Consequently, these changes have caused a need for changes in industry's contractual practices. With the new demand, organizations publishing standard forms of contracts for construction sector, have begun forming new standard forms of contract specially designed for sustainable projects.

What is the main purpose of this study?

This questionnaire is designed regarding for a master's thesis titled: "The Future of Green Construction Contracts in Turkey". This thesis is being pursued in the graduate program at the Middle East Technical University (METU) Civil Engineering & Construction Management Department.

The purpose of this research is to seek the opinion of experienced professionals about following questions:

- To what extent are (or will) construction *contracts be affected as a result of the green building movement* in Turkish construction sector?
- Which *types of construction contract & delivery method* can be considered as the most suitable approach for sustainable projects?
- What are the *possible future legal risks* regarding green construction practices in Turkey?
- How critical can the role, green construction contracts play in *mitigating those risks*? How can "green features" of these contracts handle green related risks?

The structure of the questionnaire:

The current questionnaire consists of five parts:

1st section: general information about the participant

2nd section: general information about the participant's *green building knowledge*

3rd section: general perception about green projects and *green construction contracts*

4th section: general perception about green projects' *legal risks*

5th section: general perception about the contractual risk *mitigation strategies*

This survey which you are about to complete will take **approximately 15 minutes**. Thank you so much for your time and contribution to our survey.

A1. GENERAL INFORMATION ABOUT RESPONDENTS

A1.1 Please state your job / profession:

- o Owner
- o Architect
- o Engineer
- o Contractor
- o Construction manager
- o Green building consultant
- o Material vendor
- o Attorney
- o Other:

A1.2 Your job is …… % focused on green building projects.

- o 1-20
- o 20-40
- o 40-60
- o 60-80
- o 80-100

A1.3 How long have you been working in the green building field?

- o < 1 years
- o 1 to 2 years
- o 2 to 3 years
- o 3 to 4 years
- o > 4 years

A1.4 How many green building projects have you been involved with?

- o 1
- o 2
- o 3
- o 4
- o > 4

A1.5 How did you gain green building knowledge? (Mark all that apply)

- Attending conference
- Reading trade publications
- Internet research
- Working with consultants
- Sharing knowledge with my colleagues
- Taking courses about green buildings
- Other (specify):

A2. GENERAL PERCEPTION ABOUT GREEN BUILDINGS

A2.1 Is the *trend of Turkish construction market positive*, in regard to sustainable projects?

Strongly disagree Disagree Agree Strongly agree

Please Rank the following questions, according to their importance in your opinion:

A2.2 What can be among *the main reasons of building green* in Turkey?					
	Very Important	Somewhat Important	Neutral	Somewhat Unimportant	Very Unimportant
Financial benefits					
Indoor healthy environment					
Climate change					
Energy crisis					
Getting benefit of governmental incentives					
Gaining reputation					
Other (specify)					

A2.3 What are key strategies making green practices *more effective and widely adopted*?					
	Very Important	Somewhat Important	Neutral	Somewhat Unimportant	Very Unimportant
Society awareness					
Education					
Increased market value					
Legal enforcement					
Government incentives					
Restrictions in competitive bidding process					
Other (specify)					

A2.3 Which of the following *professionals has the most critical responsibility* in order to achieve the green goals of a project?					
	Very Important	Somewhat Important	Neutral	Somewhat Unimportant	Very Unimportant
Engineers					
Architects					
Contractors					
Material vendors					
Construction manager					
Green building consultant					
Other (specify)					

A2.4 Turkish government has issued *two regulations* governing green buildings and energy consumption reduction:

1. **"Energy performance in buildings, regulation of ministry of public works and settlement, no: 27075 in December 2008" &**
2. **"Documentation of sustainable green buildings and settlings, regulation of Turkish ministry of environment and urban planning no: 29199 in December 2014"**

Do you agree that *these regulations are sufficient* as governmental support for building green in Turkey?

	To a large extent	To a moderate extent	To some extent	To little extent	Not at all
1st regulation					
2nd regulation					
Other regulations (specify):					

A2.5 Please rate the importance of the following parties in *making decision to build green*?

	Very Important	Somewhat Important	Neutral	Somewhat Unimportant	Very Unimportant
Government policy					
Society					
Owner					
General Contractor					
Architect					
Other (specify)					

A. 2. B. GENERAL VIEW ABOUT GREEN CONTRACTS

A2.6 Do you agree with the idea that *specifying green goals of a project and parties' responsibilities in contracts* will increase the chance of a positive outcome in comparison with conventional contracts which doesn't include such specifications?

Strongly disagree Disagree Agree Strongly agree

Please Rank the following questions, according to their importance in your opinion:

A2.7 What *types of contracts* would be *most useful* for managing and financing green building projects?

	Very Useful	Somewhat Useful	Neutral	Somewhat Useless	Very Useless
Lump sum contracts					
Unit price contracts					
Incentive contracts					
The Guaranteed maximum price contract					
Cost plus fee					
Other (specify)					

A2.8 In *incentive contracts*, what *type of incentives and clauses* should be added to the contracts to *promote sustainable* features of the final design or construction?

	Very Important	Somewhat Important	Neutral	Somewhat Unimportant	Very Unimportant
Incentives for cost reduction					
Incentives for time reduction					
Incentives for certain level of performance					
Other (specify)					

A2.9 What *type of delivery methods* would be most useful for managing and implementing green building projects?					
	Very Useful	Somewhat Useful	Neutral	Somewhat Useless	Very Useless
Design bid build (DBB)					
Design build (DB)					
Construction management (CM)					
Integrated project delivery (IPD)					
Engineer Procure Construct (EPC) or Turnkey					
Build Operate Transfer (BOT)					
Other (specify)					

A2.10 Have you used any *standard form of contract* that specifically includes green features for sustainable projects?

- FIDIC (the International Federation of Consulting Engineers)
- JCT (The Joint Contracts Tribunal)
- BE collaborative (Collaborating for the Built Environment)
- AIA (The American Institute of Architects)
- ConsensusDocs (the ConsensusDocs Coalition)
- None
- Other local forms:

A3. PROFESSIONALS' OPINION ABOUT MAJOR CONTRACTUAL & OTHER LEGAL RISKS

A3.1 In *which phase(s)* of a project, are *legal issues* most probably encountered?

	Very probable	To some extent probable	Neutral	To some extent improbable	Improbable
Pre-design & preliminary assessments					
Design					
Construction					
Gaining 3rd party certification (e.g. USGBC)					
Operation					
Reuse and refurbishment					
Other (specify)					

A3.2 Which of the following issues can be the most critical reasons for *the possible future claims regarding green projects*?

	Very Important	Somewhat Important	Neutral	Somewhat Unimportant	Very Unimportant
Claims of 3rd party certification (e.g. USGBC)					
Claims for energy savings					
Claims of governmental incentives (e.g. claims for loss of tax discount)					
Claims for unfair market competition (e.g. to be considered eligible to enter tenders as green building					

specialists while you're not)					
Other (specify)					

A3.3 Please rank the following *professionals' level of awareness* of legal issues which may arise due to the nature of the green construction approach for a project.

	To a large extent	To a moderate extent	To some extent	To little extent	Not at all
Engineers					
Architects					
Contractors					
Material vendors					
Construction manager					
Green building consultant					
Other (specify)					

A3.4 Who are the most likely *professionals* that may *face green project claims*?

	Very Likely	Somewhat Likely	Neutral	Somewhat Unlikely	Very Unlikely
Engineers					
Architects					
Contractors					
Material vendors					
Construction manager					
Green building consultant					
Other (specify)					

A3.5 What can be the most critical *3rd party certification (e.g. USGBC) risks* in green projects in your opinion?

	Very Important	Somewhat Important	Neutral	Somewhat Unimportant	Very Unimportant
Failure in achieving 3rd party certification (e.g. USGBC)					
Decertification					
Lost incentives due to certification failure					
Other (specify)					

A3.6 What can be the most critical *financial risks* in green projects in your opinion?

	Very Important	Somewhat Important	Neutral	Somewhat Unimportant	Very Unimportant
Limited insurance or lack of insurance for green projects					
Limited surety bonds for green projects					
Low payback rate					
Other (specify)					

A3.7 What can be the most critical *contractual risks* regarding *breach (violation) of contract* in green projects?

	Very Important	Somewhat Important	Neutral	Somewhat Unimportant	Very Unimportant
Breach (violation) of warranty					
Elevated standard of care (higher professional service expectancy from green building specialists compare to the rest of professionals)					

False advertising (e.g. marketing certain materials as green while not true)					
Damages to professional reputation (due to not full filing a promise)					
Unfair market competition risks (e.g. to be considered eligible to enter tenders as green building specialists while you're not)					
Construction products liability					
Other (specify)					

A4. PROFESSIONALS' OPINION ABOUT MAJOR CONTRACTUAL RISK MITIGATION STRATEGIES

A4.1. Considering all *possible future legal issues* related to green projects, what do you think can be the most *effective risk mitigation strategies* in each category?					
A4.1. Contractual language regarding:					
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Defining sustainability related terms					
Defining the timelines					
Assigning liability according to responsibility					
Inclusion of consequential damages clause					
Inclusion of liquidated damages clause					
Length and scope of obligations					
Amendments to industry standard forms					
Promising (warrantying) only what can be achieved					

A4.2. Consultation for editing contract terms:					
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
With an attorney					
With a professional green building consultant					

A4.3. Dealing with limited insurance					
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Use of professional liability insurance, including green building risks					
Be aware of potential insurance exclusions					

A4.4. Choice of project delivery method:					
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Design build delivery method (DB)					
Integrated project delivery method (IPD)					
Project team members coordination through building information modeling (BIM)					
Project team members coordination through a professional green building coordinator					
Experienced team					
High level of knowledge of professionals regarding green projects					

A4.5. Strategies regarding 3rd party certification (e.g. USGBC):					
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Early establishment of certification goals					
Early planning for achieving green goals					
Proper and regular documentation					

A4.6. Preventing product liability:					
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Use of tested materials and products					
Testing the new materials					
Checking the availability of the material in the market					

APPENDIX B

B. NON-PARAMETRIC STATISTICAL ANALYSIS

B1.1 Contract Language Strategies Kruskal Wallis H Test:

B1.1 Ranks

	Various factors of risk mitigation in Contract Language	N	Mean Rank
respondent's ratings	[Defining sustainability related terms]	82	336.89
	[Defining the timelines]	82	313.03
	[Assigning liability according to responsibility]	82	362.13
	[Inclusion of consequential damages clause]	82	357.10
	[Inclusion of liquidated damages clause]	82	342.07
	[Length and scope of obligations]	82	368.71
	[Amendments to industry standard forms]	82	246.05
	[Promising (warrantying) only what can be achieved]	82	302.01
	Total	656	

B1.1 Test Statistics[a,b]

	respondent's ratings
Chi-Square	30.055
df	7
Asymp. Sig.	.000

a. Kruskal Wallis Test

b. Grouping Variable: Various factors of risk mitigation in Contracts

B1.2 Contract Language Strategies Wilcoxon Rank Sum Test:

B1.2.1 Test Statistics[a]

	D1.2 Defining the timelines - D1.1 Defining sustainability related terms	D1.3 Assigning liability according to responsibility - D1.1 Defining sustainability related terms	D1.4 Inclusion of consequential damages clause - D1.1 Defining sustainability related terms	D1.5 Inclusion of liquidated damages clause - D1.1 Defining sustainability related terms	D1.6 Length and scope of obligations - D1.1 Defining sustainability related terms	D1.7 Amendments to industry standard forms - D1.1 Defining sustainability related terms	D1.8 Promising (warrantying) only what can be achieved - D1.1 Defining sustainability related terms
Z	-.580[b]	-1.209[c]	-1.047[c]	-.205[c]	-.993[c]	-3.879[b]	-1.723[b]
Asymp. Sig. (2-tailed)	.562	.227	.295	.837	.321	.000	.085

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

c. Based on negative ranks.

B1.2.2 Test Statistics[a]

	D1.3 Assigning liability according to responsibility - D1.2 Defining the timelines	D1.4 Inclusion of consequential damages clause - D1.2 Defining the timelines	D1.5 Inclusion of liquidated damages clause - D1.2 Defining the timelines	D1.6 Length and scope of obligations - D1.2 Defining the timelines	D1.7 Amendments to industry standard forms - D1.2 Defining the timelines	D1.8 Promising (warrantying) only what can be achieved - D1.2 Defining the timelines
Z	-1.917[b]	-1.406[b]	-.720[b]	-1.686[b]	-3.842[c]	-1.350[c]
Asymp. Sig. (2-tailed)	.055	.160	.472	.092	.000	.177

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

c. Based on positive ranks.

B1.2.3 Test Statistics[a]

	D1.4 Inclusion of consequential damages clause - D1.3 Assigning liability according to responsibility	D1.5 Inclusion of liquidated damages clause - D1.3 Assigning liability according to responsibility	D1.6 Length and scope of obligations - D1.3 Assigning liability according to responsibility	D1.7 Amendments to industry standard forms - D1.3 Assigning liability according to responsibility	D1.8 Promising (warrantying) only what can be achieved - D1.3 Assigning liability according to responsibility
Z	-.147[b]	-.924[b]	-.133[b]	-4.646[b]	-2.537[b]
Asymp. Sig. (2-tailed)	.883	.355	.895	.000	.011

a. Wilcoxon Signed Ranks Test

B1.2.4 Test Statistics[a]

	D1.5 Inclusion of liquidated damages clause - D1.4 Inclusion of consequential damages clause	D1.6 Length and scope of obligations - D1.4 Inclusion of consequential damages clause	D1.7 Amendments to industry standard forms - D1.4 Inclusion of consequential damages clause	D1.8 Promising (warrantying) only what can be achieved - D1.4 Inclusion of consequential damages clause
Z	-1.105[b]	-.142[c]	-4.504[b]	-2.271[b]
Asymp. Sig. (2-tailed)	.269	.887	.000	.023

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

c. Based on negative ranks.

B1.2.5 Test Statistics[a]

	D1.6 Length and scope of obligations - D1.5 Inclusion of liquidated damages clause	D1.7 Amendments to industry standard forms - D1.5 Inclusion of liquidated damages clause	D1.8 Promising (warrantying) only what can be achieved - D1.5 Inclusion of liquidated damages clause
Z	-.941[b]	-4.045[c]	-1.821[c]
Asymp. Sig. (2-tailed)	.347	.000	.069

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

c. Based on positive ranks.

B1.2.6 Test Statistics[a]

	D1.7 Amendments to industry standard forms - D1.6 Length and scope of obligations	D1.8 Promising (warrantying) only what can be achieved - D1.6 Length and scope of obligations
Z	-4.954[b]	-2.777[b]
Asymp. Sig. (2-tailed)	.000	.005

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

B1.2.7 Test Statistics[a]

	D1.8 Promising (warrantying) only what can be achieved - D1.7 Amendments to industry standard forms
Z	-2.312[b]
Asymp. Sig. (2-tailed)	.021

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

B2. Consultation Strategies Wilcoxon Rank Sum Test:

B.2 Test Statistics[a]

	D2.2 [With a professional green building consultant] - D2.1 [With an attorney]
Z	-3.576[b]
Asymp. Sig. (2-tailed)	.000

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

B3. Insurance Wilcoxon Rank Sum Test:

B.3 Test Statistics[a]

	D3.2 [Be aware of potential insurance exclusions] - D3.1 [Use of professional liability insurance, including green building risks]
Z	-1.029[b]
Asymp. Sig. (2-tailed)	.303

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

B4.1 Proper Coordination & Project Delivery Method Strategies Kruskal Wallis H Test:

B.4.1 Ranks

	Project delivery choice & Coordination	N	Mean Rank
respondent's ratings	[Design build delivery method (DB)]	82	167.73
	[Integrated project delivery method (IPD)]	82	286.13
	[Project team members coordination through building information modeling (BIM)]	82	248.71
	[Project team members coordination through a professional green building coordinator]	82	264.06
	[Experienced team]	82	254.90
	[High level of knowledge of professionals regarding green projects]	82	257.46
	Total	492	

B4.1 Test Statistics[a,b]

	respondent's ratings
Chi-Square	39.189
df	5
Asymp. Sig.	.000

a. Kruskal Wallis Test

b. Grouping Variable: Project delivery choice & Coordination

B4.2 Proper Coordination & Project Delivery Method Strategies Wilcoxon Rank Sum Test:

B4.2.1 Test Statistics[a]

	D4.2 [Integrated project delivery method (IPD)] - D4.1 [Design build delivery method (DB)]	D4.3 [Project team members coordination through building information modeling (BIM)] - D4.1 [Design build delivery method (DB)]	D4.4 [Project team members coordination through a professional green building coordinator] - D4.1 [Design build delivery method (DB)]	D4.5 [Experienced team] - D4.1 [Design build delivery method (DB)]	D4.6 [High level of knowledge of professionals regarding green projects] - D4.1 [Design build delivery method (DB)]
Z	-5.062[b]	-3.563[b]	-4.165[b]	-4.389[b]	-3.917[b]
Asymp. Sig. (2-tailed)	.000	.000	.000	.000	.000

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

B4.2.2Test Statistics[a]

	D4.3 [Project team members coordination through building information modeling (BIM)] - D4.2 [Integrated project delivery method (IPD)]	D4.4 [Project team members coordination through a professional green building coordinator] - D4.2 [Integrated project delivery method (IPD)]	D4.5 [Experienced team] - D4.2 [Integrated project delivery method (IPD)]	D4.6 [High level of knowledge of professionals regarding green projects] - D4.2 [Integrated project delivery method (IPD)]
Z	-2.091[b]	-1.069[b]	-1.330[b]	-1.408[b]
Asymp. Sig. (2-tailed)	.037	.285	.183	.159

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

B4.2.3 Test Statistics[a]

	D4.4 [Project team members coordination through a professional green building coordinator] - D4.3 [Project team members coordination through building information modeling (BIM)]	D4.5 [Experienced team] - D4.3 [Project team members coordination through building information modeling (BIM)]	D4.6 [High level of knowledge of professionals regarding green projects] - D4.3 [Project team members coordination through building information modeling (BIM)]
Z	-.878[b]	-.523[b]	-.411[b]
Asymp. Sig. (2-tailed)	.380	.601	.681

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

B4.2.4 Test Statistics[a]

	D4.5 [Experienced team] - D4.4 [Project team members coordination through a professional green building coordinator]	D4.6 [High level of knowledge of professionals regarding green projects] - D4.4 [Project team members coordination through a professional green building coordinator]
Z	-.276[b]	-.306[b]
Asymp. Sig. (2-tailed)	.782	.759

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

B4.2.5 Test Statistics[a]

	D4.6 [High level of knowledge of professionals regarding green projects] - D4.5 [Experienced team]
Z	-.134[b]
Asymp. Sig. (2-tailed)	.893

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

B5. Recommendations for Third Party Certification Kruskal Wallis H Test:

B5. Ranks

	Groups	N	Mean Rank
Scores	[Early establishment of certification goals]	82	127.13
	[Early planning for achieving green goals]	82	131.52
	[Proper and regular documentation]	82	111.85
	Total	246	

B5. Test Statistics[a,b]

	Scores
Chi-Square	4.799
df	2
Asymp. Sig.	.091

a. Kruskal Wallis Test

b. Grouping Variable: Groups

B6. Recommendations for Product Liability Prevention Kruskal Wallis H Test:

B6. Ranks

	Groups	N	Mean Rank
Scores	[Use of tested materials and products]	82	132.27
	[Testing the new materials]	82	109.67
	[Checking the availability of the material in the market]	82	128.56
	Total	246	

B6. Test Statistics[a,b]

	Scores
Chi-Square	5.732
df	2
Asymp. Sig.	.057

a. Kruskal Wallis Test