ISTANBUL TECHNICAL UNIVERSITY ★ GRADUATE SCHOOL OF SCIENCE ENGINEERING AND TECHNOLOGY

INTERNATIONAL ADOPTION FRAMEWORK OF GREEN BUILDING GUIDELINES IN DEVELOPING COUNTRIES

M.Sc. THESIS

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Department of Civil Engineering

Construction Management Programme

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Thesis Advisor: Asst. Prof. Dr. Esin ERGEN

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İSTANBUL TEKNİK ÜNİVERSİTESİ ★ FEN BİLİMLERİ ENSTİTÜSÜ

GELİŞMEKTE OLAN ÜLKELERDE ULUSLARARASI YEŞİL BİNA İLKELERİNİN ADAPTASYONU ÇERÇEVESİ

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HAZİRAN 2012

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Date of Submission : 4 May 2012
Date of Defense : 8 June 2012

FOREWORD

I first would like to thank and express my appreciation to my thesis advisor, Asst. Prof. Dr. Esin ERGEN, for her support during my thesis.
Also I would like to thank Asst. Prof. Dr. Sinem KORKMAZ for her worthwhile help and great contribution to my thesis.
I also owe sincere thanks to Turkish Green Building Association, Green Building Council Indonesia, Fatih Toptaş, also all Indonesian and Turkish respondents who contributed to this thesis with their invaluable time.
Finally, I would like to present my thanks to my beloved family (Etty Herliati, Yustanto Tarik, Muhammad Ega Nanda and Ahmad Rayyan Tarik) and my special companion (Vladimir Milcik) for supporting and encouraging me during my master's programme.

June 2012

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ABBREVIATIONS

AEC : Architectural, Engineering, and Construction
AP : Accredited Professional
ASHRAE : American Society of Heating, Refrigerating and Air-conditioning Engineers
ASTM : American Society for Testing and Materials
BCA : Building and Construction Authority
BCSD : Business Council for Sustainable Development
BEE : Bureau of Energy Efficiency
BIM : Building Information Modeling
BERDE : Building for Ecologically Responsive Design Excellence
BRE : Building Research Establishment
BREEAM : Building Research Establishment Environmental Assessment Method
CASBEE : Comprehensive Assessment System for Building Environmental Efficiency
CMES : *Consejo Mexicano de Edificación* Sustentable / Mexico Green Building Council
ÇEDBİK :*Çevre Dostu Yeşil Binalar Derneği*
DGBC : Dutch Green Building Council
DGNB : *Deutsche Gesellschaft für Nachhaltiges Bauen* / German Sustainable Building Council
GBAS : Green Building Assessment Method
GBC : Green Building Council
GBCA : Green Building Council Australia
GBCI : Green Building Council Indonesia
GBCSA : Green Building Council of South Africa
GBI : Green Building Index
GHG : Greenhouse gas
GRIHA : Green Rating for Integrated Habitat Assessment
IAPGSA : Institute of Architecture Pakistan Green Sustainable Architecture
IGBC : Indian Green Building Council
IPD : Integrated Project Delivery
JaGBC : Japan Green Building Council
KGBC : Korea Green Building Council
LEED : Leadership in Energy and Environmental Design
NAHB : National Association of Home Builders
NGBS : National Green Building Standard
NRDC : Natural Resources Design Council
NZGBC : New Zealand Green Building Council
OPEC : Organization of Petroleum Exporting Countries
SBTool : Sustainable Building Tool
TERI : Energy and Resources Institute
USAID : United States Agency for International Development
USGBC : United States Green Building Council
WMP : Waste Management Plant

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INTERNATIONAL ADOPTION FRAMEWORK OF GREEN BUILDING GUIDELINES IN DEVELOPING COUNTRIES

SUMMARY

Throughout last decade, green buildings became an important factor to reach higher sustainability through more efficient use of scarce natural resources. As a result of the development in green building concepts, many countries have established their green building councils and guidelines. Such guidelines are considered as one of the widely recognized innovations in the construction industry. This thesis focused on examining how green building guidelines diffuse in developing countries, which have relatively young green building movement compared with developed countries that have long history of the green building movement. These developing countries need to build adoption framework to accelerate the use of these green building guidelines.There are three objectives of this thesis: (1) to propose an implementation strategy for accelerating the adoption of green building in Indonesia and Turkey; (2) to compare them with the previous study to validate and improve the green building guidelines adoption framework for developing countries; and (3) to comprehend how green building guidelines as an innovation in construction industry diffuse in developing countries.In this thesis, adoption framework of green building guidelines in developing countries is built based on examples of three developing countries: India, Indonesia, and Turkey. These three countries have similar circumstances but made different progress with the green building guidelines. India has successfully established green building councils, built their own green building guidelines and proven that adoption framework of green building guidelines can catalyze the number of certified green buildings. Indonesia has established green building council and launched its green building guideline. However, the number of certified green buildings is quite low and centralized in the capital city. Turkey has already had its green building council. Nevertheless, this country is using international green building guidelines and working on framing their green building guidelines based on the existing ones. Besides, the number of certified green buildings is still low.

The thesis is done through a through literature review, evolution of green building movements, and a survey. There were 110 experts participated in the survey from Indonesia and Turkey representing individuals, private and governmental sectors. Survey in India was done by previous study with 44 experts participation. Based on the findings and comparison of survey's results in India, Indonesia, and Turkey, this thesis offers adoption framework of green building guidelines in developing countries consisting of: (1) the most useful sources of information to bring awareness about green building guidelines; (2) individual's and company's motivation to adopt green building guidelines; (3) incentives and barriers associated with green building guidelines; and (4) "diffusion of innovation" that defines the current state of each adopter organization. As the result is developed only according to data from three countries, future verification based on other countries experiences will be necessary.

Nevertheless, the international adaption framework proposed in this thesis can serve as a foundation for future progress towards more sustainable buildings in many developing countries.

GELİŞMEKTE OLAN ÜLKELERDE ULUSLARARASI YEŞİL BİNA İLKELERİNİNADAPTASYONU ÇERÇEVESİ

ÖZET

Son on yıldır, yeşil binalar kıt doğal kaynakların daha etkin kullanımı ile yüksek sürdürülebilirliğe ulaşmak için önemli bir faktor haline geldi. Yeşil bina kavramları gelişmenin bir sonucu olarak, bir çok ülke kendi yeşil bina konseylerini kurdu ve ilkelerini oluşturdu. Bu tür ilkeler inşaat sektöründe on de gelen yeniliklerden biri olarak kabul edilmektedir. Bu tezde, gelişmiş ülkelerle karşılaştırıldığında yeşil bina hareketinde yeni olan gelişmekte olan ülkelerde yaygın yeşil bina kurallarının nasıl uygulanabileceği üzerinedir. Bu gelişmekte olan ülkelerin yeşil bina kılavuzların kullanımı hızlandırmak için bir yol haritasına ihtiyaç duyulmaktadır. Bu tezin üç ana hedefi vardır: (1) Endonezya'da ve Türkiye'de yeşil binanın benimsenmesi için bir uygulama stratejisi önermek; (2) bu stratejiyi doğrulamak ve geliştirmek için önceki çalışma ve daha ileri durumdaki ülkelerle karşılaştırmak; ve (3) gelişmekte olan ülkelerde inşaat sektöründe yaygın bir yenilik olarak yeşil bina kurallarının ne kadar kavrandığını görmek. Bu tez çalışmasında, gelişmekte olan ülkelerde yeşil bina kurallar benimsenmesi çerçevesinde üç gelişmekte olan ülke bazalınmıştır: Hindistan, Endonezya ve Türkiye. Bu üç ülke benzer şartlara sahip olduğu halde yeşil bina konusunda farklı kurallar uygulamış ve farklı ilerlemeler kaydetmiştir. Hindistan başarıyla, yeşil bina konseylerini kurmuş, kendi yeşil bina inşa kurallarını uygulamış ve yeşil bina ilkelerin benimsenmesi stratejisiyle sertifikalı yeşil bina yapımını kolaylaştırmıştır. Endonezya yeşil bina konseyini kurmuş ve yeşil bina kılavuzunu başlatmıştır. Ancak, sertifikalı yeşil binaların sayısı başkent dışında oldukça düşük ve başkentte kümelenmiş bir durumdadır. Türkiye zaten kendi yeşil bina konseyine sahiptir. Yine de, bu ülkenin uluslararası yeşil bina kurallarını örnek olarak ve mevcut olanlara dayanarak kendi yeşil bina kurallarını belirlemek için çalışmaktadır. Üstelik, sertifikalı yeşil binaların sayısı hala oldukça düşüktür.

Literatür taraması, yeşil bina hareketlerinin evrimi ve yeşil bina üzerine bir anket aracılığıyla bu tez hazırlanmaktadır.Özel sektör ve kamu sektörünü temsil eden Endonezya ve Türkiye'den 110 uzmanankete katılmaktadır. Hindistan'da 44 uzman önceki çalışmada ankete katılmaktadır. Bulgular Hindistan, Endonezya ve Türkiye'de anket sonuçlarının karşılaştırılmasına dayanarak, bu tez gelişmekte olan ülkelerde oluşturulan yeşil bina kurallarının benimsenmesi hakkında bir çerçeve çizmektedir: (1) yeşil bina kuralları hakkında farkındalık oluşturmak için en yararlı kaynaklardan bilgi edinmek; (2) kişilerin ve şirketlerin yeşil bina kurallarını kabullenmesi için motive etmek, (3) teşvikler uygulamak ve yeşil bina kuralları ile ilgili sorunları çözmek; ve (4) benimseyen her kurumun durumunu "yenilik uygulamaları" ile tanımlamak. Sonuçta bu üç ülke, deneyimlerini gerek duydukları gelecek doğrulama verilerini sadece gelişmiş ülkelerin durumlarına bakarak oluşturmuş gibilerdir. Bununla birlikte, bu tez, önerdiği uluslararası adaptasyon çerçevesiyle, bir çok

gelişmekte olan ülkede daha sürdürülebilir binaların yapımlarının yaygınlaştırılması için bir temel olarak hizmet verebilir.

Hindistan'daki, Endonezya ve Türkiye'deki araştırma sonuçlarının karşılaştırılmasına dayanarak, gelişmekte olan ülkelerde yeşil bina kuralları inşa edilmiştir. Her üç ülke için ortak temel faktörler şunlardır: (1) atölye / seminer ve toplumda yeşil bina kuralları hakkında farkındalık getirebilir bilgi kaynağı olarak eğitim; (2) toplumsal vicdan ve en önemlisi kişinin motivasyonları gibi çevre dostu uygulamaların gösterilmesi; (3) şirketin en önemli motivasyonu olarak çevre dostu uygulamaları göstermek; (4) yeşil bina kurallarının etkin uygulanması için kurumsal çerçevenin uygunluğu ve (vergi indirimi, hibe, vb) gerekli yeşil bina kılavuzların benimsenmesi için en önemli mali teşvikler; ve (5) yeşil bina ilkelerinin benimsenmesini önleyen en önemli engel olarak vergi indirimi ve hibe şeklinde teşvik eksikliği.

Yeşil bina kurallarının stratejisi konusunda Hindistan'da, Endonezya ve Türkiye'de bazı farklılıklar vardır. Eğitim ya da araştırma ile ilgili bilgi kaynakları, Hindistan için uygundur, ve eğitim, araştırma ya da popüler medya ile ilgili bilgi kaynaklarının kombinasyonu Endonezya ve Türkiye için daha uygundur. Birey ve şirketin motivasyonu hakkında konuşmak,pazar avantajı kazanmak,şirket politikası ve tanıtım değeri Hindistan üzerinde büyük etkiye sahiptir.Diğer taraftan regülatör Endenozya'da önemli rol oynar,müşteri isteğinin ve karın Türkiye üzerinde büyük bir etkisi varken. Bu özel motivasyonlar teşvik ve engelleri etkileyecektir. Eğitim ve bilgilendirme teşvikleri Hindistan ve Endonezya'da önemlidirler.Ayrıca,yönetmelikler Endonezya ve Türkiye'de de önemlidirler.. Buna ek olarak, yerel yönetimler Türkiye'de gereklidir. Müşterinin ve inşaat sektörünün doğasındaki engeller Hindistan'ı ve Endonezya'yı etkiler. Maliye ile ilgili engel de Hindistan'ı etkiler. Regülatör Endonezya'da kaydadeğer bir rol oynadığından beri, onların tutumları Türkiye kadar bu ülkeyi de etkileyecektir. Yerel caydırıcı önlemler ve yeşil bina hareketi Türkiye'de de belirleyicidir.

Genel engellere gelince, devletten, toplumdan, müşterilerden, kar amacı gütmeyen kuruluşlardan, şirketlerden, tedarikçilerden, bireylerden ve diğer açılardan engeller olarak kategorize edilebilir. Mülk sahibi, işletmeler ve finans kurumlar için hiç bir teşvik, uygun enstrümanların eksikliği (örneğin vergi iadeleri); uygun politikaların, mevzuat ve kanunların eksikliği, zayıf izleme mekanizmaları; pazar denetleyecek kurumların eksikliği, devletten kaynaklanan yatırım ve finansal destek eksikliği Hindistan'da, Endonezya ve Türkiye'de devletten kaynaklanan engellerdir. Uzun vadeli tasarruflar üzerinde faiz ve belirsiz bilgi eksikliği müşteri açısından engellerdir. Finansman sorunları ve hükümet düzeyinde teşvik yetersizliği kar amacı gütmeyen kuruluşların engelleridir. Şirketlerdeki ana engel sorunları nasıl tanımak gerektiğinin her zaman bilinmemesi eksikliğidir. Yerel standartlara sahip mevcut bina kılavuzlarının uyumluluk sorunları ve geri dönüşen materyal içeriğini etiketlemek için standart sistemlerin eksikliği. Bil-nasıl/faiz eksikliği; teşvik eksikliği, yüksek maliyet algısı; sermayeye erişim eksikliği; kısa planlama ufukları ancak uzun geri ödeme dönemleri;inşaat sektörünün muhafazakar yapısı ve yeşil teknolojilerin yeni gönüllü kabul eksikliği bireylerin engellerinin örnekleridir. Ayrıca,uluslar arası yeşil bina klavuzlarını kullanan ülkelerin genellikle karşılaştıkları diğer engeller de vardır.Bu engellerin örnekleri yerel standartlardaki LEED (Leadership in Energy and Environmental Design) veya BREEAM (Building Research Establishment Environmental Assessment Method) arasındaki uyumluluk;yerel yönergelerin eksikliği; LEED referans kodlarının çok az bilgisi

(örneğin, ASHRAE - Amerikan Isıtma, Soğutma ve Klima Mühendisleri) standartların çok az bilgisi (örneğin, ASTM - Amerikan Malzeme ve Test Derneği) ve ürün sertifikasyonları (örneğin, Greenseal) ve küçük LEED kuralları içindeki gereksinimlerin çok az bilgisi.

"Yeniliğin yayılması" hakkında konuşmak; tez anket sonuçları Rogers modeli (2003) temel alınarak geliştirilen her uygulayıcı örgütün mevcut durumunu tanımlayan benzer kategoriler göstermektedir. Örneğin, çevre grupları ortak bir yenilikçi olarak görülür; büyük iş evleri erken benimseyici olarak hareket eder; ve ilgili ajanslar Hindistan'da, Endonezya ve Türkiye'de sık görülen erken çoğunluk gibi ticaret dernekleridir. Bununla birlikte, geç çoğunluk ve tembeller için her ülkenin farklı benimseyicileri vardır. Bununla birlikte, her bir kategorinin bölümü olarak bazı farklılıklar da mevcuttur. Hindistan'a bağlı üye grupların çoğu erken benimseyen (6 grup) olarak dağıtılır; Endonezya'da ve Türkiye'de bağlı üye grupların çoğu erken çoğunluk olarak yoğunlaşırken (her iki ülkede de 8 grup vardır). Bu bulgular, yeşil bina kurallarının Endenozya'daki ve Türkiye'dekinden Hindistan'da daha iyi benimsendiğini ve dağıldığını gösterdi. Yine de, bu üç ülkede yeni uyum yollarının benzer olduğundan bahsetmek hala dikkat çekicidir.

Sonuç olarak, bu tez gelişmekte olan ülkeler için yeşil bina kurallarının benimsenmesi çerçevesini genişletti. Bu, Hindistan'da (Potbhare ve ark., 2009b), Endonezya ve Türkiye'de ortak bulgular ve araştırmalara dayanarak oluşturuldu. Yeşil bina ilkelerinin benimsenmesi çerçevesinde kapsamlı faktörler ile ilgili diğer gelişmekte olan ülkeler tarafından seçilebilir üç seçenek vardır: (1) Hindistan'da, Endonezya ve Türkiye'de yalnızca ortak olan başlıca faktörleri seçmek; (2) bu kendilerine benzer koşullar ve özelliklere sahip seçilen üç ülkelerden birini seçmek; veya (3) Hindistan'daki, Endonezya ve Türkiye'deki büyük ortak faktörleri ve farklı olan diğer değerli faktörleri birleştirmek. Bu tezin sonuçları Hindistan, Endonezya ve Türkiye gibi benzer yeşil bina hareketine sahip diğer gelişmekte olan ülkeler tarafından da kullanılabilir. Hindistan, Endonezya ve Türkiye farklı koşullara sahip olmasına rağmen seçilen bu üç gelişmekte olan ülkelerde ortak yeşil bina kriterleri vardır.

1. INTRODUCTION

The importance of green buildings and sustainability has increased in the last decade due to the buildings' large consumption of natural resources. This large consumption leads to environmental damage, such as ecosystem change and global warming. For example, in the United States, buildings consume approximately 40% of all energy, 72% of all electricity and produce 39% of primary greenhouse gas emissions (DOE, 2007). Moreover, buildings use one-sixth of the world's freshwater, one-quarter of wood harvest, and two-fifths of its material and energy flows (Gottfried, 2005). The structures of the buildings also affect their location, including the spring, quality of the air, and surrounding transportation system (Rodman and Lenssen, 1996). There is an estimation showing that 70% of all timber is used for buildings, 45% of energy generated is consumed to power and maintain buildings, and 5% to construct buildings (Davoudi and Layard, 2001).

By considering all these facts, green buildings are designed to minimize their damage to the environment. Thus, many countries developed their green building guidelines or certification systems, or they are working on developing them. For instance, Building Research Establishment Environmental Assessment Method (BREEAM) in the UK, Leadership in Energy and Environmental Design (LEED) in the USA, Comprehensive Assessment System for Building Environmental Efficiency (CASBEE) in Japan, GreenStar in Australia, Sustainable Building Tool (SBTool) in Canada and Europe, EcoProfile in Norway, and PromisE in Finland are widely used as green building certification systems.

The first certification system is BREEAM which was founded in 1990 in the UK (BRE, 2012). Since then, several countries have released their own green building guidelines (Seo, 2002). Those countries, which are mostly developed countries, have implemented their green building guidelines and many other developing countries are in the process of framing these green building guidelines for their societies through rapid adoption framework (Bondareva 2005, Dalal-Clayton et al. 1994,

Landman 1999, Melchert 2005). Adoption framework is an adaptive strategy to deal with unexpected events and to accelerate in achieving the expected target. Since every country has its own characteristics and conditions not only in climate, but also in the availability of materials, power generation, culture, and legislative support, each country needs to establish its own green building guideline and its adoption framework that reflects its local situations (Erten et al., 2009).

Having the ability to innovate is one of the keys of success in construction industry (Goodrum and Haas, 2000). Innovation comes from Latin word “novus” which means new, hence it can be defined as the introduction of something new (Arditi et al., 1997).Innovation is an object, practice, or idea perceived as new by a person or other unit of adoption. Due to project based and fragmented construction industry, the patterns of innovation in this industry mostly remain hidden (Aouad et al., 2010). Building Information Modeling (BIM) (Azhar et al., 2008), alternative forms of project delivery (i.e. Integrated Project Delivery [IPD]) (Kent and Gerber, 2010), green building products and technologies such as photovoltaics (Lippiatt, 1999), and adoption of green building approaches (Potbhare et al., 2009b) are several examples of innovations in construction industry. Green building guidelines and certification systems have received the attention at organization, institution, city, and country levels. Besides, these have influenced the principles of Architectural, Engineering, and Construction (AEC) industries. Because of that, green building guidelines and certification systems have also changed the way how things work in construction industries. Thus, understanding how diffusion of innovation theory applies in the process of adoption works for developing countries is very important. The adoption of green building certification systems in the developed countries can be associated with the long history of green building movement in these nations. The emergence of green building certification systems and their acceptance has created a new trend for the developing countries. Next step for the developing countries is to formulate an implementation method that can ensure the rapid adoption of these green building certification systems in their societies.

A recent study (Korkmaz, et al., 2009) reviewed green building movement timelines in the U.S., India, and Turkey. Another study (Potbhare et al., 2009b) determined the adoption strategies in the U.S. and India which are both based on LEED (India has its own LEED named LEED-India), and presented the adoption of green building

guidelines based on the survey conducted in India.The research study carried out in this thesis builds on Potbhare at al.'s study (2009b) and conducts a similar survey to determine an adoption framework in Turkey, Indonesia and other developing countries with similar circumstances. India has successfully established green building councils, built their own green building guidelines, and proven that adoption framework of green building guidelines can catalyze the number of certified green buildings. Indonesia has established green building council and launched its green building guideline. However, the number of certified green buildings is quite low and centralized in the capital city. Turkey has already had its green building council. Nevertheless, this country is using international green building guidelines (LEED and BREEAM), and working on framing their green building guideline based on the existing ones. Besides, the number of certified green building is still low.

1.1 Aim and Objectives

This thesis aimed to validate previously defined strategies for developing countries by Pobhare, et al. (2009b) based on survey performed in India and extend it by using data from the other selected developing countries which are Indonesia and Turkey. In order to achieve this aim, the objectives are determined as followed:

(1) to propose an implementation strategy for accelerating the adoption of green building guidelines in Indonesia and Turkey;

(2) to compare them with the previous study to validate and improve the green building guidelines adoption framework for developing countries; and

(3) to comprehend how green building guidelines as an innovation in construction industry diffuse in developing countries.

To achieve above objectives, the same survey performed by Potbhare, et al. (2009b) was conducted in Indonesia and Turkey. Furthermore, the results were compared and integrated with the results of the previous study.

1.2 Scope of the Thesis

Inthis thesis the adoption strategies of green building guidelines from its required social attributes, green building movement in selected developing countries (India, Indonesia, and Turkey), and the analysis of conducted surveys' results in those

developing countries are included. On the other hand, the elements and assessment of green building guidelines are not included in this thesis.

1.3 Methodology of the Thesis

The steps of the methodology used in this thesis are given below:

- Reviewing the existing green building guidelines used worldwide
- Conducting the survey performed in India to relevant respondents in Indonesia and Turkey
- Analyzing the responses and comparing them with each other
- Proposing an adoption framework of green building guidelines in developing countries by extending the one proposed by Potbhare et al. (2009b) based on Indonesia and Turkey's results.

In this thesis, I firstly reviewed the existing green building guidelines that is used worldwide. This helped me in understanding the characteristics of an adoption framework for green building guideline that can support its adoption in a country. Potbhare et al. (2009b) has found the characteristics and used these as the foundation in conducting survey about adoption framework for green building guidelines in India. Secondly, I conducted a survey in Indonesia and Turkey which was previously developed and used by Potbhare, et al. (2009b) for India case. The survey questionnaire was distributed among 175 participants in Indonesia during eight weeks and 212 participants in Turkey during six weeks by email or in person. The response rate for Indonesia is 29%, while the response rate for Turkey is 28%. Potential participants were selected from the adopters of green building guidelines, such as architects, engineers, sustainable building consultants, contractors, or developers; researchers or educators; and government officials using public online databases. Thirdly, I analyzed the responses of survey in India, Indonesia, and Turkey, then compared them with each other. Lastly, I proposed an adoption framework of green building guidelines in developing countries by extending the one proposed in previous study by Potbhare et al. (2009b) based on Indonesia and Turkey's survey results.

1.4 Organization of the Thesis

The background information of green building guidelines and green building movements in India, Indonesia, and Turkey are presented in Chapter 2. The proposed adoption framework of green building guidelines in India, Indonesia, Turkey, and developing countries are mentioned in Chapter 3. Chapter 4 explains the diffusion of innovation of green building guidelines in India, Indonesia, Turkey, and developing countries. Finally, the conclusions and recommendations are given in Chapter 5.

2. LITERATURE REVIEW

The effects of environmental deterioration have historically been local in scale, visible to the community and reversible; but current environmental concerns are global in scale and generational in consequence. Many methods have been developed to expose tangible effects of buildings to environment. Most of these methods are green building guidelines and certification systems. To identify the required attributes for adoption of green building certification systems, Potbhare et al. (2009b) has examined LEED, BREEAM, and CASBEE as mostly used systems up to 2009. To ensure that these attributes are suitable for current condition, green building guidelines in the world including the mostly used worldwide four green building guidelines and world green building council are discussed. After that, it is found that social attributes associated with green building guidelines and characteristics of a green building guideline in which Potbhare et al. (2009b) mentioned are still suitable for current condition. Since this thesis is focus on three selected developing countries, green building movement in India, Indonesia, and Turkey are also discussed.

2.1 Green Building Guidelines

Mead (2001) stated that "green buildings are designed, constructed, operated, and demolished in an environmentally and energy efficient way". Even though green buildings can reduce the impacts of environmental deterioration, there is a need for qualitative approaches to determine the criteria of green buildings. Legislation has been viewed as the most appropriate means of solving environmental issues through the establishment of rules (Cole, 2003). The standards developed for this purpose usually related only to the fulfillment of the criteria. On the other hand, there is another important thing to find out how appropriate the way of providing standards is.

As a result of the development in green building concepts, many countries have established their green building councils also developed standards and rating systems. Green building rating system is intended to promote voluntary improvements in design and construction practices. If a building accumulates a sufficient number of points, it may be certified by the green building alliance / green building council as a green building. These let the regulators, professionals, and consumers prefer green buildings instead of normal buildings. Green building rating systems award credits for optional building criteria that support green design in various categories for example, reduced energy use, greater use of daylight rather than artificial lights, recycling construction waste, rainfall runoff reduction, availability of public transit access. The number or letter of credits determines the level of achievement (Cole, 2003).

To identify the required attributes for adoption of green building certification systems, the mostly used systems are examined and explained in the following sub chapter.

2.1.1 Green building guidelines in the world

There are several green building guidelines, certification systems, accreditations or assessment tools which are used worldwide as follows (World GBC, 2011):

1. Australia Nabers / Green Star (developed based on LEED and BREEAM by Green Building Council of Australia)
2. Brazil: AQUA / LEED Brasil,
3. Canada: LEED Canada/ Green Globes / Built Green Canada / SBTool,
4. China: GBAS (Green Building Assessment Method),
5. Czech Republic: SBTool CZ,
6. Finland: PromisE,
7. France: HQE,
8. Germany: DGNB (*Deutsche Gesellschaft für Nachhaltiges Bauen* / German Sustainable Building Council) / CEPHEUS,
9. Hong Kong: HKBEAM,
10. India: LEED-India (Indian Green Building Council) / GRIHA (Green Rating for Integrated Habitat Assessment),
11. Indonesia: Greenship by GBCI (Green Building Council Indonesia),

12. Italy: Protocollo Itaca by Green Building Council Italia,
13. Japan: CASBEE,
14. Jordan: EDAMA (Energy, Water, and Environment Productivity),
15. Korea: Daejeon by KGBC (Korea Green Building Council),
16. Malaysia: GBI (Green Building Index) Malaysia,
17. Mexico: CMES (*Consejo Mexicano de Edificación* Sustentable / Mexico Green Building Council),
18. Netherlands: BREEAM-NL by DGBC (Dutch Green Building Council),
19. New Zealand: NZGBC (New Zealand Green Building Council) / Green Star New Zealand,
20. Norway: ECOPROFILE (A method for simplistic environmental assessment of existing buildings),
21. Pakistan: IAPGSA (Institute of Architecture Pakistan Green Sustainable Architecture),
22. Philippines: BERDE (Building for Ecologically Responsive Design Excellence),
23. Portugal: Lider A,
24. Republic of China (Taiwan): Green Building Label,
25. Singapore: BCA (Building and Construction Authority) Green Mark,
26. South Africa: GBCSA (Green Building Council of South Africa) Green Star SA,
27. Spain: VERDE,
28. Switzerland: Minergie,
29. United Arab Emirates: Estidama,
30. United Kingdom: BREEAM, and
31. United States: LEED / Living Building Challenge / Green Globes / Build it Green / NAHB (*National Association of Home Builders*) NGBS (National Green Building Standard) / International Green Construction Code.

BREEAM, LEED, Green Star, and CASBEE are mostly used green building guidelines, certification and rating systems in the world (Table 2.1). All of them were released in developed countries which have a long green building movement.

Table 2.1 : Most commonly used green building guidelines.

Detail	Green building council (GBC)			
	BRE	USGBC	Green Star	JaGBC
Country of origin	Great Britain	The U.S.	Australia	Japan
Establishment of GBC	1920	1993	2002	2001
Green building guideline (GBG)	BREEAM	LEED	Green Star	CASBEE
Establishment of GBG	1990	2000	2003	2005
Current certified buildings	Over 200,000	30,933	390	200
Current registered buildings	Over 1,000,000	Over 100,000	550	N/A
Rating (lowest to highest)	Pass, good, very good, excellent, outstanding	(0-39 points) certified, (50-59 points) silver, (60-79 points) gold, (80-110) platinum	(45-59) 4 Star Green Star, 5 Star Green Star (60-74), and 6 Star Green Star (75-100)	(C) Poor, (B-) fairly poor, (B+) good, (A) very good, (S) excellent
Reference	(BRE, 2012)	(USGBC, 2012)	(GBCA, 2012)	(IBEC, 2012)

2.1.2 Building research establishment environmental assessment method

Building Research Establishment (BRE) is a British organization which was established in 1920 and administers the BREEAM system. BRE established BREEAM in 1990 with several schemes for offices, retail, industrial, education, eco-homes, the code for sustainable homes, healthcare, bespoke, multi-residential, international, courts, prisons, communities, domestic refurbishment, in-use, and other buildings for leisure, complexes, laboratories, community buildings, and hotels. Several data requirements such as construction records, architectural, drawings/diagrams, engineer calculations, energy model report/energy performance certificate, project narratives/declarations, site visit, and BREEAM Tool filled out are needed. There are over 200,000 buildings certified and over a million registered for BREEAM certification (BRE, 2012).

BRE has created partnerships with a number of government agencies (non-departmental public bodies) which are also paid members of BRE; central

government departments on the development of regulation, policy and legislation relating to the build of environment; and universities with expertise in the built environment. BRE has held monthly events which often take the form of tropical debates on policy or technical issues. These activities are beneficial to raise the awareness and policy influence.

BREEAM categories include management, health and well-being, energy, transport, water, materials, waste, land use and ecology, and pollution. The validation criteria have two stages of data collection and audit process of design and construction. BRE may perform an in-depth audit of the project as well. Any project outside the UK must undergo a prequalification showing that local codes are equivalent to BREEAM criteria. The ratings of this certification from the lowest to the highest are pass, good, very good, excellent, and outstanding. All buildings attempting a BREEAM qualification require the full services of a certified BRE Assessor. The Assessor compiles all project data which will show the building meets BREEAM criteria. The Assessor may assist in design guidance and project management as well. BRE staff will perform two audits of the material submitted by the Assessor. BRE has the option to perform a Site Audit to ensure the as-built project meets design criteria.

2.1.3 Leadership in environmental and energy design

In the U.S., green building movement started in 1962 and continued in 1972 through an oil embargo laid by the Organization of Petroleum Exporting Countries (OPEC). This incident raised people's environmental awareness and developed alternative sources of energy to reduce the unwanted usage of oil in their daily life. After that in 1987 Brundtland Commission defined sustainable development in their report titled "Our Common Future". It took 31 years from its start to establish the U.S. Green Building Council (USGBC) (Korkmaz et al., 2009). However, once LEED was established in 2000 by USGBC and Natural Resources Design Council (NRDC), its diffusion in AEC industry in the U.S. happened relatively fast due to the long history of green building movement in the U.S. As of March, 2012, there are 30,933 certified and over 100,000 publically registered projects for LEED certification (USGBC 2012).

USGBC has conducted educational programs that focus on teaching the currently developed LEED rating systems to assist building industry professionals in learning,

understanding, and applying the information to buildings that are seeking LEED certification. It has also provided workshops and online courses to help increase a professional knowledge, expand their practice, and maximize their success in the green building industry. Those educational programs are funded through registration fees from each attendee to cover the costs of development and delivery. The LEED Reference Guide and US-GBC website resources provide all guidelines. Once finished, all documentation is compiled and submitted online to the US-GBC. One set of comments will be issues, and corrections can be made. The full review process can last 6 months. Comments are detailed and technically specific.

LEED has several schemes for new construction, existing buildings in operation and maintenance process, commercial, interiors, shell and core, schools, retail, healthcare, homes, and neighborhood development. Its priorities are physical site, community, transportation, heat island, light pollution, water use, sewage, energy efficiency, greenhouse gas (GHG) emissions, commissioning, green power, materials, waste, air quality, fresh air, quantity, occupant, and comfort. Data requirements such as construction records, engineer calculations, energy model report, owner/developer narratives and declarations, project drawings and diagrams are compulsory provided.

It has some categories like sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, and innovation in design. The validation criteria are based on data collection which can be easily split between design and construction phases. Based on LEED V.3: Leadership in Energy and Environmental Design 2009 Systems, the ratings from the lowest to the highest are certified (0-39 points), silver (50-59 points), gold (60-79 points), platinum (80-110 points).

2.1.4 Green star

Green Building Council Australia (GBCA) was founded in 2002 and established Green Star in 2003 with several schemes for education, healthcare, industrial, multiunit residential, office, office interiors, retail center, and public. Up to the end of 2011, there are 390 projects certified and 550 projects registered (GBCA, 2012). Those projects are located in Australia. GBCA have created partnerships with Property Council of Australia whom they work with annually to host Green Cities,

Australia’s largest green building conference; all levels of government who are also the members of GBCA; and the owners of Green Star certified and registered buildings. Besides, in order to promote Green Star, GBCA also offers educational programs by providing Green Star training courses and seminars. Those programs are self-funding with revenue earned from course fees covering costs and providing funds for additional development of the program.

Drawing, specifications, material (safety) data sheets, project timeline, design intent document, Waste Management Plant (WMP), copy of third-party, documents, and contract project narratives/declaration are its data requirements. Its categories are divided into management, indoor environment quality, energy, transport, water, materials, land use and ecology, emissions, and innovation. To be able to assessed, a project must meet the prerequisites such as space use, spatial differentiation, conditional requirements, and timing of certification. If the results of the assessment have validated the project's achievement of a score of 45 or above, the GBCA will award a Green Star Certified rating. The ratings from the lowest to the highest are 4 Star Green Star Certified Rating (score 45-59) signifies "Best Practice", 5 Star Green Star Certified Rating (score 60-74) signifies "Australian Excellence", and 6 Star Green Star Certified Rating (score 75-100) signifies "World Leadership".

2.1.5 Comprehensive assessment system for building environmental efficiency

The Japan Green Building Council (JaGBC) was established in 2001. Due to the growing needs for a certification of the assessment result, CASBEE was released in 2005. There is no registration system on CASBEE and only the certification system. The total number of certified buildings is 200 (IBEC, 2012). JaGBChas been constituted of government agencies, private sector, and academia to develop a national assessment system and to promote it based upon this close partnership and collaboration. It conducted biannual trainings and seminars in Tokyo and other major cities in Japan. These educational programs are funded by the registration fees paid by the attendees. CASBEE was developed according to the following policies:

1. the system should be structured to award high assessments to superior buildings, thereby enhancing incentives to designers and others,
2. the assessment system should be as simple as possible,
3. the system should be applicable to buildings in a wide range of applications, and

4. the system should take into consideration issues and problems peculiar to Japan and Asia.

CASBEE is composed of four assessment tools corresponding to the building lifecycle. "CASBEE Family" is the collective name for these four tools and the expanded tools for specific purposes, which are listed below. The CASBEE assessment tools are CASBEE for Pre-design, CASBEE for New Construction, CASBEE for Existing Building and CASBEE for Renovation, to serve at each stage of the design process. Each tool is intended for a separate purpose and target user, and is designed to accommodate a wide range of uses (offices, schools, apartments, etc.) in the evaluated buildings.

There are some schemes for new construction, existing building, renovation, heat island, urban development, urban area & buildings, home, and property appraisal. The priorities are energy efficiency, resource efficiency, local environment, and indoor environment. These four fields are largely the same as the target fields for the existing assessment tools in Japan and abroad, but they do not necessarily represent the same concepts, so it is difficult to deal with them on the same basis. Data requirements include quality and loadings. Building environmental quality & performance evaluates the improvement in living amenity for the building users, within the hypothetical enclosed space (the private property). Meanwhile building environmental loadings evaluates the negative aspects of environmental impact which go beyond the hypothetical enclosed space to the outside (the public property).

As the result of two type required data, the categories of CASBEE are based on quality and loadings as well. Building environment quality & performance is broken down into three categories of Q-1 (indoor environment), Q-2 (quality of service) and Q-3 (outdoor environment on site). Reduction of Building Environmental Loadings is also sub-grouped into LR-1 (energy), LR-2 (resources and materials) and LR-3 (off-site environment). The ratings of CASBEE from the lowest to the highest are poor (C), fairly poor (B-), good (B+), very good (A), and excellent (S).

2.1.6 World green building council

World Green Building Council (World GBC) was founded in San Francisco in 1999. The founding countries were the U.S., Canada, Spain, the U.K., Japan, and Korea.

The objectives of this council are to assist Green Building Councils to form and transform their own markets, to share information on successful strategies for market transformation, to have a collective voice in international affairs and in fund-raising, and to develop a common understanding on difficult issues. Currently, there are 20 established countries, 9 emerging countries, 26 prospective countries, and 27 associate group countries in World GBC membership (Fig.2.1). India is in Asia Pacific's established group member, Indonesia is in Asia Pacific's emerging group member, and Turkey is in Europe's emerging group member of World GBC (World GBC, 2011).

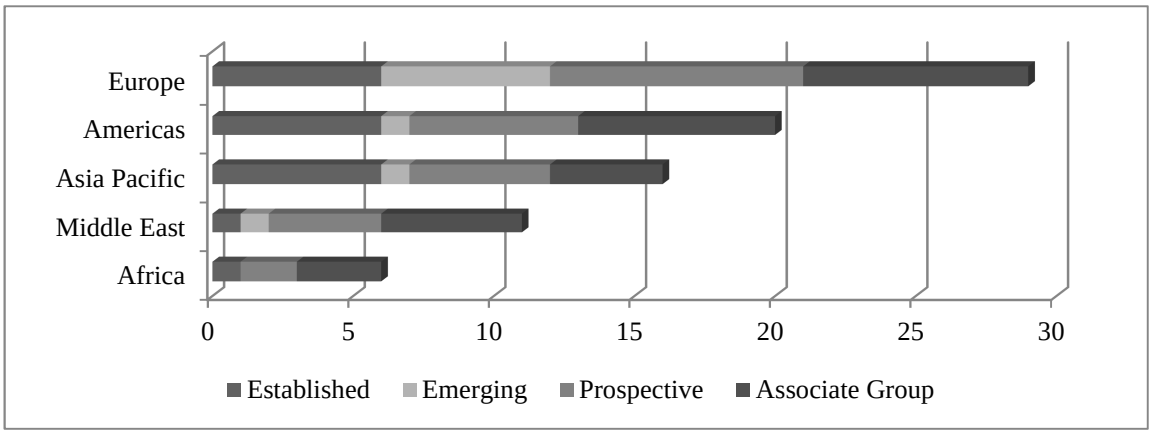

Figure 2.1 : World Green Building Council members (World GBC, 2011).

2.1.7 Social attributes associated with green building guidelines

Potbhare et al. (2009b) has identifed the social attributes associated with green building guidelines. His findings are based on comparative review of worldwide major existing green building guidelines (LEED, BREEAM, and CASBEE) and the theories of Bondareva (2005), Dalal-Clayton et al. (1994), Landman (1999), and Melchert (2005) which stated that the environmental awareness, education level, and skilled workforce of the society effectthe adoption of green building guidelines. These have been proved based on the overview on how developed countries have raised people's awareness on the concept of green buildings and policy influence. Besides, these findings are still suitable for current condition. Thus, this thesis used the similar survey that Potbhare et al. (2009b) conducted. The survey is based on the social attributes and characteristics associated with green building guidelines. As Potbhare et al. (2009b) mentioned,social attributes in a country vary according to the unit in the society that adopts green building guidelines. The units in the society that

can adopt these guidelines are classified under three categories for this research as shown in Table 2.2 below.

Table 2.2 : Classification of the units in a society adopting green building guidelines (Potbhare et al., 2009b).

Category name	Organization adopting green building guidelines
Government	Federal, state and local governments and related organizations, semi-government organizations, political leaders
Profit and non-profit organizations	Large business houses, multi-national corporations, community groups, media, trade organizations, manufacturers, suppliers, universities, educational institutions, non-governmental organizations, environmental groups
Individuals	General contractors, engineers, architects, owners, developers, sustainable building consultants, consumers

Government is the first category that plays an important role to provide incentives to organizations to incorporate green building guidelines in their projects. Endorsement by the government, for example a policy or a regulation, can catalyze green building guideline. Following is the list of initiatives a government can undertake to accelerate the adoption of green building guidelines (Bondareva, 2005; Dalal-Clayton et al., 1994; Landman, 1999; Potbhare et al., 2009b):

- Providingtax and subsidies benefits to the adopters;
- Enforcing special regulations and laws;
- Providing research data and funding to the environmental groups and non-governmental organizations (NGOs);
- Providing information to the public by promoting these guidelines in the media and publishing articles;
- Assessing and monitoring private actions that pose threat to the adoption of these guidelines in the society;
- Taking capacity building measures to increase the awareness of these guidelines in the society.

Several examples of the attributes associated with the government may hinder the adoption of green building guidelines in the society. For example, corruption within the government, also the gap between the actual implementation and the government's false belief that once they formulate the policy or pass a law it will be implemented. Besides, there are also difficulty of enforcing the sustainable building

regulations in the society and need to prioritize other issues of national interest such as poverty, unemployment, and illiteracy (Bondareva, 2005; Dalal-Clayton et al., 1994; Landman 1999; Potbhare et al., 2009b).

The next category is profit and non-profit organizations which represents the largest portion of green building guidelines adopters in the society. These organizations can be motivated if information related to economic, environmental and reputational benefits associated with a green building guideline is provided. Furthermore, it is essential to provide incentives and resolve barriers for the adopter organizations in this category to ensure the rapid acceptance of green building guidelines.Below is the list of the incentives that can be given to these adopter organizations (Bondareva, 2005; Dalal-Clayton et al., 1994; Landman, 1999; Potbhare et al., 2009b):

- Institutional framework which can be provided to these organizations for effective implementation of green building guidelines;
- Proactive governmental agencies which encourage organizations to adopt green building guidelines;
- Seminars and educational programs which can initiated to increase awareness among owners, developers, constructors, and policy makers related to green building guidelines;
- Reliable information on cost and other benefits of green building guidelines;
- Publicity provided to adopter organizations in this category through media (e.g. television shows, print media, internet, radio programs) for their adoption of green building guidelines.

Besides above incentives, the barriers associated with the adoption of green building guidelines need to be resolved. These barriers can obstruct the process of adoption as well as cancel out the incentives given by the governmental agencies. The barriers associated with the adoption of these guidelines are (Bondareva, 2005; Dalal-Clayton et al., 1994; Landman, 1999; Potbhare et al., 2009b):

- Lack of infrastructure, for exampleinformation related to green building guidelines at local or regional levels, availability of certifying agencies, and demonstration projects;
- High cost associated with the certification, “green” products and technology;

- Unclear information on the recovery of long-term savings on the adoption of "green" technology or products in the projects;
- Unorganized nature of the construction industry;
- Lack of incentives such as tax relief or grants from the government;
- Lack of financing from banks for adopting green building guidelines;
- Lack of education or training in construction or sustainable design;
- Lack of expressed interest from clients such as owners or developers;
- Lack of technical understanding on the part of subcontractors and product manufacturers related to "green" technology.

The last category is individuals which are represented by owners, developers, architects, general contractors, engineers and sustainable building consultants. They generally provide the services associated with the construction of a building. It is therefore, necessary to bring awareness related to the green building guidelines among these individuals because they are the services providers to various organizations in the society.Conferences, seminars, courses or workshops should be conducted for the promotion of these guidelines among the individual adopters. The incentives and barriers associated with the adoption of green building guidelines for this category are similar to those of profit and non-profit organizations.

2.1.8 Characteristics of a green building guideline

Potbhare et al. (2009b) has also identified the characteristics of a green building guideline based on the detailed review of LEED, BREEAM, and CASBEE. These three green building guidelines were the most used green building guidelines in 2009. Since BREEAM, LEED, and CASBEE are still worldwide the most used green building guidelines up to now, the characteristics that Potbhare et al. (2009b) found are also used in this thesis. These characteristics in table 2.3 are useful to frame a green building guideline for the society in a developing country.

Table 2.3 : Characteristics of a green building guidelines (Potbhare et al., 2009b).

Characteristics	Description
Complexity	A green building guideline should be easily understood by the adopters
Compatibility	A green building guideline should be in sync with the current construction practices adopted in the society

Trialability	Adopters should be able to preview the credits and verify in advance on their choice of credits, even before the registration of their projects under a green building guideline
Observability	Demonstration projects should be available where adopters can visit and experience the benefits associated with the adoption of a particular green building guideline
Competitive advantage	This characteristic relates to the social benefits associated with the adoption of a green building guideline, such as to be in the forefront among the peers by the adoption of green building guideline
Availability of information	Variety of information sources such as internet, print media, newspapers, should have information related to the green building guidelines, their credits, and example projects
Flexibility and adaptiveness	Adopters should have choices for the credit selection within different categories of a green building guideline
Cost	Documentation and certification costs and soft costs (e.g. cost associated with time devoted to material search, commissioning, energy modeling, and day lighting simulations) related to acquiring a rating under a green building assessment system might be high enough to hinder project teams from going for those ratings

2.2 Green Building Movement in India

Major policy decisions (e.g., Environmental / Protection Act) by the Indian government were in response to the international events such as the Brundtland Commission or the Second Earth Summit, so was the green building movement. Indian green building movement consisted of three phases: (1) From 1974 to 1996 the Indian government established institutions to encourage sustainability, (2) from 2001 to 2003 the Indian Green Building Council (IGBC), the Energy and Resources Institute (TERI), Business Council for Sustainable Development (BCSD), and the Bureau of Energy Efficiency (BEE) were established, and (3) from 2004 to 2007 two green building guidelines TERI-GRIHA (Green Rating for Integrated Habitat Assessment) and LEED-India were launched (Potbhare et al. 2009a). Currently, there are 223 LEED-India certified buildings, 1,505 LEED-India registered buildings, (IGBC, 2012), 8 GRIHA certified buildings, and 167 GRIHA registered buildings (GRIHA, 2012).

IGBC have created partnerships with Indian government, USAID (the United States Agency for International Development), USGBC, and Government of Victoria in Australia to work in the areas of green buildings. IGBC has administered LEED India through website; educational programs that are self sustaining such as training programs conducted at various centres accross India, conference on green building

materials, and green building congress to raise the awareness on the concept of green buildings.

2.3 Green Building Movement in Indonesia

Indonesian green building movement was emerging sometime in the period between early 2000s until 2009 and it was influenced by series of external and internal factors. In this period of time, formal incorporation of the World GBC took place. This happened in 2002 and the council is now the largest international organization influencing the green building marketplace (World GBC, 2011). World GBC is supporting the transformation of construction field and buildings to be more sustainable. This is a clear sign that the awareness for the importance of buildings in achieving sustainability gained global dimension. Furthermore, World GBC also encourages establishing new Green Building Councils throughout the world and it helped several countries to establish their own councils by providing them counseling, effective strategies and guidance. Another sign showing the increasing global awareness for sustainability in this period is that Kyoto Protocol, an international agreement linked to the United Nations Framework Convention on Climate Change aimed at fighting climate changes, came into force. This happened in February 2005 with Indonesia ratifying it in December 2004 (UNFCCC, 2011). In this time, not only various civil society groups were striving for more environmental protection and higher level of sustainability, but also governments started to take some steps. In Indonesia, for example, Ministry of Environment introduced "Program BangunPraja" focused on promoting sustainable city with sustainable buildings by improving performance in environmental management (Adiwoso et al., 2010). The other important factor behind the higher sustainable efforts was rapid escalation of oil prices in 2008. While the crude oil prices were in July 1998 around 11 U.S. dollars per barrel, ten years later in July 2008 crude oil prices reached the record and they were more than 130 U.S. dollars per barrel (measured as all countries spot price FOB weighted by estimated export value) (EIA, 2011). This automatically made renewable energies more attractive and put pressure on using energy more effectively. All these factors influenced the green building movement in Indonesia and they ultimately led to the establishment of GBC Indonesia.

Green Building Council (GBC) Indonesia has been established on September 9, 2009 by 7 initiators. These initiators have been developed into 50 core founders and 21 corporate founders. Currently, there are 92 company members of GBC Indonesia (GBC Indonesia, 2011). The mission of GBC Indonesia is to develop a reference or criteria regarding the planning, construction, operation and maintenance of a building and the area to realize the environmental quality and sustainability, based on social responsibility to the surrounding community and future generations in order to improve the quality of life.GBC Indonesia has developed Greenship as an assessment tool which accommodates local interests to determine whether a building can be certified as green building or not since 17 June 2010. GBC Indonesia has 44 staff members and 3 assessors to assess Greenship certification (GBC Indonesia, 2011). The first Greenship is Greenship for New Building v.1.0. The second Greenship is Greenship for Existing Building which was launched in January 2011, followed by Greenship Interior Space. Besides, GBC Indonesia plans to launch Greenship Housing, GreenshipNeighbourhood Development, and Greenship New Building 2.0. Greenship as a rating system is divided into six aspects:

- Appropriate Site Development,
- Energy Efficiency and Refrigerant,
- Water Conservation, Materials and Cycle Resources,
- Water Indoor Health & Comfort,
- Building and Environment Management.

Each aspect consists of several ratings that contain credits. Each credit has a charge of particular value and will be processed to determine the assessment. Value points contain raw standards and recommendations for achieving these standards (GBC Indonesia 2011).

Based on GBC Indonesia (2011), currently, there are 10 Greenship certified buildings (Table 2.4) which are Ciputra World Jakarta (Jakarta), German Centre Indonesia (Tangerang), Austrian Embassy Jakarta (Jakarta), Sampoerna Strategic Square (Jakarta), Grand Indonesia Office Tower (Jakarta), Gedung Menteri Pekerjaan Umum (Jakarta), Gedung Teknogas (Jakarta), Gereja Kristus Raja (Jakarta), Gedung DPRD (Jakarta), and Alamanda Tower (Jakarta).

Table 2.4 : Greenship Certified Buildings (GBC Indonesia, 2011).

Building Name	City of Location
Ciputra World Jakarta	Jakarta
German Centre Indonesia	Tangerang
Austrian Embassy Jakarta	Jakarta
Sampoerna Strategic Square	Jakarta
Grand Indonesia Office Tower	Jakarta
GedungMenteriPekerjaanUmum (Building of Ministry of Public Works)	Jakarta
GedungTeknogas	Jakarta
GerejaKristus Raja	Jakarta
Gedung DPRD	Jakarta
Alamanda Tower	Jakarta

Above Greenship certified buildings are centralized in Jakarta, the capital city of Indonesia. Besides Greenship, there are several buildings which are using international assessment tools. In this case, GBC Indonesia does not take control of them.

2.4 Green Building Movement in Turkey

Similar to green building movement in Indonesia, Turkish green building movement wasalso emerging sometime in the period of early 2000s until 2009 and influenced by series of factors, majorly from World Green Building Council, ratification on Kyoto Protocol, and escalation of oil prices.Formation of green building councils above has proved that it helped to increase environmental awareness. Thus, Turkish Green Building Association / ÇEDBİK (*Çevre Dostu Yeşil Binalar Derneği*) has been established with intentions to be a Green Building Council (GBC) in October 2007. The objective of this association is to increase the quality and the environmental performance of buildings in Turkey. It has 100 company members ÇEDBİK, 2011).

Turkey does not have its own green building certification system yet; therefore, ÇEDBİK supports the use of BREEAM and LEED in Turkey. ÇEDBİK has agreements with BRE-Global (Building Research Establishment-Global) on 28 September 2009, DGNB on 25 November 2010, and LEED-International on 24 December 2010 to support the application of their green building certification systems in Turkey. Currently, there are 3 BREEAM and 19 LEED certified

buildings, and 29 BREEAM and 53 LEED registered projects in Turkey (ÇEDBİK, 2012).

Table 2.5 : Certified green buildings in Turkey (BRE, 2012; USGBC, 2012).

No	Building Name	Owner Organization	City of Location	Certification	Year of Certification
1	United Nations Population Fund (UNFPA) Eastern Europe and Central Asia Regional	Ministry of Foreign Affairs, Turkey	Istanbul	BREEAM-Pass	2009
2	Toyota Onatça	Onatça Motorlu Araçlar Ticaret	Adana	BREEAM-Very good	2010
3	Ada AVM	Corio N.V	Sakarya	BREEAM-Good	2010
4	BASF Construction Chemicals Laboratories	BASF Turk	Gebze	LEED-Platinum	2009
5	BASF Dilovası Yönetim Binası	BASF Turk	Kocaeli	LEED-Gold	2009
6	Baylo Suites	Zemin Yatirim	Istanbul	LEED-Silver	2009
7	DEEPO Istanbul AVM	Torunlar Gyo A.S.	Istanbul	LEED-Gold	2009
8	Eser Holding Binası	Eser Holding	Ankara	LEED-Platinum	2009
9	Kavacık Ticaret Merkezi	Cevahir Yapı	Istanbul	LEED-Gold	2009
10	KFC Bostancı	Turkent Gıda	Istanbul	LEED-Gold	2009
11	Li Fung Center	Lı Fung	Istanbul	LEED-Silver	2009
12	Method Research Company	Method Research Company	Istanbul	LEED-Silver	2009
13	Olive Plaza	Kapital Gayrimenkul A.S	Istanbul	LEED-Gold	2009
14	Philps Head Office	Philips Turkey	Istanbul	LEED-Silver	2009
15	Sabancı University Nanotechnology Center	Sabancı University	Istanbul	LEED-Gold	2009
16	Schneider Electric Transformer Factory	Schneider Energy Industry A.S	Kocaeli	LEED-Gold	2009
17	Soyak Holding Headquarters	Soyak Holding A.S	Istanbul	LEED-Silver	2009
18	Siemens Gebze PTD Building	Kocaeli	Kocaeli	LEED-Gold	2009

Table 2.6 (continued) : Certified green buildings in Turkey (BRE, 2012; USGB, 2012).

No	Building Name	Owner Organization	City of Location	Certification	Year of Certification
19	Unilever Head Office	Unilever Turkey	Istanbul	LEED-Silver	2009
20	Turkish Engine Center	THY Teknik – Pratt & Whitney	Istanbul	LEED-Gold	2010
21	TekfenOZ Levent Office	TekfenOZ	Istanbul	LEED-Gold	2011
22	Wilo Pump Orhanlı Location	Wilo Pompa Sistemleri A.S	Istanbul	LEED-Gold	2011

There are some efforts led by ÇEDBİK and some researches for developing a green certification system in Turkey (Erten et al., 2009, Darwish and Agnello 2009). Furthermore, recently regulatory and rhetorical changes have been introduced due to Turkey's energy dependence and the need for energy efficiency. For instance, the central government defined mandatory insulation requirements for both commercial and residential buildings in 2008 (Korkmaz et al., 2009).

3. ADOPTION FRAMEWORK OF GREEN BUILDING GUIDELINES

The adoption of green building guidelines is affected by the environmental awareness, education level, and skilled workforce of the society (Potbhare et al., 2009b). These factors are termed as the societal attributes in a country and vary according to the units in the society that adopt green building guidelines.These units in the society can be divided into three main categories: (1) various governmental organs, from the top layers of the vertical line of power such as federal governments until the lower layers such as local governments, and also various governmental and semi-governmental organizations and politicians; (2) profit and non-profit organizations, which include business enterprises, transnational corporations, players in a logistic chain, educational groups, and civil society groups such as non-governmental organizations or environmental organizations; and (3) individuals, where engineers, architects, designers, developers, contractors, consultants, and consumers can be classified(Potbhare et al., 2009b).

Governmental support in the shape of various measures, policies or regulations can influence organizations to adopt these green building guidelines and thus make their projects more environmentally friendly. To encourage this adoption among profit and non-profit organizations, economic incentives and reputational benefits should be provided. Furthermore, special governmental board focusing in the implementation of green building guidelines can also be established. To ensure the rapid acceptance of green building guidelines, it is essential to provide incentives and resolve barriers for the adopter organizations because this category represents the largest portion of green building guidelines adopters in the society. However, individuals are of big importance as well because they also influence the construction process of a building and there is a constant interaction between them and organizations. For example, individuals provide consultancy or various other services related to the construction. Therefore it is necessary to spread environmental awareness among them, especially the awareness related to the green building guidelines.

The surveys conducted in India (Potbhare et al. 2009b), Indonesia, and Turkey consisted of 15 questions which were divided in the following four parts:

Part 1	Demographic information of the respondents
Part 2	Understanding and involvement with green building guidelines
Part 3	Adoption of green building guidelines
Part 4	Questions based on the "Diffusion of innovation" theory

In order to reach the sample target, the study used purposive sampling. This sampling is being used when the potential respondents are known, so that numerous rich information can be explored from them (Patton, 2002; Denzin and Lincoln, 2005). The survey questionnaire was distributed among 175 participants in Indonesia during eight weeks and 212 participants in Turkey during six weeks by email or in person. Potential participants were selected from the adopters of green building guidelines, such as architects, engineers, sustainable building consultants, contractors, or developers; researchers or educators; and government officials using public online databases.

In Indonesia some of the participants' email addresses were retrieved from Green Building Council Indonesia member list on its website. These questionnaires were also sent to researchers or educators who do research or teach about building and sustainability; the members of Chamber of Civil Engineers; the members of Chamber of Architects; Building and Environment Directorate and Urban Development Directorate of Ministry of Public Works; Department of Housing and Building of Regional Government; building and housing developers; building materials suppliers; and Indonesian Contractors Association by email and online survey (Table 3.1). There are 127 members of construction companies in Indonesian Contractors Association (AKI, 2012). The questionnaires were sent to the 25 biggest Indonesian construction companies among those.

In Turkey some of the participants' email addresses were retrieved from Turkish Green Building Association member list on its website. Besides, I attended Green Building Association Member's Information Day in Istanbul and directly contacted the members. Moreover, these questionnaires were also sent by email to researchers or educators who do research or teach about building and sustainability; the members of Chamber of Civil Engineers; the members of Chamber of Architects; Board of

Research, Planning and Coordination of Ministry of Public Works and Settlement; Directorate of Housing, Urban Planning, and Development, Directorate of Environmental Protection, and Directorate of Projects at regional municipality level; building and housing developers; building materials suppliers; and Turkish Contractors Association (Table 3.1). There are 150 members of construction companies in Turkish Contractors Association, 133 of them are working for construction of building and housing (TMB, 2012). The questionnaires were sent to the 25 largest Turkish construction companies among those 133 construction companies. Below is the tabulation of affiliation of entities asked to participate in the survey in Indonesia and Turkey:

Table 3.1 : Affiliation of entities asked to participate in the survey.

In Indonesia	In Turkey
Green Building Council Indonesia member list	Turkish Green Building Association member list
Researchers or educators	Researchers or educators
Chamber of Civil Engineers members	Chamber of Civil Engineers members
Chamber of Architects members	Chamber of Architects members
Building and Environment Directorate and Urban Development Directorate of Ministry of Public Works	Board of Research, Planning and Coordination of Ministry of Public Works and Settlement
Department of Housing and Building of Regional Government	Directorate of Housing, Urban Planning, and Development, Directorate of Environmental Protection, and Directorate of Projects at regional municipality level
Building and housing developers	Building and housing developers
Building materials suppliers	Building materials suppliers
Indonesian Contractors Association	Turkish Contractors Association

As Denzin and Lincoln (2005) pointed out that many qualitative researchers employ sampling methods purposively and not random. They seek out groups, settings, and individuals where the processes being studied are most likely to occur. Sample is required to fulfil the criteria. Several basic considerations were used to select the samples provided, based on the research questions and objectives. To be a participant of this survey, each participant should meet at least one of these criteria:

- have worked or been associated with the design or construction of a green building in Indonesia or Turkey
- currently doing or had done research related to the green building or green building guidelines in Indonesia or Turkey
- associated with the policy formation/governmental initiatives related to the promotion/research and development of green buildings in Indonesia or Turkey.

The response rates by the type of respondent are presented in Table 3.2 and 3.3. Since a respondent might have more than one affiliation (e.g., a recipient can be both engineer and educator), the total number in response rates of the survey is more than the total number of respondents.

Table 3.2 : Response rates of surveys in Indonesia.

Type of Respondent	Number of Questionnaires			Rate of Response (%)
	Mailed	Incorrect Address	Answered	
Architect / Engineer / Sustainable Building Consultant	100	5	30	30%
Contractor / Developer	45	4	8	18%
Government Official	20	3	7	35%
Educator / Researcher	20	0	13	65%
Others (Building Materials Suppliers)	10	4	2	20%
Total	195	16	60	31%

Table 3.3 : Response rates of surveys in Turkey.

Type of Respondent	Number of Questionnaires			Rate of Response (%)
	Mailed	Incorrect Address	Answered	
Architect / Engineer / Sustainable Building Consultant	78	0	49	63%
Contractor / Developer	66	3	10	15%
Government Official	10	1	4	40%
Educator / Researcher	16	0	7	44%
Others (Project Managers, Urban Planners, and Building Materials Suppliers)	58	49	7	12%
Total	228	53	77	34%

However, the rate of response in general without categorizing the type of respondent is 29% for the survey conducted in Indonesia and 28% for the survey conducted in Turkey. There were 44 respondents in the survey in India (Potbhare et al., 2009b), 50 respondents involved in the survey in Indonesia, and 60 respondents participated in the survey in Turkey. Finally, the results of survey in India, Indonesia and Turkey were compared to build an international adoption framework of green building guidelines in developing countries.

3.1 Results of the Survey Conducted in Indonesia

The response rate to the survey questionnaire is 29% with 50 responses in eight weeks. More than half of responses are from architects, engineers, and sustainable building consultants. Over one forth of the respondents are educators or researchers. The rest are contractors, developers, and government officials (Table 3.4). In addition, there are few respondents of building materials suppliers. The reasons for a high response rate from architects, engineers, sustainable building consultants can be attributed to the awareness of the green building guidelines as well as their initiatives to address the issues such as energy, natural resources and material conservation in the building design and construction.

Table 3.4 : Professional affiliation of Indonesian respondents.

Professional Affiliation	Response Count	Response Percent
Architect / Engineer / Sustainable Building Consultant	30	60%
Contractor / Developer	8	16%
Government Official	7	14%
Educator / Researcher	13	26%
Others (Building Materials Suppliers)	2	4%

In response to the question related to the respondent's involvement with green building guidelines, 29% of the respondents reported participating in public, government, or business types of meetings in support of green building guidelines (Fig.3.1). Other major sources of involvement for the respondents include working on a green project (20%), attending a course on green building guidelines (12%), being green building consultants (10%), taking Greenship or LEED AP (Accredited Professional) examination (10%), and being an active member of a green policy

forming group (9%). Only few of the respondents who have been writing letters or editorials (6%) and articles (3%) about green buildings.

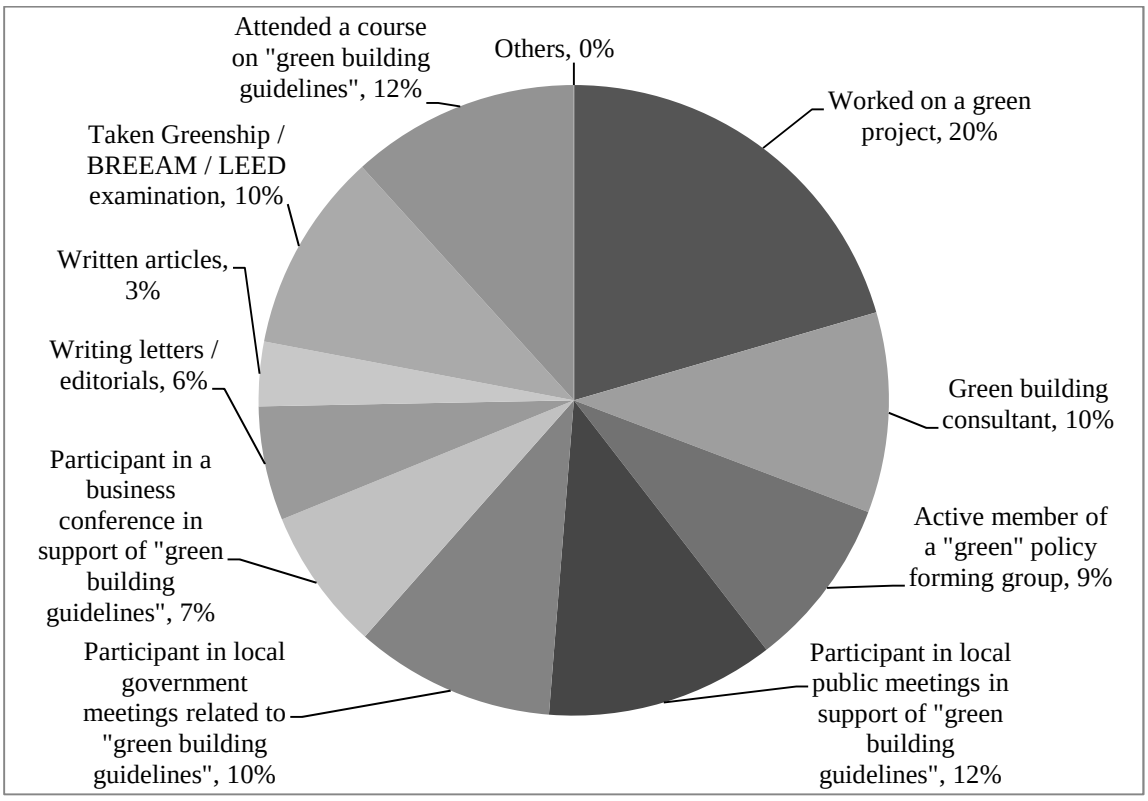

Figure 3.1 : Involvement of Indonesian respondents with the green building guidelines.

Workshops or seminars are identified as the most important source of information for green building guidelines in Indonesia by 78% of the respondents (Fig.3.2). The other most commonly observed sources of information are education (51%), internet (47%), radio or television programs (38%), courses on these guidelines (36%), newsletters (29%), and books (27%). Blogs (13%), research studies (13%), hoardings and banners (13%) are the least preferred source of information by the respondents.

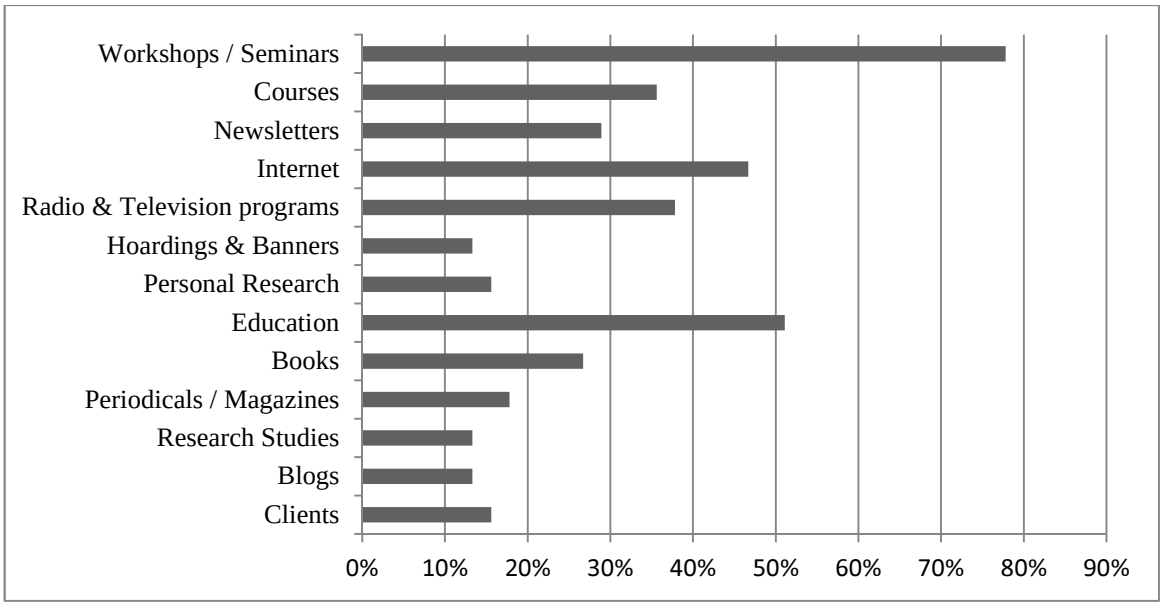

Figure 3.2 : Sources of information related to green building guidelines in Indonesia.

The current adopters of green building guidelines represent a small fraction of the Indonesian construction industry. Their motivations to adopt these green building guidelines can be linked to the potential societal benefits associated with these guidelines. Figures 3.3 and 3.4 show the respondents' and their organizations' motivations to incorporate green building guidelines in their projects. These motivations can be promoted in the Indonesian society, to catalyze the adoption of green building guidelines. The most important factors in both individual and company motivations are (1) social conscience and (2) to demonstrate environmentally friendly practices.

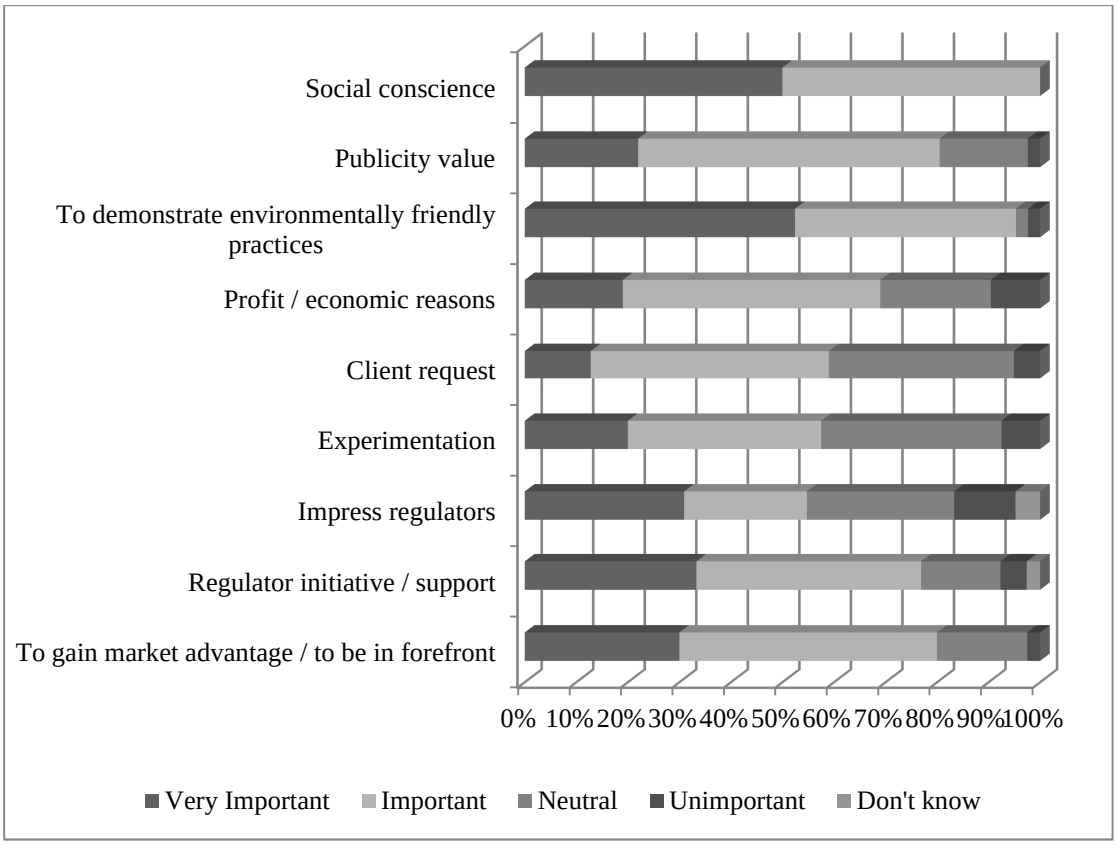

Figure 3.3 : Individual's motivation to adopt green building guidelines in Indonesia.

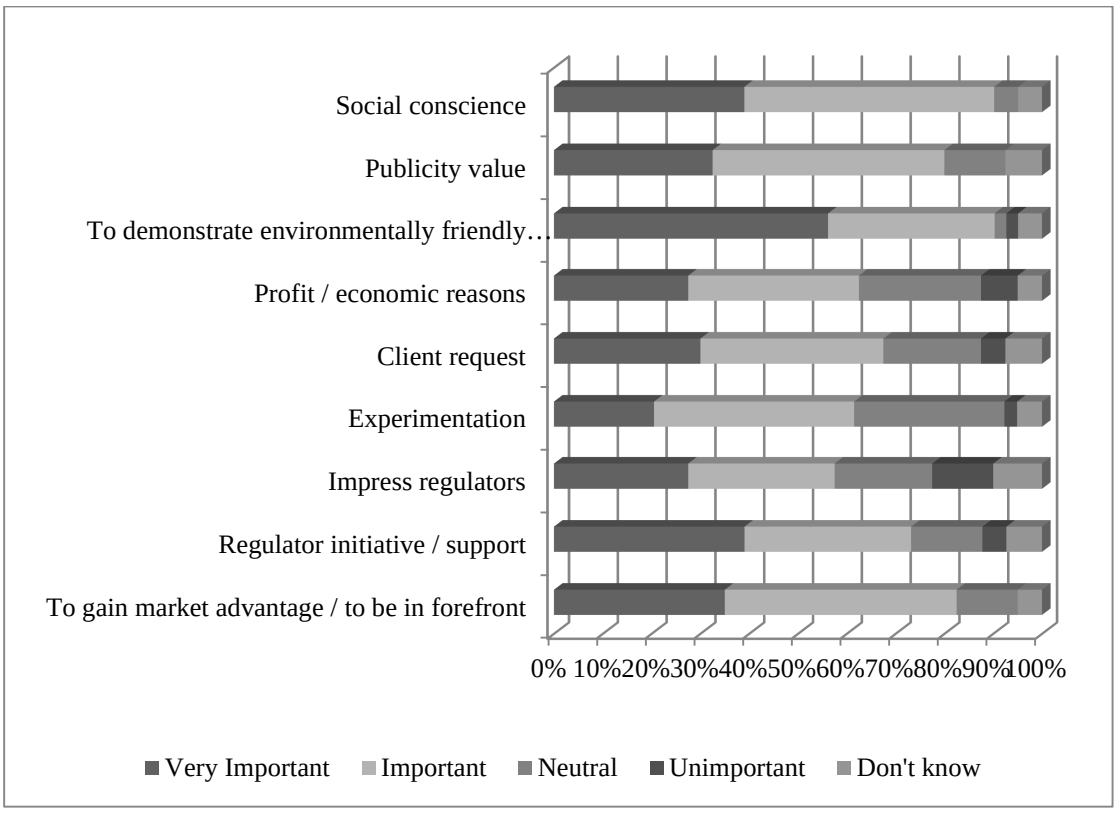

Figure 3.4 : Company's motivation to adopt green building guidelines in Indonesia.

In personal motivations, 54% of the respondents selected “to demonstrate environmentally friendly practices”, 51% of the respondents identified “social conscience”, 33% of the respondents chose “regulator initiative or support”, and 32% of the respondents determined “to impress regulators” as “very important” factors (Fig.3.3). If we consider both “very important” and “important” individual motivations, the most important factors in their order of importance are “social conscience”, “to demonstrate environmentally friendly practices”, “publicity value”, and “to gain market advantage or to be in forefront”.

When company motivations are considered, the most important factors and the rankings are: “to demonstrate environmentally friendly practices” (56%), “social conscience” (39%), “regulator initiative or support” (39%), and “to gain market advantage or to be in forefront” (35%) are identified as the top ranked “very important” factors (Fig.3.4). When these top ranked factors are compared with the highest ranked personal motivations, it is observed that the factors and the ranking of these factors are almost the same, except the forth top ranked factor of company’s motivations which is “to gain market advantage or to be in forefront”. At personal motivations, the forth top ranked factor is “to impress regulators”. If we consider “very important” and “important” factors, “social conscience”, “to demonstrate environmentally friendly practices”, and “to gain market advantage or to be in forefront”, and “publicity value” are the company main motivations. Both for companies and individuals motivations, the forth top ranked of “very important” and “important” factors are the same.

In response to the question related to the incentives that catalyze the adoption of green building guidelines, most of the respondents agreed that “availability of better information on cost and benefits of green building guidelines” (68%). The second “very important” incentives are “regulation or mandatory standards” (61%) and “educational programs for developers, contractors, policy makers related to green building” (61%). The third is “tax relief, grants and other financial incentives” (51%). The forth “very important” incentives are “availability of institutional framework for effective implementation of green building guidelines” (49%) and “proactive local authorities” (49%) (Fig.3.5). If both “very important” and “important” factors are considered, the first factor is “educational programs for developers, contractors, policy makers related to green building guidelines”. The

second factors are “to create public environmental awareness by workshops, seminars, conferences”, “more publicity through media”, and “availability of better information on cost and benefits of green building guidelines”. The third factors are “proactive local authorities” and “regulation or mandatory standards”. The forth factor is “availability of institutional framweork for effective implementation of green building guidelines”. Figure 3.5 shows the distribution of responses related to important incentives associated with green building guidelines. The results show that media, goverment, and academics have more responsibilities for giving incentives in providing information, regulations, and educational program.

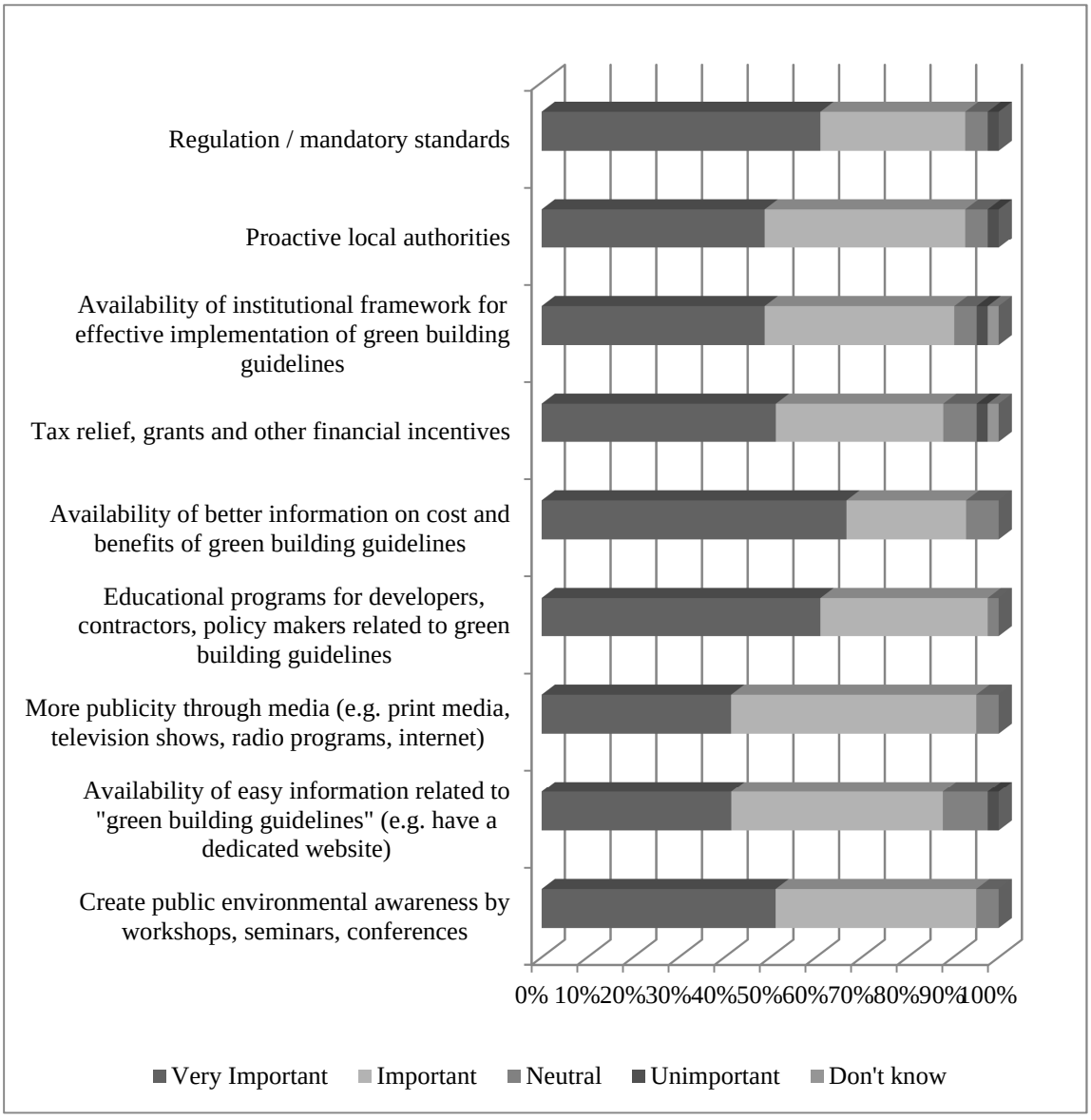

Figure 3.5 : Incentives necessary to catalyze adoption of green building guidelines in Indonesia.

“Attitudes of government agencies” (36%) and “the lack of incentives by the government” (36%) are identified as “very important” barriers than prevent the adoption of green building guidelines in Indonesia (Fig.3.6). “Lack of expressed interest from clients” (33%) is the second “very important” barriers followed by “cost” (31%) and “unorganized nature of construction industry” (31%). The forth “very important” barriers are “lack of training or education in sustainable design or construction” (30%) and “local disincentives” (30%). “Local disincentives”, “lack of incentives”, “lack of expressed interest form clients”, and “attitudes of government agencies” are also identified if “very important” and “important” barriers are combined. Out of the four most significant factors that prevent the adoption of green building guidelines, three of them are related to government (i.e., local disincentives such as lack of infrasturcture at local level; lack of incentives by the government, such as tax relief, grants, governmental subsidies, etc.; and attitudes of government agencies). Solutions are needed to overcome these barriers so that green building guidelines can be accepted in the society.

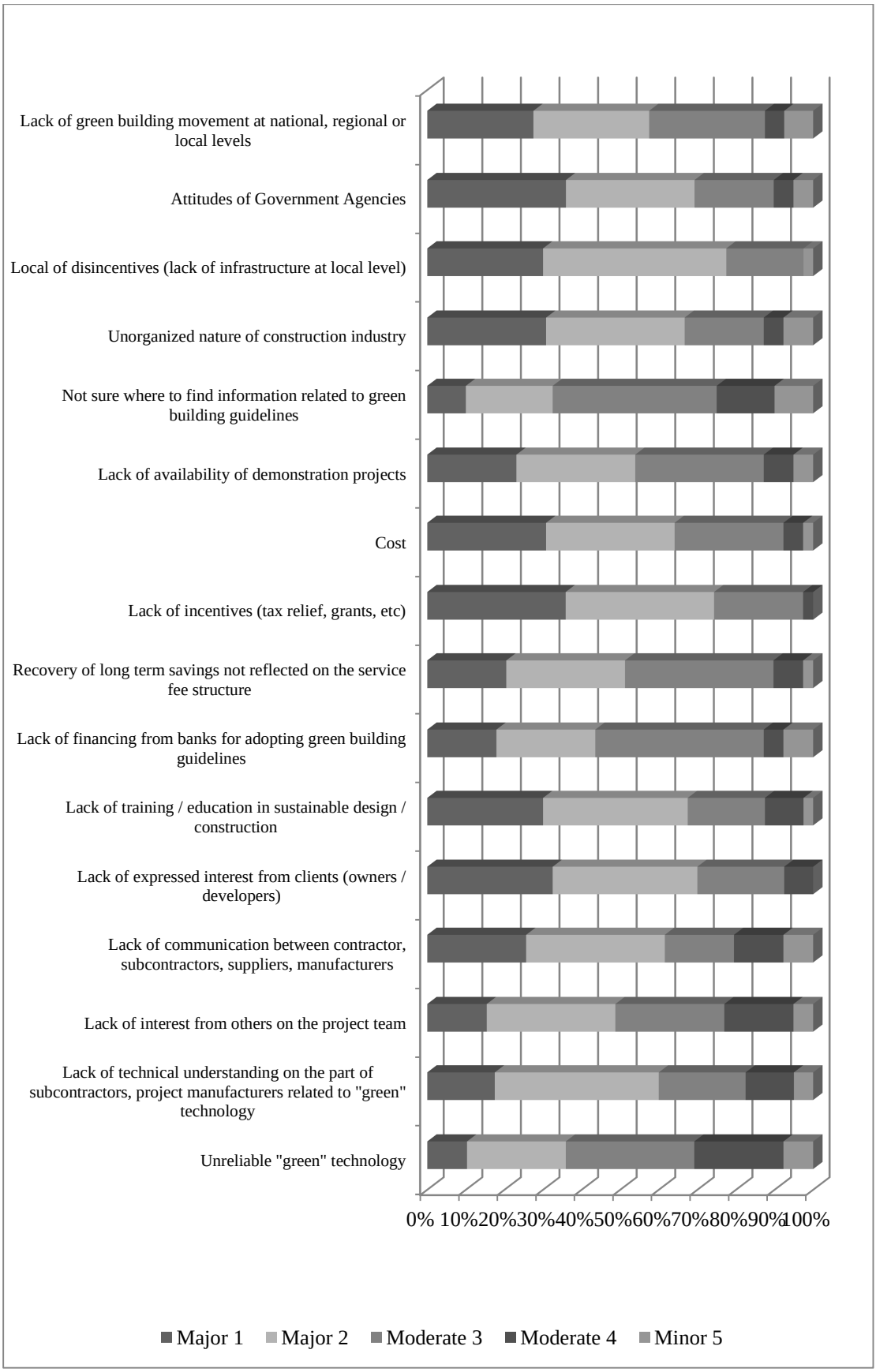

Figure 3.6 : Barriers that prevent the adoption of green building guidelines in Indonesia.

3.1.1 Adoption framework of green building guideline in Indonesia

Based on the results of the survey conducted in Indonesia, the green building guidelines adoption framework for Indonesia includes the following items:

- Workshops or seminars are the most important source of information to bring awareness about green building guidelines in Indonesian society. Education, internet, and radio or television programs are the other powerful sources of information that can be used.
- The most important motivations for individuals and companies to adopt green building guidelines are “social conscience”, “demonstrating environmentally friendly practices”, “regulator initiative or support”, “gaining market advantage or being in forefront”, and “publicity value”. The first two motivation factors show that both individuals and companies notice that they need to contribute in protecting the environment. Regulator initiative from the government is needed to force and boost private sectors in constructing green buildings based on the guidelines. Publicity value through media is an important factor to motivate people to adjust their buildings into green buildings and to spread the information about green building guidelines.
- The most crucial incentives that can catalyze the adoption of green building guidelines are “availability of better information on cost and benefits of green building guidelines” and “educational programs for developers, contractors, policy makers related to green building”. Indonesia is a diverse and huge country, hence availability of information related to an innovation are crucial to be accessed not only in the capital city, but also in the entire nation. This will create better understanding and knowledge of the cost and benefits of green building guidelines. Educational programs are proper ways to introduce green buildings to the related stakeholders. Besides, regulations and mandatory standards should be more developed by the government.
- The most important barriers that prevent the adoption of green building guidelines are “attitudes of government agencies”, “lack of incentives (tax relief, grants)”, “lack of expressed interest form clients (owners or developers)”, and “local disincentives (lack of infrastructure at local level)”.

These barriers can be improved by developing mandatory standards by the government. The standards should be sounded to from the local level to the national level through workshops or seminars.

- Indonesian government should provide special privileges for business or individuals who have demonstrated their commitment towards green building guidelines. The government should also take initiative in adoption of green building guidelines followed to start the green building movement.

These strategies can accelerate the adoption of green building guidelines in the Indonesian society.

3.2 Results of the Survey Conducted in Turkey

The response rate to the survey questionnaire was 28% with 60 responses in six weeks. More than half of responses are from architects, engineers, sustainable building consultants. Some of the respondents are contractors, developers, educators, government officials as well as researchers. Few of them are project managers, urban planners, and building materials suppliers (Table 3.5). The reasons for a high response rate from architects, engineers, sustainable building consultants can be attributed to the awareness of the green building guidelines as well as their initiatives to address the issues such as energy, natural resources and material conservation in the building design and construction.

Table 3.5 : Professional affiliation of Turkish respondents.

Professional Affiliation	Response Count	Response Percent
Architect / Engineer / Sustainable Building Consultant	49	82%
Contractor / Developer	10	17%
Government Official	4	7%
Educator / Researcher	7	12%
Others (Project Managers, Urban Planners, and Building Materials Suppliers)	7	12%

In response to the question related to the respondent's involvement with green building guidelines, 40% of the respondents reported participating in business, public, or government types of meetings in support of green building guidelines (Fig.3.7). Other major sources of involvement for the respondents include attending a

course on green building guidelines (12%), working on a green project (11%), being green building consultants (8%), taking LEED AP or BREEAM examination (8%).

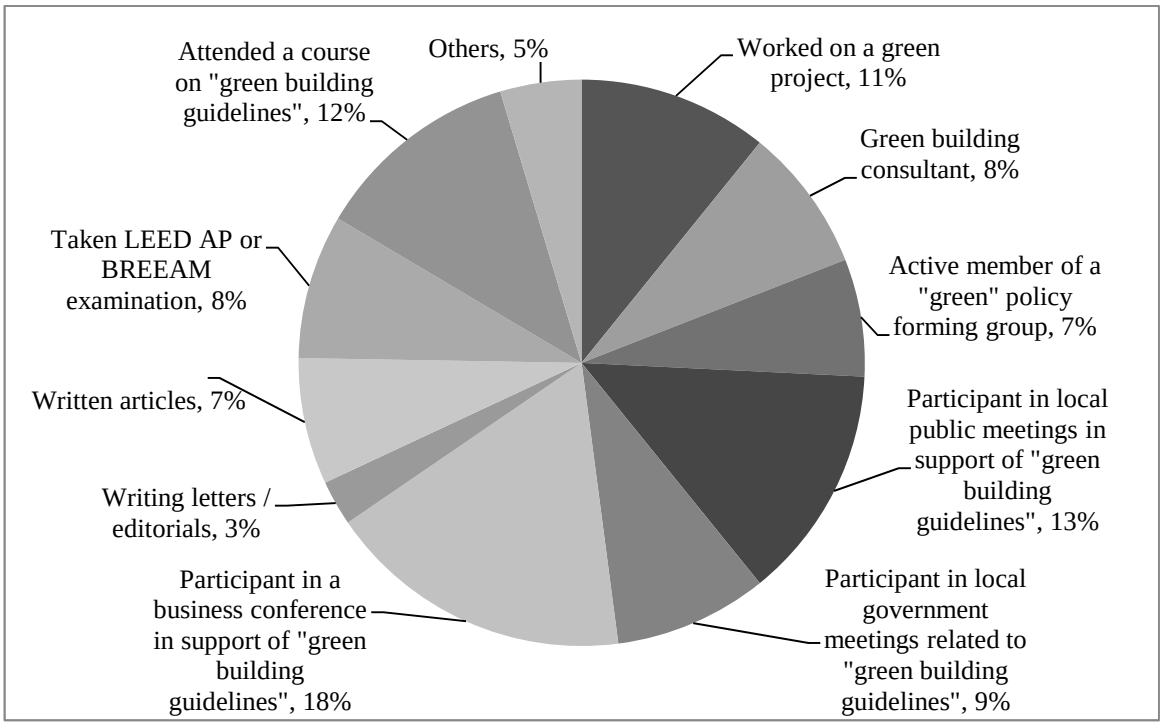

Figure 3.7 : Involvement of Turkish respondents with the green building guidelines.

Radio and television programs are identified as the most important source of information for green building guidelines by 65% of the respondents (Fig.3.8). The other most commonly observed sources of information are education (62%), workshops or seminars (58%), internet (53%), courses on these guidelines (45%), and magazines (43%). Personal research (10%) is the least preferred source of information by the respondents.

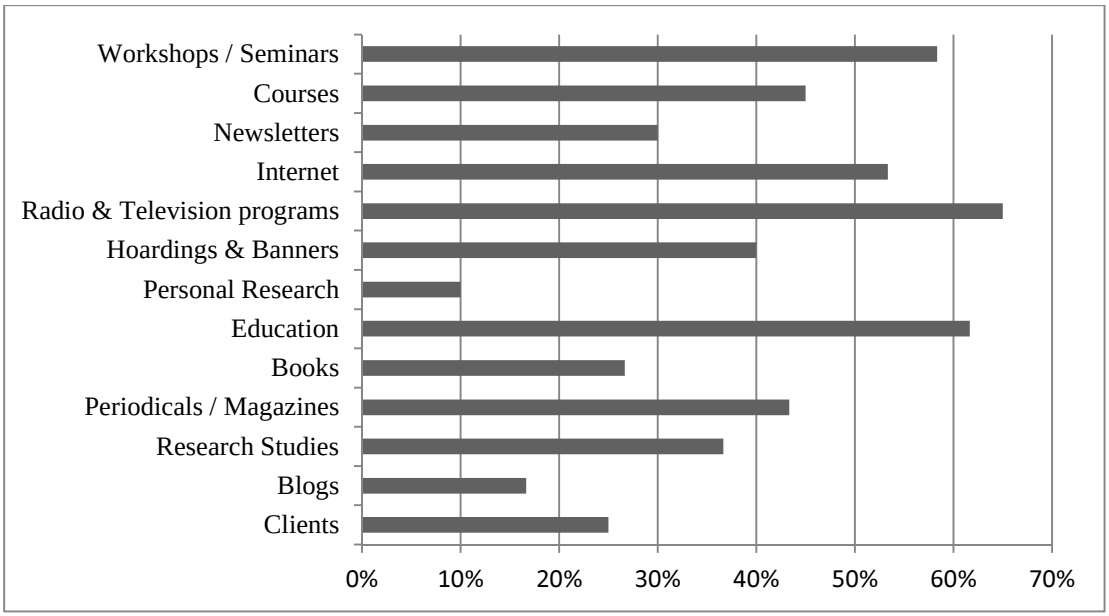

Figure 3.8 : Sources of information related to green building guidelines in Turkey.

The current adopters of green building guidelines represent a small fraction of the Turkish construction industry. Their motivations to adopt these green building guidelines can be linked to the potential societal benefits associated with these guidelines. Figures 3.9 and 3.10 show the respondents' and their organizations' motivations to incorporate green building guidelines in their projects. These motivations can be promoted in the Turkish society, to catalyze the adoption of green building guidelines. The most important factors in both individual and company motivations are (1) to demonstrate environmentally friendly practices and (2) social conscience.

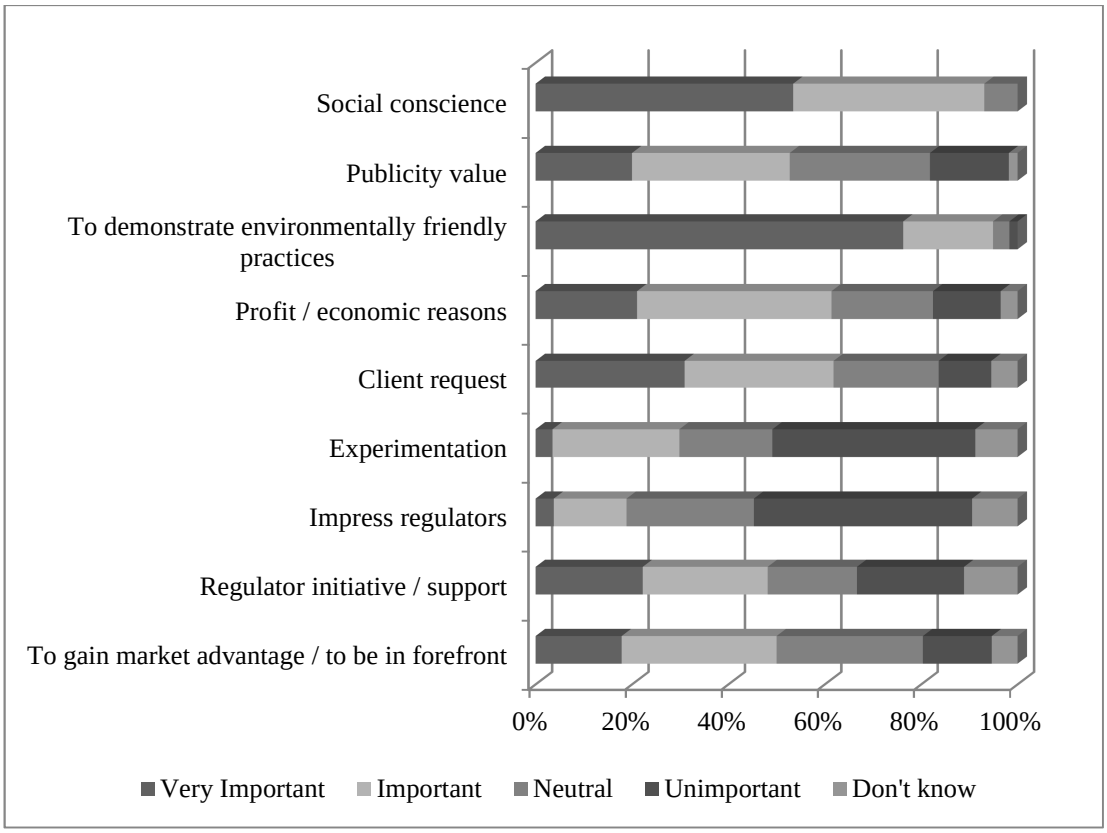

Figure 3.9 : Individual's motivation to adopt green building guidelines in Turkey.

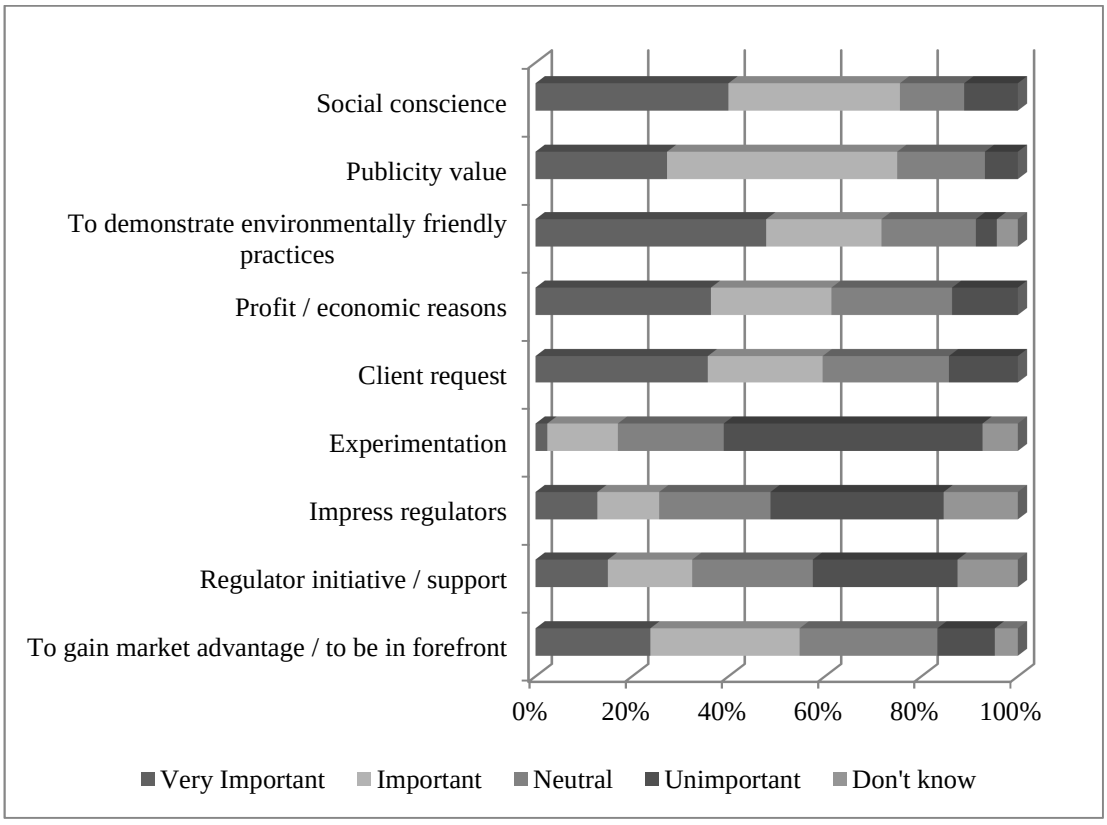

Figure 3.10 : Company's motivation to adopt green building guidelines in Turkey.

In personal motivations, 76% of the respondents selected “to demonstrate environmentally friendly practices”, 53% of the respondents identified “social conscience”, 31% of the respondents chose “client request”, and 21% of the respondents determined “profit” as “very important” factors (Fig.3.9). If we consider both “very important” and “important” individual motivations, the most important factors and their order of importance do not change.

When company motivations are considered, the most important factors and the rankings are the same: “to demonstrate environmentally friendly practices” (48%), “social conscience” (40%), “client request” (36%), and “profit” (36%) are identified as the top ranked “very important” factors (Fig.3.10). When these top ranked factors are compared with the highest ranked personal motivations, it is observed that the factors and the ranking of these factors are the same. However, the factors called “to demonstrate environmentally friendly practices” and “social conscience” have a higher percentage among personal motivations in comparison with company motivations.

Meanwhile if we consider “very important” and “important” factors, “social conscience” (76%), “publicity value” (75%), and “to demonstrate environmentally friendly practices” (72%) are the company main motivations. For companies “profit and publicity value” are one of “very important” and “important” factors, while “client request” is one of “very important” and “important” factors for individuals. “Publicity value”, “profit/economic reasons”, and “to gain market advantage/to be in forefront” orderly are “very important” and “important” factors from company perspectives.

In response to the question related to the incentives that catalyze the adoption of green building guidelines, most of the respondents agreed that “regulation or mandatory standards” (77%), “availability of institutional framework for effective implementation of green building guidelines” (63%), “tax relief” (62%), and “proactive local authorities” (62%) are “very important” factors (Fig.3.11). If both “very important” and “important” factors are considered, the first factor (i.e., regulation or mandatory standards) is ranked the second, and vice versa. Figure 3.11 shows the distribution of responses related to important incentives associated with green building guidelines. The results show that government has more

responsibilities for providing incentives since regulations/mandatory standards, tax relief and proactive local authorities can mostly be initiated by the public authorities.

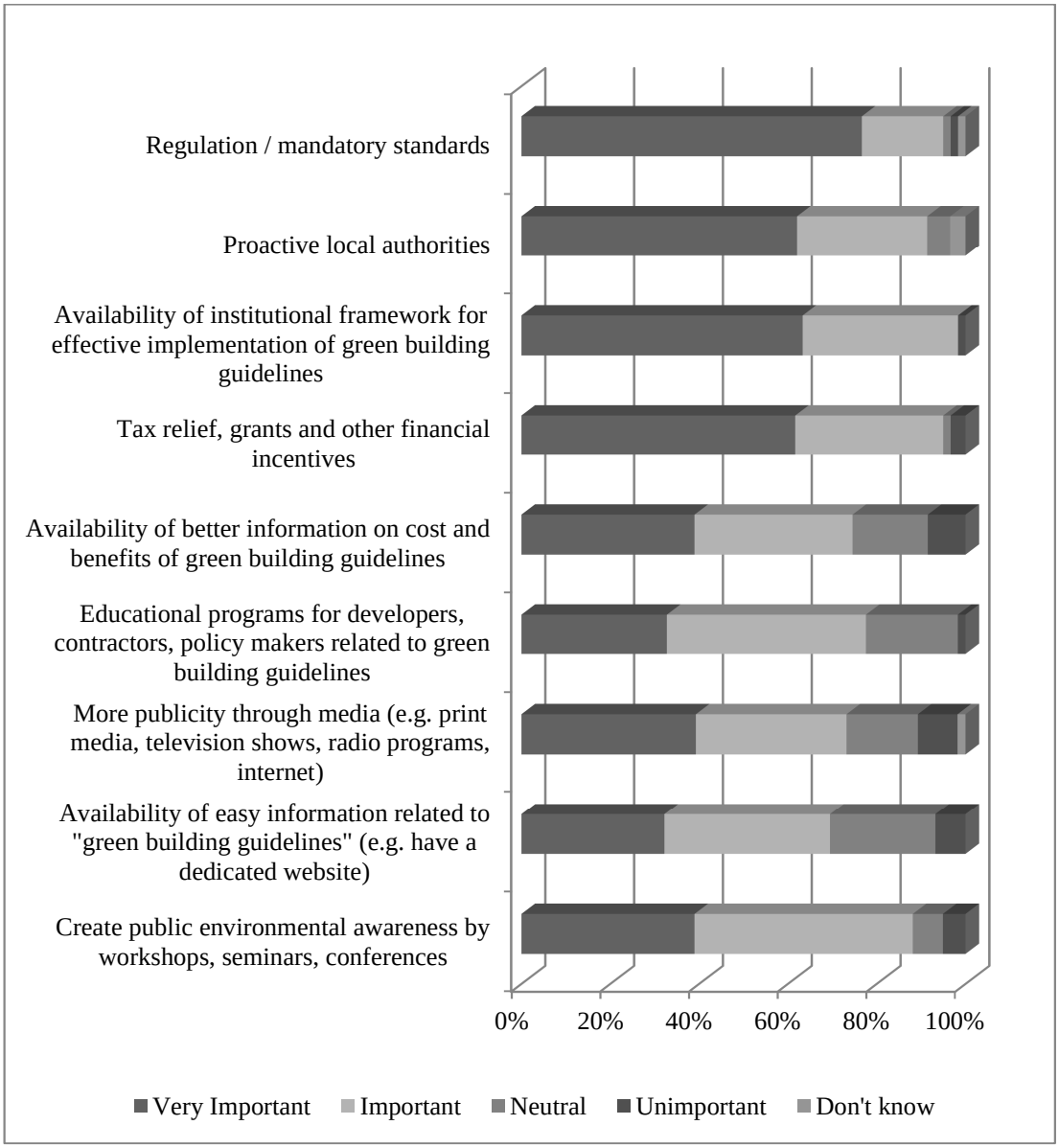

Figure 3.11 : Incentives necessary to catalyze adoption of green building guidelines in Turkey.

“Local disincentives (lack of infrastructure at local level)” (60%), “the lack of incentives by the government, (tax relief, grants, governmental subsidies, etc).” (53%), and “the lack of green building movement at national, regional or local levels” (52%) are identified as “very important” barriers that prevent the adoption of green building guidelines in Turkey (Fig.3.12). The same barriers are also identified if “very important” and “important” factors are combined. “Attitudes of government agencies” and “cost” are also important factors that need to be considered. The cost

can be reduced by relief provided by the government. Out of the five most significant factors that prevent the adoption of green building guidelines, three of them are related to government (i.e., the lack of incentives by the government, such as tax relief, grants, governmental subsidies, etc.; attitudes of government agencies; and cost). These barriers need to be resolved in advance to ensure the successful acceptance of these guidelines in the society.

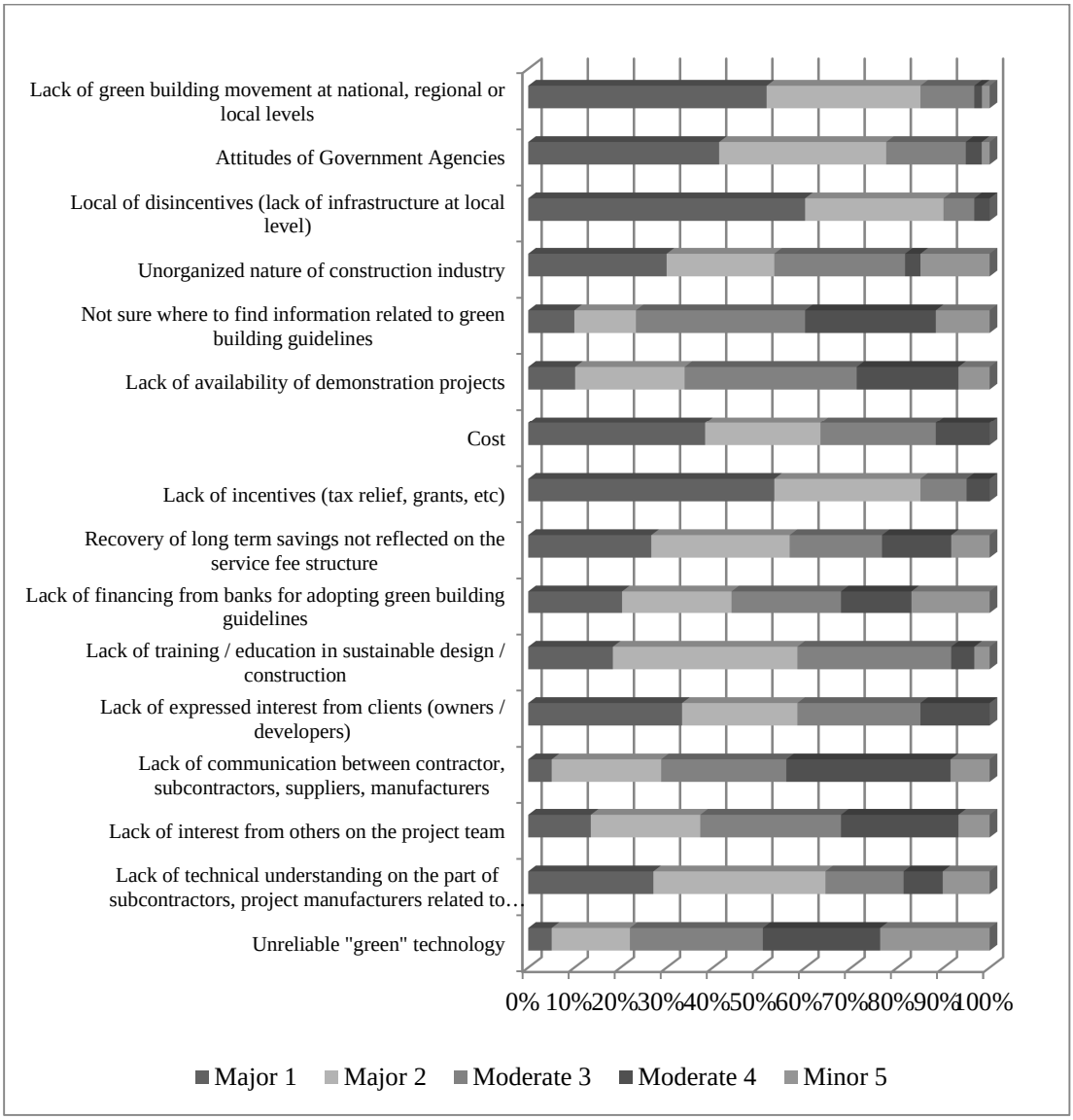

Figure 3.12 : Barriers that prevent the adoption of green building guidelines in Turkey.

3.2.1 Adoption framework of green building guideline in Turkey

Based on the results of the survey conducted in Turkey, the green building guidelines adoption framework for Turkey includes the following items:

- Radio and TV programs are the most important source of information to bring awareness about the green building guidelines in Turkish society. Education, workshops or seminars, and internet are the other powerful sources of information that can be used.
- The most important motivations for individuals and companies to adopt green building guidelines are “demonstrating environmentally friendly practices”, having “social conscience”, meeting “client request”, and gaining “profit”. The first two factors show that both individuals and companies realize that they need to contribute in protecting the environment. The client’s request is an significant driving force for motivating the other parties in a supply chain; thus, increasing the awareness of the potential clients should be a major goal. Also, increasing profit is another significant motivation for companies, as expected.
- The most crucial incentives that can catalyze the adoption of green building guidelines are “regulations or mandatory standards”. Some regulations are recently developed by the government; however, more effort on this subject is needed. Also of “institutional framework for effective implementation of green building guidelines need to be available” to monitor the use of green building guidelines. “Tax relief” should also be provided by the government to compansate the additional cost of having a green building. Finally, “proactive local authorities” are needed to promote green building guidelines in local areas.
- The most important barriers that prevent the adoption of green building guidelines are “lack of infrastructure at local levels (e.g. information about green building guidelines and demonstration of green building projects)”, “lack of incentives”, “lack of green building movement at national, regional or local levels”, and “attitudes of government agencies”. These barriers can be improved by raising the society’s awareness about the green building guidelines. Providing information about green building guidelines and demonstrating green building projects in countries who have implemented green building guidelines are the examples of the improvement. The society can easily get these from the important sources of information (e.g. radio and TV programs are important sources of information in Turkey).

- Turkish government should provide special privileges for business or individuals who have demonstrated their commitment towards green building guidelines. The government should also take initiative in adoption of green building guidelines followed to start the green building movement.

These strategies can accelerate the adoption of green building guidelines in the Turkish society.

3.3 Adoption Framework of Green Building Guideline in Developing Countries

In this section, the adoption framework for Indonesia and Turkey are compared with that of India case (Potbhare et al. 2009b), and the adoption framework previously developed by Potbhare was extended based on Indonesia's and Turkey's results. To validate the adoption framework that was identified for developing countries Potbhare et al. (2009b), the same survey and data collection techniques were used in both of the studies. Furthermore, the distribution of respondents' professional affiliation in both studies is also similar.

In Indonesia, more than half of responses are from architects, engineers, and sustainable building consultants (60%). Over one forth of the respondents are educators or researchers (26%). The rest are contractors or developers (16%), and government officials (14%). In addition, there are few respondents of building materials suppliers (4%). The reasons for a high response rate from architects, engineers, sustainable building consultants can be attributed to the awareness of the green building guidelines as well as their initiatives to address the issues such as energy, natural resources and material conservation in the building design and construction. In Turkey, almost all of the respondents were from the group of architects, engineers, and sustainable building consultants (82%); 17% of them were contractors and developers; 12% of them were educators and researchers, 7% of them were government officials, and 12% of them where from other affiliations such as project managers, urban planners, and building materials suppliers. Similar distribution was observed in India: 55% of respondents were architects, engineers, and sustainable building consultants, 18% of them were contractors and developers; 15% from the group of educators and researchers, 10% from the group of government officials, and 2% from other affiliation. The response rate to the survey questionnaire in India was 21% with 44 responses. The response rate in Indonesia

was 29% with 50 responses, and the response rate in Turkey was 28% with 60 responses (Table 3.6).

Table 3.6 : Response percent in India, Indonesia, and Turkey.

Professional Affiliation	Response Percent		
	India	Indonesia	Turkey
Architect / Engineer / Sustainable Building Consultant	55%	60%	82%
Contractor / Developer	18%	16%	17%
Government Official	10%	14%	7%
Educator / Researcher	15%	26%	12%
Others (Project Managers, Urban Planners, and Building Materials Suppliers, Building Materials Suppliers)	2%	4%	12%
Response rate in general	21%	29%	28%

The other similarilty is regarding the respondents' involvement in the context of green building guidelines. As seen in Figure 3.13, respondents from India, Indonesia, and Turkey have similar percentages in most of the involvement types. The similar percentages can be found in the percentages of the respondents who are green building consultants, active members of a green policy forming group, participants in local public meetings. However, there are significant differences in terms of the percentages of respondents who have worked on a green project, participated in a business conference in support of green building guidelines, written letters/editorials and articles, taken LEED AP or BREEAM examination and attended a course on green building guidelines. The percentage of respondents who have taken LEED AP or BREEAM examination in Turkey is twice of that percentage in India. It is because Turkey has not yet launched its own green building guidelines and is still using international guidelines. The percentages of respondents who have participated in a business conference in support of green building guidelines in India and Turkey are double than the percentage in Indonesia. This shows that green building guidelines have already impacted business conference in India and Turkey. The percentages of the respondents who have worked on a green project in India and Indonesia are twice of this percentage in Turkey. It shows that individuals in India and Indonesia are more motivated to work on a green project.

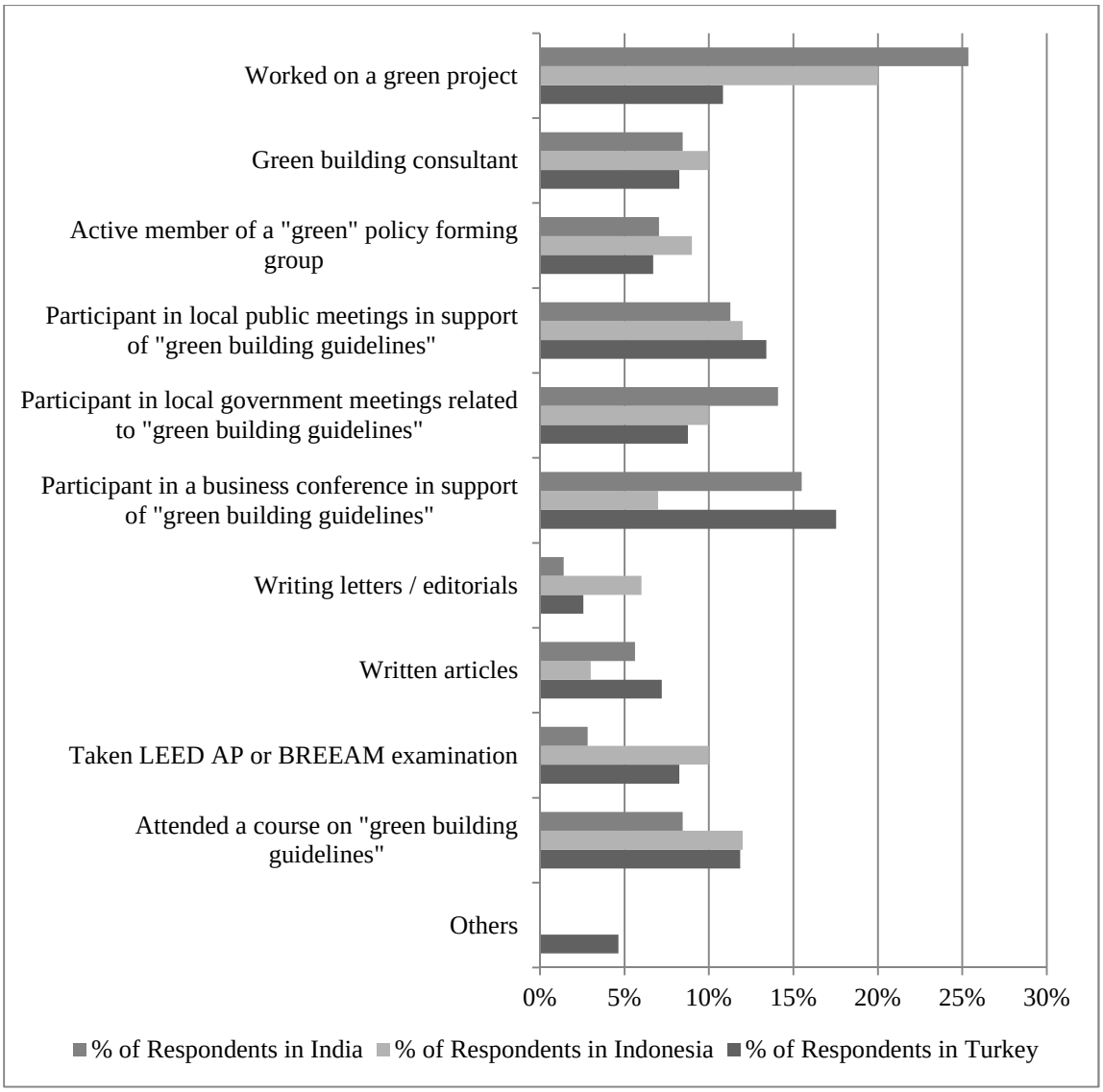

Figure 3.13 : Respondents' involvement in context of “green building guidelines”.

The common major information sources that can bring awareness about the green building guidelines in Indian, Indonesian, and Turkish society are workshops or seminars and education (Table 3.7). However, radio and television programs are identified as the most effective sources of information in Turkish society, whereas in India and Indonesia workshops and seminars are the most significant source of information.

Table 3.7 : Sources of information related to green building guidelines.

India	Indonesia	Turkey
Workshops / seminars	Workshops / seminars	Radio & Television programs
Education	Education	Education
Periodicals / magazines	Internet	Workshops / seminars
Courses	Radio & Television programs	Internet

Both Indonesia and Turkey cases validate the most important individual's motivations identified in India case. "Social conscience" and "demonstration of environmentally friendly practices" are the most important individual's motivations to adopt green building guidelines in India, Indonesia, and Turkey. "Client request" and "gaining market advantage" are among "very important" individual's motivations in India. Meanwhile in Indonesia "regulator initiative or support" and "impressing regulators" are "very important" individual's motivations as well. "Client request" and "regulator initiative" are also one of the "very important" individual's motivations in Turkey (Table 3.8).

Table 3.8 : Individual's motivations to adopt green building guidelines.

Category	India	Indonesia	Turkey
The most important motivations			
-Social conscience	✓	✓	✓
-Demonstration of environmentally friendly practices	✓	✓	✓
Very important motivations			
-Client request	✓		✓
-Regulator initiative or support		✓	✓
-Gaining market advantage	✓		
-Impressing regulators		✓	

In India, Indonesia, and Turkey cases, "demonstration of environmentally friendly practices" is the most important motivation for companies. In India "company policy", "gaining market advantage" and "publicity value" are the second, third, and forth "very important" company's motivations. In Indonesia, "social conscience", "regulator initiative", and "gaining market advantage" are the next "very important" company's motivations. On the other hand, Turkish companies or organizations have slightly different motivations to adopt green building guidelines. "Social conscience", "profit reasons", and "client request" are also the most important

motivations in Turkey. This show that in India, Indonesia, and Turkey have created awareness in their societies about the implementation of green building guidelines. Thus, demonstration of environmentally friendly practices, gaining market advantage and social conscience are profitable for both the company and the market (Table 3.9).

Table 3.9 : Company's motivations to adopt green building guidelines.

Category	India	Indonesia	Turkey
The most important motivations			
-Demonstration of environmentally friendly practices	✓	✓	✓
Very important motivations			
-Gaining market advantage	✓	✓	
-Social conscience		✓	✓
-Company policy	✓		
-Publicity value	✓		
-Regulator initiative		✓	
-Profit reasons			✓
-Client request			✓

In terms of incentives necessary to catalyze adoption of green building guidelines, respondents in those selected three countries stated that "availability of the institutional framework for effective implementation of green building guidelines" and "financial (tax relief, grants, governmental subsidies, etc.)" are important incentives. Nevertheless, the perception of the most important incentive (i.e., "very important") differs in each country. In India, "availability of better information on cost and benefits of green building guidelines"; "tax relief, grants, governmental subsidies, and other financial incentives"; "availability of institutional framework for efective implementation of green building guidelines"; and "educational programs for developers, contractors, and policy makers related to green building guidelines" are "very important" incentives."Availability of better information on cost and benefits of green building guidelines", "educational programs for developers, contractors, and policy makers related to green building guidelines", and "regulations/mandatory standards" are among "very important" incentives in Indonesia. Whilst in Turkey, the most important incentives are "regulation/mandatory standards", "availability of institutional framework for effective implementation of green building guidelines", "tax relief, grants, governmental subsidies, and other financial incentives"; and "proactive local

authorities". Above incentives show that institutions and government play significant role in the implementation of green building guidelines (Table 3.10).

Table 3.10 : Incentives necessary to catalyze adoption of green building guidelines.

Category	India	Indonesia	Turkey
Important incentives			
-Availability of the institutional framework for effective implementation of green building guidelines	✓	✓	✓
-Financial incentives (tax relief, grants, governmental subsidies, etc.)	✓	✓	✓
Very important incentives			
-Availability of better information on cost and benefits of green building guidelines	✓	✓	
-Tax relief, grants, governmental subsidies, and other financial incentives	✓		✓
-Availability of institutional framework for efective implementation of green building guidelines	✓		
-Educational programs for developers, contractors, and policy makers related to green building guidelines	✓	✓	
-Regulations/mandatory standards		✓	✓
-Availability of institutional framework for effective implementation of green building guidelines			✓
-Proactive local authorities			✓

The common barrier that prevent the adoption of green building guidelines in India, Indonesia, and Turkey is "lack of incentives in the form of tax reliefs, grants, and governmental subsidies". "Lack of incentives", "cost", "lack of expressed interest from clients", and "unorganized nature of construction industry" are the most important barriers in India. On the other hand, in Indonesia the most crucial barriers are "attitudes of government agencies", "lack of expressed interest from clients", and "unorganized nature of construction industry". "Local disincentives (lack of infrastructure at local level)", "lack of incentives (tax relief, grants, governmental subsidies, etc.)", "lack of green building movement at national, regional or local levels", and "attitudes of government agencies" are identified as "very important" barriers that prevent the adoption of green building guidelines in Turkey. The barriers in India and Indonesia are mostly caused by government, clients, and

construction industry. Meanwhile the barriers in Turkey are mostly because of lack of governmental supports (Table 3.11).

Table 3.11 : Barriers that prevent the adoption of green building guidelines.

Category	India	Indonesia	Turkey
Barrier			
-Lack of incentives in the form of tax reliefs, grants, and governmental subsidies	✓	✓	✓
The most crucial barriers			
-Lack of expressed interest from clients	✓	✓	
-Unorganized nature of construction industry	✓	✓	
-Lack of incentives	✓		✓
-Attitudes of government agencies		✓	✓
-Cost	✓		
-Local disincentives (lack of infrastructure at local level)			✓
-Lack of green building movement at national, regional or local levels			✓

As for barriers in general, it can be categorized into barriers from governmental, clients, non-profit organizations, companies, suppliers, individuals, and others perspectives. No incentives for the property owner, businesses and financial institutions; lack of appropriate instruments (e.g. tax rebates); lack of appropriate policies, legislations and laws; weak monitoring mechanisms; lack of institutions that oversee the market; and lack of investment and financial support from the government are the barriers from governmental side in India, Indonesia, and Turkey. Lack of interest and unclear information on long term savings are the barriers from clients point of view. Problems in financing and lack of incentives at the government level are the barriers from non-profit organizations. The main barrier from companies is lack of sustainability know-how problems. Suppliers have barriers such as compatibility problems of existing building guidelines with the local standards, and lack of standard systems to label the recycled content of materials. Lack of know-how/interest; lack of Incentives; the perception of high up-front costs; lack of access to capital; short planning horizons but long pay-back periods; conservative nature of construction industry; and lack of voluntary adoption of new green technologies are examples of individuals barriers. In addition, there are also others barriers that usually face by countries which use international green building guidelines. The examples of those barriers are compatability of LEED/BREEAM

with local standards; lack of local guidelines; lack of experienced LEED/BREEAM professionals; little to no knowledge of LEED referenced codes (e.g., ASHRAE - American Society of Heating, Refrigerating and Air-conditioning Engineers), standards (e.g., ASTM - American Society for Testing and Materials) and product certifications (e.g., Greenseal); and little to no knowledge of requirements adressed in LEED guidelines.

Based on above comparison of the surveys' results in India, Indonesia, and Turkey, the adoption framework of green building guidelines in developing countries is extended as shown in Table 3.12. The common major factors for both countries are as follows: (1) workshops/seminars, and education as sources of information that can bring awareness about the green building guidelines in the society; (2) social conscience, and demonstration of environmentally friendly practices as the most important individual's motivations; (3) to demonstrate environmentally friendly practices as the most important company's motivation; (4) availability of institutional framework for effective implementation of green building guidelines, and financial (tax relief, grants, governmental subsidies, etc.) incentives as the most important incentives necessary to catalyze adoption of green building guidelines; and (5) lack of incentives in form of tax reliefs, grants, and governmental subsidies as the most crucial barrier that prevent the adoption of green building guidelines.

There are some differences regarding the adoption framework of green building guidelines in India, Indonesia, and Turkey. Sources of information related to education or research is suitable for India, whilst the combination of sources of information related to education or research and popular mass media is more suitable for Indonesia and Turkey. Talking about the individual's and company's motivations, gaining market advantage, company policy, and publicity value have big influence in India. On the other hand,regulator plays an important role in Indonesia, whereas client request and profit have big influence in Turkey. Those specific motivations effect the incentives and barriers. Educational, and informational incentives are the substantial incentives in India and Indonesia. Besides, regulations are also substantial in Indonesia and Turkey. In addition, local authorities are essential in Turkey.Barriers from clients and nature of construction industry affect India and Indonesia. Barrier associates with cost is also affect India. Since regulator plays a valuable role in Indonesia, the attitudes of them affect this

country as well as in Turkey. Local disincentives and green building movement are also decisive in Turkey (Table 3.12).

Table 3.12 : Adoption framework of green building guidelines in developing countries.

Category	India	Indonesia	Turkey
Sources of information related to green building guidelines			
-Workshops/seminars	✓	✓	✓
-Education	✓	✓	✓
-Internet		✓	✓
-Radio and TV programs		✓	✓
-Periodicals/magazines	✓		
-Courses	✓		
Individual's motivations			
-Demonstration of environmentally friendly practices	✓	✓	✓
-Social conscience	✓	✓	✓
-Client request	✓		✓
-Regulator initiative		✓	✓
-Gaining market advantage	✓		
-Impressing regulators		✓	
Company's motivations			
-Demonstration of environmentally friendly practices	✓	✓	✓
-Gaining market advantage	✓	✓	
-Social conscience		✓	✓
-Company policy	✓		
-Publicity value	✓		
-Regulator initiative		✓	
-Profit			✓
-Client request			✓
Incentives necessary to catalyze adoption of green building guidelines			
-Availability of institutional framework for effective implementation of green building guidelines	✓	✓	✓
-Financial incentives	✓	✓	✓
-Availability of better information on cost and benefits of green building guidelines	✓	✓	
-Educational programs for developers, contractors, and policy makers related to green building guidelines	✓	✓	
-Regulations/mandatory standards		✓	✓
-Proactive local authorities			✓

Table 3.12 (continued) : Adoption framework of green building guidelines in developing countries.

Category	India	Indonesia	Turkey
Barriers that prevent the adoption of green building guidelines			
-Lack of incentives in form of tax reliefs, grants, and governmental subsidies	✓	✓	✓
-Lack of expressed interest from clients	✓	✓	
-Unorganized nature of construction industry	✓	✓	
-Attitudes of government agencies		✓	✓
-Cost of "green" technology	✓		
-Local disincentives			✓
-Lack of green building movement (at national, regional, or local levels)			✓

Based on these findings of India, Indonesia, and Turkey, it is identified that both similiraties and differences exist in adoption strategies of developing countries. The adoption framework by Potbhare et al. (2009b) is extended to include all significant factors.

4. DIFFUSION OF INNOVATION OF GREEN BUILDING GUIDELINES

Several construction innovation models exist in the literature (Tatum, 1987; Laborde and Sanvido, 1994). The use of green building guidelines in a construction project as an innovation can fall into anywhere in a spectrum from incremental to radical innovations (Marquis, 1988). Slaughter (1998) further refines this spectrum with five distinguished levels: (1) incremental innovation which refines and extends an established design, (2) modular innovation that changes a core design concept without changing the product's architecture, (3) architectural innovation which changes the way in which the components of a product are linked together, while leaving the core design concepts untouched, (4) system innovation that improves the facility performance through integrated independent innovations to perform new functions, and (5) radical innovation that establishes a new way of solving problems. For example: if the project is certified at low level LEED (i.e., certified or silver) by following traditional design and construction practices, the use of green building guidelines in this concept would fall into incremental innovation. On the other hand, a project that minimizes the energy use from the grid through design, technologies used, and on-site renewable energy systems would qualify for a high level of LEED certification (e.g. gold, platinum) and thus can be defined as a radical innovation (Sheffer et al., 2010).

In the construction industry each stakeholder has different acts as followed: (1) clients can act as a catalyst to increase innovation, and (2) contractors are a mediator in the interface between the institutions that develop many of the new products and processes such as materials and components suppliers and trade contractors. Contractors also adopt these innovations to clients, regulators, and professional institutions (Aouad et al., 2010). As Swarup et al. (2011) pointed out, if the reason for pursuing sustainability is predominantly owners' vision, then there is greater chance to achieve higher level of innovation and ultimately also higher certification. This vision is usually not profit-oriented but rather stem from the belief of doing

“right thing” such as reducing carbon emissions or reducing resource consumption and waste. On the other hand, if there is some external factor such as certain regulation or code, the goal for sustainability will be usually set lower, just to achieve the necessary limit required by the regulation. In this case it can be expected that the level of innovativeness will be much lower as well.

Aouad et al. (2010) explained that the patterns of innovation in the construction industry are different from other industries. Construction is a complex industry that involves manufacturing (materials, equipment, and components) and services (surveying, design, engineering, consulting, and management).Diffusion of innovation, defined as the process in which a new idea, concept or technology has been introduced throughout a social system over a time period (Rogers 2003). Bass (1980) introduced an S-curve diffusion of innovation model that estimates the spread of an innovation as a function of time. Davies (1979) reported that diffusion of innovation curves cannot be independent of the conditions, therefore might vary. Its speed can be dependent on the communication and market failures in a homogenous market. However, just like in the construction industry, most adopters are heterogenous (Kelley and Brooks, 1991; Jaffee and Stavins, 1995), where heterogenity is dependent on the size, integration, and concentration of the industry. Roger (2003) has built a diffussion of innovation’s adoption model which are classified based on adopters’ timing of adopting the innovation: 1) innovators, 2) early adopters, 3) early majority, 4) late majority, and 5) laggards. This model assumes a normal distribution with a typical 10 year mean time to reach 50% of potentially available market.

In Indonesia environmental groups, architects / engineer / consultants, and universities / educational institutions are viewed as the innovator. Multinational corporations, large business houses, owners / developers are seen as early adopter. Most of affiliation groups are under early majority category, such as trade associations, suppliers / manufacturers, media, community groups, general contractors, nodal agencies, municipalities, and political leaders. Late Majority. Both state and central governments are identified as late majority. Finally, celebrities are found as laggards. Indonesian people tend to follow what celebrities suggest. In this case, those celebrities can help in advertising and promoting green building guidelines. The above results show that environmental, individuals, and educational

institutions groups in Indonesia are already aware to the existance of green building guideline (Greenship as Indonesian green building guideline). However, the governments have not yet really encouraged the other stakeholders to use it (Table 4.1).

Meanwhile in Turkey environmental groups, multinational corporations, universities / educational institutions are classified as innovator. Early adopter category is filled with large business houses, and architects / engineers / consultants. There are many groups of affiliation in early majority category, from media, community groups, nodal agencies, general contractors, suppliers / manufacturers, trade associations, owners / developers, and celebrities. Political leaders and municipalities are seen in late majority category. Both Turkish central and state governments are categorized as laggards (Table 4.1). This is also one of the reasons why Turkey still use international green building guidelines and has not yet established its own green building guideline. The following tabulation is the overall "diffusion of innovation" categories for green building guidelines that define the current state of each adopter in India (Potbhare et al., 2009b), Indonesia, and Turkey:

Table 4.1 : "Diffusion of innovation" (Roger, 2003) categories for green building guidelines that define the current state of each adopter in India, Indonesia, and Turkey.

Categories	Adopters of Green Building Guidelines		
	India	Indonesia	Turkey
Innovator	Environmental groups, architects / engineers / consultants	Environmental groups, architects / engineers / consultants, universities / educational institutions	Environmental groups, multinational corporations, universities / educational institutions
Early Adopter	Community groups, owners / developers, multinational corporations, large business houses, celebrities, media	Multinational corporations, large business houses, owners / developers	Large business houses, Architects / engineers / consultants
Early Majority	Nodal agencies, trade associations, universities / educational institutions	Trade associations, suppliers / manufacturers, media, community groups, general contractors, nodal agencies, municipalities, political leaders	Media, community groups, nodal agencies, general contractors, suppliers / manufacturers, trade associations, owners / developers, celebrities

Table 4.1 (continued) : "Diffusion of innovation" (Roger, 2003) categories for green building guidelines that define the current state of each adopter in India, Indonesia, and Turkey.

Categories	Adopters of Green Building Guidelines		
	India	Indonesia	Turkey
Late Majority	Central government, state governments, suppliers / manufacturers	State governments, central governments	Political leaders, municipalities
Laggards	Political leaders, municipalities, general contractors	Celebrities	State governments, central government

Developed based on Rogers' model (2003), thesis' survey results show similar categories that define the current state of each adopter organization in India, Indonesia and Turkey. For example, environmental groups are seen as the common innovator; large business houses act as the common early adopter; and nodal agencies also trade associations as the common early majority in India, Indonesia, and Turkey. However, as for late majority and laggards, each country has different adopters. Nonetheless, there are also some differences, such as the portion of each categories. Most of affiliation groups in India are distributed as early adopter (six groups), whilst most of affiliation groups in Indonesia and Turkey are concentrated as early majority (in both countries there are eight groups). These findings showed that green building guidelines have more been adopted and diffused in India than in Indonesia and Turkey. Nevertheless, it is still noteworthy to mention that innovation adoption paths for these three countries are similar.

5. CONCLUSIONS

In line with the objectives: (1) to propose an implementation strategy for accelerating the adoption of green building guidelines in Indonesia and Turkey; (2) to compare them with the previous study to validate and improve the green building guidelines adoption framework for developing countries; and (3) to comprehend how green building guidelines as an innovation in construction industry diffuse in developing countries, this thesis is proposing an adoption framework of green building guidelines in developing countries by extending the one proposed by Potbhare et al. (2009b) based on Indonesia and Turkey's results. This thesis has reviewed the existing worldwide green building guidelines to understand the characteristics of an adoption framework of green building guidelines in other developing countries. The adoption framework identified in this thesis includes sources of information related to green building guidelines, individual's and company's motivations, incentives necessary to catalyze adoption of green building guidelines, barriers that prevent the adoption of green building guidelines, and "diffusion of innovation" categories for green building guidelines that define the current state of each adopter in India, Indonesia, and Turkey.

The main aim of the thesis is to validate previously defined strategies for developing countries by Pobhare, et al. (2009b) and extend it by using data from the other selected developing countries which are Indonesia and Turkey.Consequently, a survey study previously performed by Potbhare et al. (2009b) was conducted in Indonesia and Turkey to capture the above objectives. Subsequently, the survey results were compared and integrated with the results of the previous study.

Based on the survey in India (Potbhare et al. 2009b), Indonesia, and Turkey, workshops or seminars, and education are the most suitable sources of information related to green building guidelines. Demonstration of environmentally friendly practices and social conscience are the common individual's motivations. The main motivation for company is to demonstrate of environmentally friendly practices.

Availability of institutional framework for effective implementation of green building guidelines and financial incentives are incentives necessary to catalyze adoption of green building guidelines. Additionally, lack of incentives in form of tax reliefs, grants, and governmental subsidies are the common barriers that prevent the adoption of green building guidelines. Finally, “diffusion of innovation” categories for green building guidelines that define the current state of each adopter in India, Indonesia, and Turkey are found. Environmental groups as innovator, large business houses as early adopter, and nodal agencies as early majority, are the common adopters and categories of green building guidelines.

5.1 Contribution of the Study

The study of Potbhare et al. (2009b) contributed the adoption of green building guidelines in India and developing countries based on India experiences. Hence, the first contribution of this thesis is the development of adoption strategy of green building guidelines in Indonesia and Turkey, which are in the process of adopting green building guidelines. Similar to India, both Indonesian and Turkish government should give special privileges to companies or individuals who have demonstrated their commitment towards green building guidelines, and take initiative in adoption of green building guidelines to start the green building movement.

The second contribution of this thesis is the extended adoption framework of green building guidelines for developing countries. This was created based on the common findings of the surveys in India (Potbhare et al., 2009b), Indonesia, and Turkey. I actually tried to identify new factors for the adoption framework through the survey, nonetheless, they were not appeared.There are three options that can be chosen by other developing countries regarding the comprehensive factors of the adoption framework of green building guidelines (Table 3.12): (1) choosing only the major factors that are common in India, Indonesia, and Turkey; (2) picking one of those three selected countries that has similar conditions and characteristics to them; or (3) combining the major common factors and the other valuable factors which are diverse in India, Indonesia, and Turkey.

The third contribution which is the diffusion of green building guidelines as an innovation of construction industry in developing countries are also discussed.India has been faster in adopting green building guidelines because they already have

regulations to motivate adoption in companies. On the other hand, Indonesia and Turkey still need to have an adoption framework since green building movement in these countries is relatively new.

In a nutshell, the results of this thesis can be used by other developing countries. There are common adoption strategies of green building guideliness in these selected three developing countries, even though India, Indonesia, and turkey have different conditions.

5.2 Future Work

For the future work, validation that involves developing countries outside the Asian continent can be done. Developing countries in different continent have different characteristics and uniqueness, and therefore they may have different adoption frameworkof green building guidelines.

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APPENDICES

APPENDIX A.1 : Survey

APPENDIX A.1

SURVEYFOR ADOPTION OF GREEN BUILDING GUIDELINES

(Potbhare et al., 2009b)

Part 1: Demographic Information

1. Name (Optional):
   _____
2. Email Address (Optional):
   _____
3. Professional Affiliation (Choose one or more of the following options)
   Architect / Engineer / Sustainable Building Consultant
   Contractor / Developer
   Government / Semi Government Official
   Educator / Researcher
   Others:_____
4. Name & Address of your Organization:
   _____

Part 2: Green Building Guidelines

5. What is your understanding of the term “green building guidelines”?

_____

6. Which one of the following options best describes your involvement in context of “green building guidelines”? (Check all that apply)
   ___ Worked on a green project
   ___ Green building consultant
   ___ Active member of a “green” policy forming group
   ___ Participant in local public meetings in support of “green building guidelines”
   ___ Participant in local government meetings related to “green building guidelines”
   ___ Participant in a business conference in support of “green building guidelines”
   ___ Writing letters / editorials
   ___ Taken LEED AP / BREEAM examination
   ___ Attended a course on “green building guidelines”
   ___ Others:_____

Comments:_____

_____

7. What will be the most useful source(s) of information to bring awareness about the "green building guidelines" in the Turkish society? (Check all that apply)

_____	Workshops / Seminars	_____	Education
_____	Courses	_____	Books
_____	Newsletters	_____	Periodicals / Magazines
_____	Internet	_____	Research Studies
_____	Radio & Television programmes	_____	Blogs
_____	Hoardings & Banners	_____	Clients
_____	Personal Research	_____	Others:_____

Comments:_____

_____

Part 3: Adoption of green building guidelines

8. Rate your motivation(s) among the categories below to adopt "green building guidelines"?

Categories	Very Important	Important	Neutral	Unimportant	Don't Know
Social conscience					
Publicity value					
To demonstrate environment friendly practices					
Profit / economic reasons					
Client request					
Experimentation					
Impress regulators					
Regulator initiative / support					
To gain market advantage / to be in forefront					
Others:_____ _____					

Comments:_____

_____

9. Rate your company's / organization's motivation(s) among the categories below to adopt "green building guidelines"?

Categories	Very Important	Important	Neutral	Unimportant	Don't Know
Social conscience					
Publicity value					
To demonstrate environment friendly practices					
Profit / economic reasons					
Client request					
Experimentation					
Impress regulators					
Regulator initiative / support					
To gain market advantage / to be in forefront					
Others:_____					

Comments:_____

_____

10. What should be done to incentivize the adoption of "green building guidelines" in Turkey?

Categories	Very Important	Important	Neutral	Unimportant	Don't Know
Regulation / mandatory standards					
Proactive local authorities					
Availability of institutional framework for effective implementation of green building guidelines					
Tax relief, grants, governmental subsidies, and other financial incentives					
Availability of better information on cost and benefits of green building guidelines					
Educational programs for developers, constructors, policy makers related to green building guidelines					
More publicity through media (e.g. print media, television shows, radio programs, internet)					
Availability of easy information related to "green building guidelines" (e.g. have a dedicated website)					
Create public environmental awareness by workshops, seminars, conferences					
Others:_____					

Comments:_____

_____

11. What are the barriers that prevent other companies from adopting green building guidelines in Turkey?

(1 - Very critical barrier, 2 - Major barrier, 3 - Moderate barrier, 4 - Very moderate barrier, 5 - Minor barrier)

		Major		Moderate		Minor	Comments
1	Lack of green building movement at national, regional or local levels	**1**	**2**	**3**	**4**	**5**	
2	Attitudes of Government Agencies	**1**	**2**	**3**	**4**	**5**	
3	Local disincentives (lack of infrastructure at local level)	**1**	**2**	**3**	**4**	**5**	
4	Unorganized nature of construction industry	**1**	**2**	**3**	**4**	**5**	
5	Not sure where to find information related to green building guidelines	**1**	**2**	**3**	**4**	**5**	
6	Lack of availability of demonstration projects	**1**	**2**	**3**	**4**	**5**	
7	Cost	**1**	**2**	**3**	**4**	**5**	
8	Lack incentives (tax relief, grants, etc)	**1**	**2**	**3**	**4**	**5**	
9	Recovery of long term savings not reflected on the service fee structure	**1**	**2**	**3**	**4**	**5**	
10	Lack of financing from banks for adopting green building guidelines	**1**	**2**	**3**	**4**	**5**	
11	Lack of training / education in sustainable design / construction	**1**	**2**	**3**	**4**	**5**	
12	Lack of expressed interest from clients (owners / developers)	**1**	**2**	**3**	**4**	**5**	
13	Lack of communication between contractor, subcontractors, suppliers, manufacturers	**1**	**2**	**3**	**4**	**5**	
14	Lack of interest from others on the project team	**1**	**2**	**3**	**4**	**5**	
15	Lack of technical understanding on the part of subcontractors, project manufacturers related to "green" technology	**1**	**2**	**3**	**4**	**5**	
16	Unreliable "green" technology	**1**	**2**	**3**	**4**	**5**	
17	Others:_____	**1**	**2**	**3**	**4**	**5**	

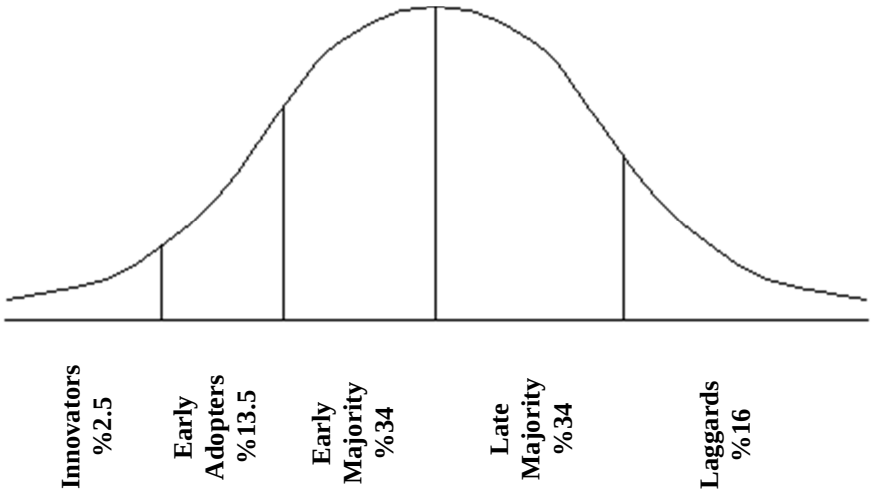
Comments:_____

_____

Part 4: Diffusion of Inovation

12. The literature on "Diffusion of Innovation" divides the adopters of "green building guidelines" in 5 categories. Following is a brief description of each of these five categories.

    - **Innovators:**These are the risk takers. Generally they are well educated and have a high income to absorb a failure
    - **Early Adopters:**This group is more visible and respected among their peers
    - **Early Majority:**They are above average in education as well as income and accept an innovation before the average person
    - **Late Majority:**They are not willing to take a chance unless the majority has already fully adopted the innovation. Reasons for the late majority to adopt are either economic or peer pressure
    - **Laggards:** They are sceptical of all new ideas and frequently by the time they adopt an innovation, a new one has already begun to take its place



Source: Rogers, Everett M. (1962). Diffusion of Innovation. The Free Press. New York

Which "Diffusion of Innovation" category best defines the current state of each adopter organization?

	“Diffusion of Innovation” Categories					
Name	**Innovators**	**Early Adopter**	**EarlyMajority**	**Late Majority**	**Laggards**	**Don’t Know**
Central Government						
State Governments						
Political Leaders						
Municipalities						
Nodal Agencies						
Community Groups						
Environmental Groups						
Owners / Developers						
Architects / Engineers / Consultants						
General Contractors						
Suppliers / Manufacturers						
Multinational Corporations						
Large Business Houses						
Trade Associations						
Universities / Educational Institutions						
Celebrities						
Media						
Others:_____						

13. What should be the strategy to accelerate the adoption of green building guidelines in the Turkish society? (Please pick one option)

_____ Government should take initiative in adoption of "green building guidelines" followed by multinational companies and large business houses to start the green building movement.

_____ Government should educate people about the profits associated with the adoption of "green building guidelines" to accelerate their adoption in Turkish society.

_____ Large Business Houses and Multi-National Companies should adopt "green building guidelines" first and set an example for other small business to follow.

_____ Government should give special privileges for business or individuals who have demonstrated their commitment towards "green building guidelines".

Others:_____

14. Would you like to receive the survey results? ____ Yes ___ No

15. If you would like to expand on your answers, may we contact you by phone or email?

If yes, provide your email or phone:_____

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- **Chergia, C.**, Ergen, E., Korkmaz S., 2012: Adoption Framework of Green Building Guidelines in Developing Countries: India, Indonesia, and Turkey Cases. *The Regional Studies Association (RSA) European Conference -- Network Regions and Cities in Times of Fragmentation: Developing Smart, Sustainable and Inclusive Places*, May 13-16, 2012, Delft, The Netherlands