

A Review of Green Building Movement Timelines in Developed and Developing Countries to Build an International Adoption Framework

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Abstract

The need for sustainable development in the construction sector has become significant in the last decade mostly due to the major resource consumption and contamination buildings generate. Green buildings have the potential to minimize this negative impact on the environment and offer business and occupant health related benefits. Many countries have either already adopted the green building guidelines or are in the process of adopting them. Developing countries are experiencing exponential growth in the built environment and there is a great potential of making the design and construction practices in these countries more sustainable through green building guidelines. Rapid adoption of these guidelines is important yet challenging. Acceptance of the green building guidelines in various societies can be attributed to comparatively a long history of this movement. The overlaps, similarities and differences in timelines of green building movement in various countries can help generate the first step on building a framework of green building movement and assessment systems adoption in the international arena. With this motivation, this paper presents the background of green building movement in the selected developed and developing countries: United States, India, and Turkey. The paper addresses emerging green building movement in these countries' markets based on the historical review and points out future directions of research.

Keywords

Sustainability, Green building guidelines, Construction industry, Developed and developing countries

1. Introduction

The terms "sustainability" and "green" that are often used interchangeably, have gained recognition in the architecture, engineering, and construction (AEC) industry within the past decade, as the world has become more sensitive to the issues of the environment and global climate change. The United Nations World Commission on Environment and Development -Brundtland Commission- Report (WCED, 1987) defines sustainable development as: "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

Globally, buildings contribute to substantial resource and energy consumption, ecosystem changes and global warming. As an 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 are responsible for over 10% of the world's freshwater withdrawals, 25% of its wood harvest, and 40% of material and energy flows, globally (Kibert, 2005). These findings justify the importance and timeliness of more aggressively engaging the AEC industry in efforts toward sustainability. Sustainable construction is a vital agent in the preservation of world's resources and promoting quality life across the globe.

In the global context, sustainable construction is defined as “a holistic process starting with the extraction of raw materials, continuing with the planning, design, and construction of buildings, and ending with their demolition and management of the resultant waste” (CIB, 1999). Sustainable construction requires a different conception of thinking about cost, quality, and time that traditional construction industry lacks (Vanegas et al., 1995). It adopts additional criteria which prioritizes minimal resource consumption and environmental procedures to achieve a healthy built environment (Kibert, 1994). This paradigm shift in the AEC industry has social, cultural, and environmental implication in the global context (CIB, 1999).

The paradigm shift in the AEC industry generated the need to develop guidelines for green building design and construction. The term green building guidelines refers to “the guidelines which evaluates the environmental performance from the ‘whole building’ perspective over the building’s service life” (Augenbro, 1998). Many countries including the U.S., U.K., Australia, Canada, Japan, Korea and India have either already developed the green building guidelines or are in the process of developing them. The U.S. Green Building Council (USGBC) became one of the front runners when it launched the Leadership in Energy and Environmental Design (LEED®) guidelines in 2000. Today, LEED® has more than 12,659 certified or registered projects in all 50 states in the U.S. and more than 85 registered projects in 69 different countries (USGBC 2008). Many developing countries, especially the rapidly developing ones such as India, have also started taking initiatives in this area. In this research, the term developing countries refers to the partially industrialized countries that usually lack sufficient national income or domestic private capital to finance the investment required to reach modern industrial statehood (IMF, 2008). Rapid adoption of these guidelines can help in reducing depletion of non-renewable resources and natural reserves in these countries, yet presents a challenge (Dalal-Clayton and Bass, 1994). Acceptance of the green building guidelines in various societies can be attributed to comparatively a long history of this movement (Melchert, 2005). The overlaps, similarities and differences in timelines of green building movement in various countries can help generate the first step on building a framework of green building movement and assessment systems adoption in the international arena. With this motivation, this paper presents the background of green building movement in the selected developed and developing countries: United States, India, and Turkey.

2. Green Building Movement in the U.S.

This movement in the U.S. can be associated with the rise in environmental awareness among the general public as well as the governmental response to the environmental movements in the form of policy initiatives. The description of the U.S green building movement has been divided into four milestones as shown in the Figure 1. These divisions are based on the major environmental and building policy initiatives during the history of green building movement in the U.S.

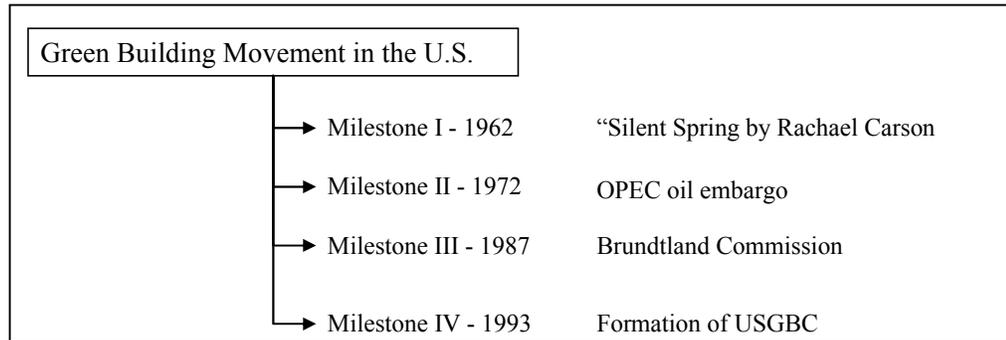


Figure 1: Milestones that Triggered Green Building Movement in the U.S. (Potbhare, 2008)

Milestone 1: “Silent Spring” by Rachael Carson in 1962: The start of the green building movement in the U.S. can be primarily associated with book named “Silent Spring” authored by Rachael Carson. The book had started a nation wide debate on the unrestricted use of the Dichloro-Diphenyl-Trichloroethane (DDT) and other pesticides by the government. This debate had united the environmentalist across the country, which had further led to the celebration of the First Earth Day on April 22, 1970. The public awareness created by this book can be referred to as the first nation wide environmental movement in the history of U.S. On the international front, the first Earth Summit was held in 1972 in Stockholm, Sweden. It is generally considered as the primary defining event in the international environmentalism and was initiated by the developed world to address the environmental effects of industrialization. 113 countries had participated in this Earth Summit and it was decided to meet every 10 years to review the progress. The conference had some successes which include 26 principles of the Declaration of the UN Conference on the Human Development, an action plan on the Human Environment and an Environment Fund (ENR, 2007).

Milestone II: OPEC oil embargo of 1972: The oil embargo laid by the Organization of Petroleum Exporting Countries (OPEC) on the U.S. had affected every citizen of the country and had brought the issues concerning the conservation of the limited non-renewable natural resources into limelight. The embargo had lasted only for six months but it had created an environment of crisis in terms of energy security and the hostility of the U.S. to OPEC nations. The government had issued many immediate measures such as tax benefits for the development of alternative sources of energy, regulating speed limits to 55 mph on highways, and had asked the public to reduce the unwanted usage of oil in their daily life.

Milestone III – Brundtland Commission of 1987: Due to the failure of any policy formulation in the Earth Summit that met in Nairobi in 1982, the U.N. General Assembly had created the World Commission on Environment and Development in 1983 under the leadership of the first woman prime minister Dr. Gro Harlem Brundtland. The primary mission of the commission was to address the growing concerns about the accelerating deterioration of the human environment and natural resources. This commission is now famously know as the “Brundtland Commission” and was responsible for defining sustainable development in their report “Our Common Future” in 1987.

Milestone IV – Formation of USGBC in 1993: All the international developments that took place in the milestone III had initiated a lot of debate within the environmental groups in the U.S (BDC 2003). To address sustainability, the U.S. government decided to target the construction sector, as it was one of the major consumers of the energy resources, contributors to the green house gas emissions and also was a direct medium of public interaction (Bhatnagar, 1999; Bondareva, 2005; Dalal-Clayton and Bass, 1994, Kibert, 2005; Landman, 1999). Formation of U.S. Green Building Council (USGBC) was one of the major events occurring during this phase. The timeline of events in green building movement for the U.S. are listed below in Table 1.

Table 1: Green Building Movement in the U.S.

| | | |
|--|---|--|
| September, 1962 | "Silent Spring" by Rachel Carson | |
| April 1, 1970 | Celebration of First Earth Day | |
| October, 1973 | OPEC oil embargo | |
| 1977 | Department of Energy was created to address energy usage and conservation | |
| 1977 | Solar Energy Research Institute was established. Later named as National Renewable Energy Laboratory to investigate in energy efficient technologies such as photovoltaics. | |
| 1978 | California commissioned 8 energy sensitive status office buildings which employed of photovoltaics, underfloor rock store cooling systems and area climate-control mechanisms. | |
| 1987 | UN World Commission on Environment and Development. Bruntland Commission: "Sustainable Development" as that which "meets the needs of present without compromising the ability of future generations to meet their own needs." | |
| 1989 | Transformation of AIA Energy Committee in to AIA Committee on Environment (COTE) | |
| 1992 | AIA Environmental Resource Guide | |
| 1992 | UN Conference Environment and Sustainable Development in Rio de Janeiro. Also called as Second Earth Summit it had representatives from 172 countries and 2400 non governmental organizations. Agenda 21 was passed during this summit for achieving global sustainability. Also The Rio Declaration on Environment and Development and statements on forest principles, climate change and biodiversity were formed. | |
| U.S. Green Building Council was formed | 1993 | UIA/AIA World Congress of Architects was held at Chicago. |
| | April 21, 1993 | President Clinton announced plans to make Presidential mansion "a model for efficiency and waste reduction" |
| | 1996 | US Department of Energy signed a memorandum of understanding with AIA/COTE to conduct joint R&D and began a program to develop a series of roadmaps for buildings of 21st century. |
| | 1997 | - Kyoto Protocol - Navy initiated the development of the Whole Building Design Guide, an online resource that incorporates sustainability requirements into mainstream specifications and guidelines. |
| | September, 1998 | President Clinton issued the first of three "greening" executive orders: - EO 13101 - Called upon the federal government to improve its use of recycled and "environmentally preferred" products. - EO 12123 - Encouraged government agencies to improve energy management and reduce emissions in Federal buildings through better design, construction and operation. - EO 13148 - charged Federal agencies to integrate environmental accountability into day to day decision making and long term planning. |
| USGBC membership approved LEED Verison 1.0 | 1999 | President's Council on Sustainable Development had culminated a final report recommending 140 actions to improve the nation's environment, many related to building sustainability. |
| USGBC membership approved LEED Verison 2.0 12 initial pilot projects achieve certification under LEED 1.0 | March 2000 | |
| LEED for New Constructionj Verison 2.1 is released. | 2002 | World Summit on Sustainable Development organised by UN was held in Johannesburg. Its also called The Earth Summit 2002 and was attended by 100 heads of states and more than 40,000 delegates. |
| LEED for Existing Buildings is approved and launched by USGBC membership | October 2004 | |
| LEED for Commerical Interiors is approved and launched by USGBC membership | October 2004 | |
| LEED for New Construction Version 2.2 is released. | November 2005 | |

3. Green Building Movement in India

The Indian green building movement can be mainly associated with the government initiatives to encourage sustainability in the society and the acceptance of the green building guidelines by the corporate sector (Bhatnagar, 1999). Unlike U.S., where the government policies were based on the public pressure through the environmental movements, major policy decisions by the Indian government were in response to the international events such as the OPEC oil embargo, the Brundtland Commission or the Second Earth Summit (Bondareva, 2005). The green building movement in India has been divided into three main phases as shown in Figure 2.

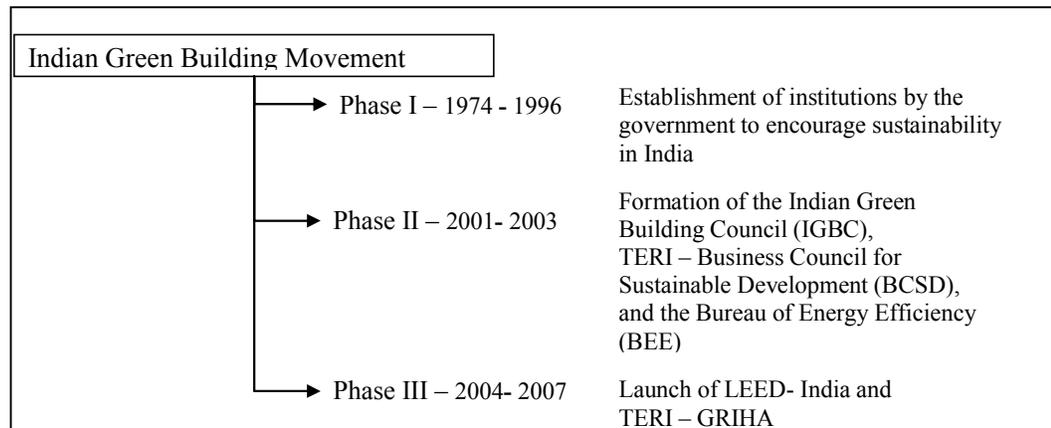


Figure 2: Indian Green Building Movement (Potbhare, 2008)

Phase I (1974 – 1996): Establishment of institutions by the government to encourage sustainability in India: In this first phase, capacity building measures were taken by the government to encourage sustainability in the Indian society. These capacity building measures can be associated as the governmental response to the energy crisis that had been triggered due to the OPEC oil embargo of 1972 (Bhatnagar, 1999; IGBC, 2007; TERI, 2007). The timeline of the events occurring during this phase is as follows (Bhatnagar 1999, TERI 2007): (1) The Energy and Resources Institute (TERI) was established. The primary mission of the institute was to address the problems in the field of energy, environment, and the future patterns of development (1974); (2) Establishment of National Hydro Electric Power Corporation (1975); (3) Establishment of National Institute of Ecology to enhance environment and conservation through education and research (1976); (4) Environmental (Protection) Act was passed in the Parliament (1986); The Indian Parliament initiated a voluntary eco-labeling program known as the “Eco-Mark” at the initiation of the Ministry of Environment and Forest (MoEF) and Central Pollution Control Board (CPCB) and The Government of India declared that 14th December of every year will be recognized as the “National Energy Conservation Day” (1991); Construction Industry Development Council was formed as a nodal agency between the government and the construction industry to address the issues of education, environmental awareness, law enforcement in the construction sector (1996).

Phase II (2001 – 2003): Formation of major policy making and supporting organizations (Bhatnagar, 1999; IGBC, 2007; TERI, 2007): This phase marks the formation of the Indian Green Building Council (IGBC), TERI – Business Council for Sustainable Development (BCSD), and the Bureau of Energy Efficiency (BEE). These institutions have been responsible for accelerating the adoption of green building guidelines in the country (Bhatnagar 1999). This phase also marks the first platinum rating award by USGBC to CII- Green Business Center under the LEED®-NC v. 2.2 (IGBC, 2007). Following is the timeline of the events occurring during this phase: (1) Indian Green Building Council was formed. The membership of this council represented the government, corporate sectors, architects, product manufacturers, institutions, etc. (2001); The Three Country Energy Efficiency Project as started by UN. The primary aim of the project was to provide the technical assistance for developing financial intermediation mechanisms for energy efficiency in India/ TERI - Business Council for Sustainable Development (BCSD) was initiated as a partner of World Business Council

for Sustainable Development. TERI BCSD is responsible for TERI- Green Rating for Intergrated Habitat Assessment / Bureau of Energy Efficiency (BEE) was formed. BEE is an autonomous organization, with the mission to improve the energy efficiency of the country (2002); CII Godrej Green Business Center was awarded Platinum Rating by U.S. Green Building Council under LEED® v. 2.0 (2003).

Phase III (2004 – 2007): Launch of LEED®- India and TERI – GRIHA® (IGBC 2007, TERI 2007): In this phase two green building guidelines, TERI-GRIHA® in 2005 and LEED®-India in 2007 were launched in the Indian society. The rapid developments in the field of green building guidelines can also be attributed to the international pressure on the Indian government to address sustainability in the Indian society and the rapid acceptance of LEED®- NC within the Indian corporate sectors. Also in this phase the first ever Indian GreenBuild Conference was held in 2005 with an objective to create awareness, bring together stakeholders and provide platform for sharing knowledge and best practices in the green building sector. Following is the timeline of the developments happening in this phase: (1) USGBC signed the LEED® licensing agreement with India during its fourth GreenBuild conference at Georgia / ITC Green Centre Project, Gurgaon was awarded with platinum rating under LEED® 2.1. ITC Green Centre is now the largest platinum rated building in the world. India thus had 2 of the 7 platinum rated buildings around the world (2004); The TERI GRIHA® rating system was launched with the aim to achieve efficient resource utilization, enhanced resource efficiency and improved quality of life in buildings / The first Indian GreenBuild conference was organized by IGBC in September 2005 at Delhi (2005); LEED® for New Construction v. 1.0 was released by IGBC/ The Government of India introduced Energy Conservation Codes with the help of BEE for commercial buildings (2007).

4. Green Building Movement in Turkey

Turkey's green building industry has recently been in a process of rapid development. Government policy is becoming more aligned with Turkey's energy deficit and external pressures further encourage environmentally responsible development. Also, international investors and non-profits are importing an environmentally conscious ethos to some of Turkey's high-profile developments. But what does "green" mean in Turkey, and moreover, which building should be considered part of Turkey's green building history? This section will consider both activities in the building sector which explicitly engage in the rhetoric of environmentalism, and buildings which would qualify as green under international standards, regardless of intent. Turkey's green building industry is forming under these sometimes disparate phenomena.

Recent Growth: In many ways, green building in Turkey has reached an unprecedented peak. Unheard of several years ago, now major commercial developments advertise an awareness of environmental issues, or a design premised on sustainable principles. Malls and major office developments are engaging in green retrofit processes. For the eco-conscious tourist, the Turkish Ministry of Culture and Tourism has mobilized hotels and resorts with its Green Star program, based on established green building standards. These recent developments, however limited, signal the entrance of green building into Turkey's mainstream building industry. Turkish Green Building Association has been established with intentions to be a Green Building Council (GBC) in October 2007. The association has been lobbying on green buildings since then.

Case Study Houses: Not all green buildings in Turkey are class-A commercial properties, nor are they recently built. The METU Solar House in Ankara, built in 1975-6, is Turkey's first green building case study. Several solar houses followed, including Cukurova University Solar House and the (MTA) Solar House in 1981, the Greater Ankara Municipality Solar House in 1993, TUBITAK National Observatory Guest-House and the Erciyes Active Solar House in 1996. The Diyarbakir Solar House, sponsored by the Diyarbakir Municipal government in 2008, shows a recent continuation of this trend. The houses use a variety of solar technologies such as direct-heated ventilation air, solar flat-plate collectors, photovoltaic cells, and passive solar heating systems.

Besides the METU example, they were all built to display the potential to use solar energy in Turkey's residential development (Hepbasli, et. al., 2004).

Holistic Examples: More holistic approaches to green building can be found as well. The Eco-Center at Kerkenes was originally founded as a research outpost for a nearby archeological dig. Francoise Summers, a member of the Middle East Technical University's faculty of architecture, developed the site into several buildings in 2002. METU students and local entrepreneurs use the facility for studying sustainable building techniques, low-tech uses of renewable energy, and local economic integration. Nevzat Sayin, one of Turkey's most respected architects, also designed locally-sensitive buildings for the town of Yaşibey in 1997. While they are not advertised as "green," the modern summer homes aesthetically and urbanistically fit into the fabric of the traditional town. Furthermore, in both high cases the structures are built with locally supplied materials and knowledge, and traditional building techniques. By these standards, their environmental sustainability can be considered on par with many of their modern commercial counterparts. There is also an Eco-Building designed by HAS architecture to be built at Istanbul Technical University Maslak Campus in 2009. This project works on the "zero energy" principle. The building is planning to apply for an international green building certification system.

Commercial Sector: The recent development of green building in the Turkish commercial sector has been closely tied to the international architectural community. Indeed, much of the green building projects and ethos has been imported from top firms abroad. The Kaplankaya project, for example, is a nearly 5 million m² eco-tourism resort planned near Milas in southwestern Turkey. Renowned international architects such as Steven Holl, Lord Norman Foster, and Robert A.M. Stern will bring green design expertise on a level currently still gestating in Turkey. In Istanbul, Zaha Hadid and Ken Yeang each have a major urban project with green ambitions on the horizon as well. Two of Turkey's largest retail developers, Metro and the Dutch-based REDEVCO, have corporate-wide sustainability policies and construction companies like SOYAK, ZORLU, TEKFEN and ECZACIBASI are developing theirs. Also, Turkish-owned Kanyon Mall both won the 2006 Cityscape Architectural Review Award and employed the London-based firm ARUP, which specialized in advanced green engineering, as project engineers. More locally, in 2007 Erginoglu & Calislar Architects built an ecologically designed telecommunications company headquarters in the TÜBİTAK Marmara Research Center Zone near Istanbul. These developments indicate that "green" design and operations are achieving cache for both building owners and potential buyers alike.

Education and Research: Turkey's educational sector also has a limited but productive investment in green building. The faculty at Istanbul Technical University, now part of the Sustainable Energy Research Group (SERG), has researched energy efficiency and passive conditioning strategies since the 1950s. Their work now includes building technology research laboratories and pairing with corporate partners such as the Kanyon Mall to research energy modeling techniques. Turkey's other major technical school, the Middle Eastern Technical University, has also long inquired into sustainable design. Students at METU built the Ankara Solar House in 1975, and current research tracks in the Architecture Department include "Architecture and Environment" and "Sustainable Architecture: Green Design, Community Design and Universal Design in Architecture". While the specific research inquiries may be mixed, it is clear that the rhetoric and agenda of sustainable architecture are being incorporated into some of Turkey's highest academic institutions.

Government: As a political entity, Turkey first engaged with the environment in 1978 with the establishment of the Undersecretariat for the Environment. Five years later, the 1982 Constitution included the "right to live in a healthy, balanced environment," and in 1983, the first Environmental Law was passed. Several environmentally directed laws followed, including regulations on pollution and the Mass Housing Law of 1984. Then in 1992, responsibility for Turkey's environmental management was given to the new Ministry of the Environment, which still exists today. A key piece of legislation was the Environmental Impact Assessment law of 1992, requiring municipal approval of all public land development. Generally, however, development interests have trumped the environmental intent of this law (Calguner, 1999). Recently, regulations for Turkey's accession into the EU have increased incentive on environmental reform, though little progress has been found

(Turkey Progress Report). Another motivating factor for green building and environment came from the UN-HABITAT II forum, held in Istanbul in 1996. This international event was a watershed for ideas on improved urban habitat and building.

Turkey's energy dependence and the need for energy efficiency has also prompted regulatory and rhetorical changes. In 2008, the central government finished implementing insulation requirements for both commercial and residential buildings. One hundred percent compliance would be expected to save billions of dollars and 70% of the country's heating energy. Though not directly related to the environment, per se, these measures to represent an advancement of the building industry.

5. Conclusion

Among the countries examined historically in terms of their green building markets, the U.S. as a developed country appeared to be the frontrunner with the acceptance and use of green building guidelines. India also has accelerated its movement with the formation of Indian Green Building Council. Though Turkey's green buildings are more of a presence than ever, more inter-development is needed to enable production on a large scale. Recently founded Green Building Association (emerging council) is aiming to transfer global know-how to Turkey through the experiences of Green Building Councils from all over the world. Historical review of green building movement in these countries showed overlapping events and trends. Moreover, formation of green building councils in each country helped to increase awareness in both developed and developing countries. The next step in this research is to examine the construction industries along with their governments and academia within these countries to understand the motivations and barriers to adoption of green building guidelines. The vision for this effort is to build a framework for developed and developing countries for adoption of green building guidelines.

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