1. Abstract

In the United States, the US Green Building Council has had stunning success at gaining widespread adoption of its LEED standard for green construction and has been the most influential body in green construction; particularly for green building codes. The culture of green construction is evolving with the anticipated adoption of green building codes. A new partnership among five major U.S. standard developers have become responsible for harmonizing ASHRAE 189.1, the International Green Construction Code (IgCC), and the LEED rating systems with the aim of simplifying implementation of local green building regulations and incentive programs. Many cities in US already adopted IgCC including the City of Dallas, Texas. The code will be mandatory for all new construction in the jurisdiction beginning in 2013. This paper will discuss green building standards, rating systems and the adaptation of IgCC as a regulatory tool to increase energy efficiency and complement voluntary green building rating systems.

Key words: Green construction, Standards, Codes, LEED, International Green Code (IgCC)

2. Introduction

The current state of the world is facing two urgent global issues in environmental degradation and poverty alleviation. There is ongoing massive environmental degradation. We need to consider the following factors: human activities are resulting in mass species extinction rates higher than ever before, depletion of the ozone layer, high rates of destruction of the earth’s biodiversity, increasing greenhouse gases, and human-induced climate change is threatening future. The development gap between developed and underdeveloped countries is also becoming glaringly apparent. According to the human development report, “Globally, 20% of the world’s people in the highest-income countries account for 86% of total private consumption expenditures—the poorest 20% a minuscule 1.3%.”[6] reported that at least 80% of humanity lives on less than $10 a day[6,5] Deepak (2009) argues while globalization has led to greater wealth and higher living standards in developed countries, developing countries have suffered as a result with dissimilar results. The gap is not only between rich and poor countries on a macro level, but also on a more micro level, the gap of disparity between the wealthy and poor of these countries [11]

Unsustainable development has encouraged only the economic optimization of natural resource consumption, resulting in environmental degradation (WCED) putting humanity at risk. In order to address environmental degradation and poverty, paradigm shift is necessary in our current path of development, we must adopt evolving methods that will encourage sustainability and increase human well-being [22].

Despite it’s wide use, sustainable development is rather difficult to define clearly. The United Nations Commission on Economic Development (UNCED), in its landmark 1987 report Our Common Future, defines it as that which “meets the needs of the present without compromising the ability of future generations to meet their own needs [27]. Acceptance of this report by the United Nations General Assembly (UNGA) gave the term political salience; and in 1992 leaders set out the
3. Buildings & Climate Change

Climate change is an energy issue, focused specifically on the burning of fossil fuels and coal for electricity generation. According to the U.S. Energy Information Administration (EIA), coal is responsible for 74.3% of the CO₂ emissions produced by electricity generation, natural gas 24.4% and petroleum 0.8%. Of the electricity we consume, three-quarters (74.9%) goes just to operate the buildings we live and work in every day. By comparison, the industry uses 24.9% and transportation, less than 1% [31].

Architecture 2030 reports that the building industry is the largest contributor to the U.S. and global CO₂ emissions and greenhouses gases as provided in figure 1.

Figure 1. US CO₂ emissions by sector (Source: http://architecture2030.org)

With the world population rapidly growing, it creates an increasing demand for building services and comfort levels. Together with the rise of time spent inside buildings, as reported by the EPA, the US population spends 90% of their time indoors [14, 21, and 28]. As the population increases the rising trend in energy demand will continue to rise accordingly in the future [30]. Therefore, energy consumption and CO₂ emissions on the built environment have made energy efficiency strategies a priority [23]. Highlighting the goals of impacting the development of new building regulations and codes at regional, national and international levels [5].

The importance of energy efficiency requirements in building codes or standards extends beyond their role in new buildings [15]. Building codes and efficiency standards often serve as efficiency targets for renovation or other improvements of existing buildings [2].

4. Green/Sustainable Buildings

Traditional design and construction focuses on cost, performance and quality objectives, but sustainable design and construction implements the minimization of resource depletion, environmental degradation or impact and creates a more suitable, i.e., healthy, environment whilst matching the core principles of traditional design [18]. The idea of energy efficient, healthy buildings has been around for a long time, but recently the concept of “green” or “sustainable” building is entering the mainstream due to increasing awareness of climate change, rising energy costs, the growing awareness and liability costs associated with “Sick Building Syndrome”, declining oil reserves, and concerns about depletion of our water supply [7, 8].

Sustainable, or “green building,” design and construction uses resources more efficiently, while creating healthier and more energy-efficient homes and commercial buildings [13.6]. Some major benefits of green building design and construction is the reduction of water consumption, a reduced carbon footprint of the buildings on the environment through conservation of resources, while at the same time balancing energy-efficient, cost-effective, low-maintenance products for construction needs. To summarize, green-building design involves finding the delicate balance between buildings and a sustainable environment [29].

The shift to sustainability can be seen as a new paradigm where sustainable objectives are within the building design and construction industry. It is considered for decision making at all stages of the life cycle of the facility [16]. Figure 3 outlines the development and challenges of the sustainable construction concept in a global context.

Figure 2. Challenges of sustainable construction in a global context (Source: Md Hussin et al., 2013)

4.1 Is LEED Enough for Green Building Challenge?
The U.S. Green Building Council’s LEED, or Leadership in Energy and Environmental Design, is a green building certification program that is the most accepted sustainable development certification system in the US and many other countries in the world. Every day, more than 1.5 million square ft. of space is certified using LEED. More than 58,000 commercial and institutional projects are currently participating in LEED, comprising 10.7 billion square feet of construction space in more than 140 countries and territories. In addition, more than 50,000 residential units have been certified under the LEED for Homes rating system [19, 29].

The LEED Green Building Rating Systems are voluntary systems that assess the environmental performance of built projects across a spectrum of key criteria. From water and energy use efficiency to location, the impact of materials used, amongst other factors, LEED is intentionally designed to recognize buildings that go beyond the minimum code of compliance. While these minimums will vary, they should vary country to country and in the US, from state to state. These minimums must also vary from jurisdiction to jurisdiction and must include the most current version of the model energy code as a mandatory minimum for all buildings [32].

Recently most noticeable conversations centered on whether LEED standards are enough to meet the growing climate challenge. How effective are LEED standards in addressing resource consumption and carbon output [24]? Some concerns about LEED center around the notion that it is becoming more of a marketing ploy for high-rise developers. Critics have also voiced concern in regards to LEED, as energy efficiency has been a part of the LEED rating system, but it is far from the only axis of sustainability advanced by LEED [19, 20].

Regardless of questions and discussions about LEED being enough for the future of Green Buildings, it is a fact that the USGBC has raised awareness of the hazards created by the cumulative impacts of buildings on human and environmental health, which has brought about the need for a contemporary step by step change in the purview of the codes. The USGBC and its partners across the building industry are committed to advancing incremental and advanced regulatory changes that are now available with the advent of green building codes and standards. Alongside these codes, rating systems play an important, distinct and complementary role. Together, they are enabling truly sustainable buildings and communities [4, 15, and 33].

4.2 GREEN Construction Code (IGCC)

The world of green construction will soon change with the adoption of new, green building codes. How will this affect the U.S. Green Building Council? Change, the evolution of the industry will always bring change as a result. The industry should expect significant changes with regards to LEED. The International Code Council (ICC) has been successful in implementing and having others adopt its International Construction Code, International Residential Code and various trade codes of differing specificities. The International Green Construction Code (IGCC) has been furthered by the ICC and is on a parallel track with the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE); who themselves are developing Standard 189.1, a Standard for the Design of High Performance, Green Buildings [2, 10].

The ICC in the U.S, is a nonprofit membership association originally established in 1994 to help the building safety community and construction industry provide safe and sustainable construction practices with the development of codes and standards used in the design, build and compliance process. The purpose of the ICC is through public/private sector collaboration, to support the government by developing codes that allow for safe and sustainable construction [15].

The first I-Code edition was established in 2000 and in 2009, the ICC launched the development of the International Green Construction Code (IGCC) with cooperating sponsors the American Institute of Architects (AIA) and the ASTM International (ASTM), and with a USGBC seat on its drafting committee. In contrast of LEED, the IGCC is not a rating system and was not established to replace LEED. As shown in figure 3, it is a code intended to be adopted on a mandatory basis.

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Figure. 3 Mandatory Versus elective provisions (source: IGCCwww.iccsafe.org/igcc)
When adopted and implemented as mandatory, these green building codes can provide regulatory oversight over a spectrum of measures that can lessen the impact of our buildings on human and environmental health, while also taking advantage of energy, water and resource efficiency [29].

The efforts to make the District of Columbia a nationwide leader in sustainability was spurned in early 2012, and by March 28, 2014, the District of Columbia adopted the 2013 District of Columbia Construction Codes, comprised of the 2012 international codes and the 2013 DC construction codes supplement [12].

Florida has adopted the IgCC as an option for the retrofitting and new construction of all state-owned facilities. Previously, Floridian law did not recognize any kind of green construction code, only voluntary rating systems. Several Jurisdictions in Arizona, including Phoenix, approved the adoption of the IgCC, ICC 700 and the National Green Building Standard for voluntary use. Oregon was another state that embraced the adoption and integration with the existing I-Codes that the state currently uses. California, on January 1, 2014, has adopted the 2013 California Building Standards Code (Cal-Green). Many other states and jurisdictions continue to follow the trend and adopt the IgCC [12,29].

5. City of Dallas Green Building Adaptation of IgCC: Case Study

In 2007, Dallas Mayor Tom Leppert tasked a green building task force (GBTF) with developing green building standards for all new construction in Dallas. Led by Public Works and composed of over 70 diverse stakeholders, including the Real Estate Council, the Dallas American Institute of Architects (AIA), and the Association of General Contractors (AGC-TEXO), the GBTF reached a consensus in favor of a green building ordinance impacting every new project in the city, municipal and private. The code was implemented in two phases: Phase 1 – effective October of 2009 - focused on energy efficiency and water conservation; Phase 2 - effective October 1, 2013 - requires a comprehensive green building standard be met for all new residential and commercial construction. Phase 2 includes the 2012 International Green Construction Code (IgCC), making Dallas the first city in the country to adopt the IgCC as a mandatory code for new commercial construction.

Adoption of the IgCC in the city of Dallas can be studied from points of novelty, innovation, effectiveness, significance and transferability.

Novelty: The Dallas Green Building Code is the result of collaboration, partnership and engagement of multiple stakeholders that through the city-led Green Building Task Force (GBTF), reached consensus regarding the components and implementation steps. The GBTF was created in 2008 and the process was so constructive that it was reconvened in 2010 and 2012 to report on the progress of Phase 1 of the Green Code and to review local and national codes to update and implement Phase 2. The 2012 GBTF was comprised of industry stakeholders that participated in the development of the original ordinance or expressed interest subsequently (approx. 190 in list—15 to 35 participants twice weekly for a period of four months). Their contribution was significant to make Dallas an early adopter of the IgCC and a national leader in Green Building Codes.

Innovative: The approach is innovative because it changed business as usual for all new construction in Dallas. Even more critical was the process. The Mayor brought all the parties together – staff, environmentalists, builders and community groups – to develop the new standard. The result was a real win-win for builders, consumers and the community. It was repeated in 2012 with a higher level of success due to challenges brought by a more educated and experienced group of stakeholders, a more detailed review of existing and new codes and a still volatile, recovering economy.

Another innovation is the creation of the third party provider: a certifying agent responsible for plan review and enforcement of the green code. This is being reviewed by the North Central Texas Council of Governments as a model for the region that can serve as a catalyst for other communities to adopt a green building code.

Effectiveness: The Green Building Code was implemented as a program. The main goal was to integrate it into the existing structure of the building inspection department to change the core business model entirely. The review and inspection process was mapped to insert the green code plan reviews, permits and inspections within the established framework. Understanding that a construction development project can be complex, the program requirements had to allow a development project to meet regular construction schedules and deadlines.

The program – currently on its 5th year, consisted of branding, creating a technical handbook, educational material, checklists and templates, and internal as well as industry training for a two-phase code that had to be in place within eighteen (18) months of adoption. A green building team, training and information was available online at the city’s website as well as in print by the code’s effective date. The program rolled-out smoothly and was well-received.

Significance: The adoption of the green building ordinance places Dallas at the forefront of cities leading in high performance green building initiatives. The codes promote environmental improvement, produce sustainable development, are regulations that are not burdensome to builders, and create development desired by consumers. Since taking effect in October 2013, the City has issued over 500 new residential permits, over 90 permits for green commercial buildings and
performed over 700 inspections under the comprehensive and updated Green Code Phase 2.

Transferability: Both the Dallas Green Building Code adoption and implementation processes have become regional models that are being shared and studied for adoption by other communities.

6. Conclusions

Sustainable development and green construction are essential for the current and future pace of development in the world. In the United States, the US Green Building Council has had stunning success at gaining widespread adoption of its LEED standard for green construction and has been the most influential body in green construction; particularly for green building codes. Standard building codes are to ensure safety and protect human health. In near future they will also have to adhere to codes designed to protect the environment, conserve energy, and preserve natural resources. The International Code Council (ICC) recently launched the IgCC initiative aims to significantly reduce energy usage and greenhouse gases through mandatory green building design and performance in new and existing commercial buildings. It is also intended to preserve natural and material resources in site development and land use; improve indoor air quality; and support the use of energy-efficient appliances, renewable energy systems, and water resource conservation measures. Voluntary systems, such as LEED, are crucial in sustainable building in a global context. It is in the best interest of the construction industry to have a more unified and mandatory systems in place to better allow sustainable development to affect the world. Green codes offer a flexible tool that cities around the globe can use to regulate building design and construction to meet the desired energy efficiency, conservation and sustainability goals. Cities like Dallas, TX utilized a public input process to ensure that the local community understood and participated in the goal setting and program requirements. The development and implementation process can serve as a model to be replicated globally. The progress in Dallas should serve as a template for other states, nations and country’s to develop upon in order to further sustainable practices. As civilization evolves, so to must its tools and practices in order to better prosper.

References:


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