A political ecology of the built environment: LEED certification for green buildings

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Abstract

The LEED (Leadership in Energy and Environmental Design) standards of the non-profit U.S. Green Building Council have become the accepted benchmark for designating "green buildings" in the U.S. and many other countries. Throughout their ten-year history, the standards have remained flexible, changing with input from designers, builders, environmentalists, and others to incorporate new types of buildings and modify the existing standards to make them more geographically, economically, and functionally sensitive. In this paper, I examine through an urban political ecology lens how the LEED standards help to produce a particular kind of built environment.

Political ecology has broadened from its origins in the cultural ecology of the developing world to include urban and industrialized environments. In recent years, work in this area has focused on hybridity and socio-nature to explore the ways that urban environments are constructed and maintained through biological, political, and economic processes. Political ecologists have also shown sensitivity to the importance of scale in both the ecological and social constructionist senses. In this paper, I show how the LEED standards and the green buildings and built environments they help to produce are hybrids of material objects and human practices.

Keywords: green buildings, political ecology, built environment, sustainability

The Leadership in Energy and Environmental Design (LEED) standards of the non-profit U.S. Green Building Council (USGBC) have become the accepted benchmark for designating "green buildings" in the U.S. and many other countries, with over sixteen thousand projects currently seeking certification. Throughout their ten-year history, the standards have remained flexible, changing with input from designers, builders, environmentalists, and others to incorporate new types of buildings and modify the standards to make them more geographically, economically, and functionally sensitive. This article examines through an urban political ecology lens how the LEED standards help to produce a built environment that is an explicit hybrid of human and natural objects and practices.

Political ecology has broadened from its origins in the cultural ecology of the developing world to include urban and industrialized environments. In recent years, work has focused on hybridity and socio-nature to explore how urban environments are constructed and maintained through biological, political, and economic processes. While urban political ecology is not a research method per se, it does provide a framework for considering green buildings. Approaching green buildings from an urban political ecology perspective thus leads us to ask what vision of the city is being produced by the LEED standards. (We can also ask who is producing that vision and why, as well as for whom, but these questions are beyond the scope of the current article.) Through an examination of the current standards, I will show how the LEED program works to construct cities with the following characteristics:

- flexibly and reflexively green;
- well-documented and carefully planned;

- sustainable in terms of the environment and the economy, but not society; and
- planned to be socio-natural hybrids.

After a more detailed explanation of the LEED standards and a brief review of the urban political ecology literature, this paper explores each of these points in turn. The main contribution of this article is to argue that one of the most promising sources for understanding the production of socionature is the *built environment*, which by its very name implies the irreducibility of the world to the human on one side and the natural on the other. Green buildings and the standards that produce them are one important pathway to investigating how the built environment is constructed both discursively and materially, and how changing building practices might imply a change in urban socio-nature relations.

The LEED standards

The recent and rapidly-growing green building movement urges architects and builders to take the environment into account at local, regional, and global scales. Buildings in the U.S. account for 68 percent of electricity consumption, 37 percent of energy usage, and 88 percent of potable water usage, while generating 30 percent of greenhouse gas emissions (USGBC 2003, The Economist 2004). One way to reduce these numbers is through a certification program that awards points for reducing environmental impact, and the non-profit U.S. Green Building Council was founded in 1993 with the express purpose of doing so. The LEED program began in 1998, and has since been used by public and non-profit agencies as well as private developers for buildings ranging from houses to skyscrapers. The LEED standards have been adopted in over forty countries, including Brazil, Canada, China, India, and the United Arab Emirates, and programs such

as BREEAM in the UK and Green Star in New Zealand and Australia serve a similar function.

Because of the wide variety of structures in the built environment, there are several different sets of LEED standards. Over 80 percent of certified buildings fall into the New Construction (NC) category (as opposed to Existing Buildings or Homes, for example), and so those are the standards that will be examined here. As of November 2008, there were over 2,000 projects that had been certified as LEED-NC, with an additional 15,000 registered but still under construction, and construction industry analysts estimate that by 2010, 10 percent of all buildings in the U.S. will be LEED-certified (USGBC 2008c).

One of the strengths of LEED certification is its flexible point or credit system. There are seven prerequisites, and credits can then be acquired according to the preferences of the building owner, designer, and/or contractor, up to Certified, Silver, Gold, or Platinum levels. USGBC data show that of the buildings certified under LEED-NC as of the end of 2007, 34 percent were Certified, 32 percent were Silver, 28 percent were Gold, and 6 percent were Platinum. These figures indicate that most builders are not settling for the minimum requirements, but are trying to achieve as many credits as possible.

The credits are distributed across six categories: Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials & Resources, Indoor Environmental Quality, and Innovation in Design. Table 1 shows the relationship between the percentage of total credits that are possible in each category and the credits actually achieved in that category based on all LEED-certified buildings as of the end of 2007, indicating that some categories are more popular than others.

[insert Table 1 here]

As the LEED reference guide notes, "Establishing sustainable design objectives and integrating building location and sustainable features as a metric for decision making encourages development and preservation or restoration practices that limit the environmental impact of buildings on local ecosystems" (USGBC 2007, p. 21). In the Sustainable Sites category, "sustainability" includes reducing air and water pollution from the construction process, making use of existing infrastructure, redeveloping brownfields, promoting alternative transportation, maximizing open space and habitat, managing stormwater in both quantity and quality, and minimizing heat island effect and light pollution. The proportion of credits achieved in this category was roughly equivalent to the percentage of possible points (Table 1).

Water Efficiency includes reducing water usage for both potable and non-potable water, including landscaping as a separate category. Treating wastewater on site is one possibility in addition to simply reducing usage; the intent is to reduce not only the flow of water into a building, but of wastewater out of the building as well. Credits were achieved in this category to a slightly greater extent than they were available (Table 1).

Since one of the most-cited statistics by the USGBC is the 37 percent of energy usage that goes to buildings, the Energy and Atmosphere category would seem particularly important. Beyond the obvious strategy of reducing energy consumption (with up to 10 points possible for different levels of doing so), this category includes managing refrigerants, using renewable energy onsite or paying for green power, using building commissioning, and monitoring building performance over time. Based on Table 1, credits appear more difficult to earn in Energy and Atmosphere than in other categories.

Materials and Resources is the category most concerned with connections beyond the building's immediate surroundings, including explicitly trying to promote local green economic development through the production of green building materials. As the LEED reference guide states, "Building materials choices are important in sustainable design because of the extensive network of extraction, processing and transportation steps required to process them" (p. 239). With that in mind, credits are achieved by recycling onsite, diverting construction materials from disposal sites, reusing existing building elements when possible, using recycled or rapidly-renewable materials as well as certified wood, or using local or regional materials. The latter is where one of the most significant changes in version 2.2 has occurred: instead of "local" counting as the final site of production, now at least 10 percent of materials must be extracted or sourced locally. Slightly fewer credits were achieved here than would be expected, based on Table 1.

Because the majority of the population in the U.S. spends most of its time indoors, Indoor Environmental Quality may actually be more relevant to human health than the out-of-doors is. This category addresses that concern via indoor air quality management plans, low-emitting materials (carpet, paint, etc.), the ability of building occupants to adjust their own heat and light conditions, and increasing ventilation. Proportionately more credits were achieved in this category than almost any other (Table 1).

Finally, there are three purposes for the Innovation in Design category: to reward designers for going above and beyond the existing standards (generally considered to be twice the level; for example, using 40 percent recycled content instead of 20 percent); for recognizing new technologies or processes (such as carsharing from a residential building

in lieu of carpooling); and for including a LEED Accredited Professional (AP). Anyone who passes the AP exam is qualified to go through the building process with the design team and verify that credits are or are not likely to be achieved. The USGBC then independently certifies the building. As Table 1 shows, while only 7 percent of available credits were in Innovation in Design, 11 percent of achieved credits were here, making this a very popular category.

These six categories are open to review and debate by the USGBC membership. In 2009, the fourth round of LEED standards will be put into place. The standards themselves are developed by consensus-based, volunteer committees and are open to public comment, although only member organizations are allowed to vote on the actual standards. This tips the power balance in terms of organizations rather than individuals, although that does include state and local governments, nonprofits, and educational institutions in addition to private firms. As more and more local governments insert LEED requirements into their building codes and ordinances, it is important to consider how voluntary these standards really are, as well as who is in favor of their implementation and who is not.

Each of the categories of credits also displays a particular aspect of the human-environment relationship as expressed in the built environment, largely in an urban setting. The LEED standards produce a particular kind of environment, one that uses minimal resources and produces minimal waste, but is also very much an urban, indoor environment. In recent years, geographers and others have theorized extensively about how cities and nature are not only intertwined, but co-constitutive, through the

framework of urban political ecology. The following section explains the main contributions of this field and their relevance to green buildings.

Urban political ecology

While political ecology has been around for decades, its urban branch is relatively new. Heynen et al. (2006) identify the need to fill in the missing spaces of both political ecology (where the urban has been neglected) and sustainability (where capitalism has not been rigorously considered). They and others (e.g., Swyngedouw 1996; Braun and Castree 1998, Braun 2005, 2006) argue for the hybrid, co-constructed concept of social nature or socio-nature: "Put simply, gravity or photosynthesis is not socially produced. However, their powers are socially mobilized in particular bio-chemical and physical metabolic arrangements to serve particular purposes; and the latter are invariably associated with strategies of achieving or maintaining particular positionalities and express shifting geometries and networks of social power" (Heynen et al. 2006, p. 6). Or, in short, "cities are built out of natural resources, through socially mediated natural processes" (p. 5). It is this intersection between non-human nature and social processes that produce not only cities, but the flows of people and materials through and within them.

Additionally, environmental regulation within North America and Europe has been shifting to the urban level over the last couple of decades (Keil 2005). Whether from neoliberal devolution of regulation to the local scale (Whitehead 2003) or the growing local climate change movement over frustration with national governments (Bulkley and Betsill 2003), recent years have seen many examples of environmental regulation at the urban level. Green buildings are one example, with dozens of jurisdictions mandating

various levels of "greenness" for buildings (public and/or private). Keil and various co-authors (Keil and Graham 1998, Desfor and Keil 2004, Keil and Boudreau 2005; see also Whitehead 2003) have been at the forefront of demonstrating how new post-Fordist growth regimes have become based on this new relationship between society and nature. Redevelopment of brownfields and waterfronts, marketing nature, and regulating pollution are all done for the sake of capital: to make cities competitive in a global environment and to encourage reinvestment in existing infrastructure. At the same time, renegotiating the society-nature relationship leaves room for civic engagement and even resistance by urban inhabitants who have a different relationship in mind.

What is important is not only the economics of the urban growth regime or the physical properties of water and contaminants, but the images and discourses that are created and promoted by all of the actors involved, constructing "the city" at the same time they are constructing "nature" (Keil and Graham 1998, Gandy 2002, Whitehead 2003, While et al. 2004). In particular, the desire to keep business going as usual often means that environmental concerns are only selectively incorporated into policy in what While et al. (2004) call a "sustainability fix". Here, public policy supports environmental and social goals only so long as economic goals are not diminished. A different approach is offered by Whitehead (2003), who argues that sustainable cities are sites of regulation, produced by discursive and material practices that shift over time. As he concludes, "sustainable cities are not 'simply business as usually' for capitalist urbanisation, but involve the active *repackaging* or *humanisation* of neo-liberal projects in urban areas" (Whitehead 2003, 1202-1203, italics in original). This repackaging includes presenting some green

elements as part of urban development or redevelopment without digging too deeply into ecological principles or social justice (Hagerman 2007).

Despite arguments that hybridity and the social construction of nature are a two-way street, most existing work in urban political ecology focuses on the manmade properties of living or organic things, whether in terms of piped-in water and piped-out sewage (Swyngedouw 2004, Kaika 2005), landscaping that brings "nature" into the city (Gandy 2002), urban forests that further the turnover of capital (Heynen 2006), or the status of nonhumans within the city (Hinchliffe et al. 2005, Perkins 2007). As Braun (2005) writes, "*water, energy, food* and *wastes* have proved particularly useful to think with" (p. 637, emphasis in original). The main focus has been on finding ways that nature still exists and matters within the city (Evans 2007). Little if any urban political ecology has been done on how the ecological properties of inorganic objects materially and discursively shape urban environments (but see Gandy 2002 and Kaika 2005). How do buildings, for example, direct flows of energy and water, or how does the discursive construction of a green building shape the urban environment around it? In short, how is the *built* environment socially and naturally constructed?

This article contributes such a perspective, using the LEED standards to examine how socionature is produced through the discursive and material construction of green buildings. In so doing, it offers an answer to Braun's question: "Why, then, do we need a specifically *urban* political ecology? What is gained, conceptually, by this move?" (2005, p. 647, emphasis in original). Rather than focusing on how the "natural" is actually manmade, looking at the built environment allows us to understand the biophysical properties of the manmade and in so doing, how the city is constructed as a

socionatural hybrid. One way of doing so is to look at the recent movement within the building industry to more carefully incorporate the biophysical properties of buildings and the sites they inhabit into their design and construction. The following section explains how the LEED standards of the U.S. Green Building Council do this, and what vision of the city they produce in the process.

Constructing the urban built environment

The discourse of the LEED standards works in concert with the material components of the resulting buildings to construct a particular vision of the city. Four components of that vision stand out, as discussed in this section. This portion of the paper draws on not only the standards themselves as outlined in the USGBC's reference guide, but the credit interpretation rulings (CIRs) submitted in response to the standards. CIRs are occasionally used to appeal a decision about certification but more often serve as points of clarification for a design team during the process and to get an idea as to the likelihood of being able to earn a particular point or credit. The CIRs therefore serve as a publicly-available dialogue between builders and the USGBC concerning the meaning and interpretation of the standards.

Flexibility and reflexivity

To begin, the vision of the city constructed by LEED is flexibly and reflexively green. I deliberately use "green" instead of "sustainable"; if the latter term is well-known for being vague, the former is even more so. In particular, the LEED standards are based on reducing overall impact rather than meeting a specific benchmark (e.g., the percentage of building materials required to be recycled to earn a point has changed from to 25% to 5% to 10%). Basically, this means that points are earned for *trying* to be green, not for

meeting a scientifically-established number (which may itself be problematic; see Robertson 2006) in terms of water quality or resource protection.

That being said, one of the most significant components of the LEED standards is their flexibility. Not only are many of the standards themselves flexible (for example, requiring a reduction in water usage for landscaping by 50%, but not specifying how), but the entire system allows builders to choose which points they want to pursue. In fact, a number of CIRs note that it is impossible for any one building to earn all possible credits, underlining the flexibility of the system for many different kinds of buildings. Furthermore, the Innovation in Design points are designed specifically to account for elements that can not be incorporated in the existing system: new technologies, performance above and beyond the standard, etc. This emphasis on flexibility is one of the reasons why hundreds of government jurisdictions, from municipalities to the federal government, have passed requirements that LEED standards be met for public and/or private buildings.

Reflexivity matters in terms of the ability of building owners and users to make adjustments as time goes on and to learn from past experience. There is a thoughtfulness implied in many of the standards, requiring designers to minimize or reduce impact on various aspects of the environment, to limit disruption, or to restore or rehabilitate natural settings as well as urban environments. If, as noted above, the standards are meant to modify current patterns of resource use by a somewhat arbitrary percentage, this also implies that we have to understand those patterns: where raw materials come from, where stormwater and waste go, and how we might better work with existing sources and sinks

in the local environment. As the example of recycled materials shows, the standards can be tightened if they are being met too easily.

Reflexivity also exists in quantitative terms. Three credits include establishing systems to monitor ongoing performance in energy usage, outdoor air delivery, and thermal comfort. Since one of the major criticisms of LEED is the number of points based on installing equipment but not mandating performance over time (e.g., Zimmerman and Kibert 2007), the USGBC is working to incorporate more points like these so that users' practices can be incorporated.

Finally, reflexivity is also present in terms of governance. The USGBC is comprised of member organizations and individuals from the public, private, and non-profit sectors. Any time the standards are revised, they are open to comment and voting from the entire membership (and in the most recent revision, open to comments from the public at large). This ensures that the benefits of experience are being incorporated into the requirements.

In short, the city as constructed through LEED standards is flexible in terms of what it means to be "green" and how to meet that definition: through conserving water or energy, maximizing the use of existing infrastructure, reducing indoor emissions, etc. At the same time, designers and builders need to understand existing resource use and waste emissions in order to reduce those amounts. While LEED does not require the workers, residents, and others who inhabit these buildings to consider their role in the urban environment, heightened awareness of energy and water usage is assumed to be an outcome of inhabiting buildings labeled as green.

Detailed documentation and planning

One of the features that distinguishes the USGBC's green building standards from others is the emphasis on documentation (Burnett 2007, Kibert 2008). In smaller countries such as the UK or alternative assessment systems such as the Green Globes, a representative from the administering organization goes out and inspects each building before it can be certified. Under LEED, all inspections are of paperwork (or the electronic equivalent). Documentation is therefore key to achieving certification, and it is strongly emphasized in USGBC materials. At the same time, design teams are repeatedly urged to incorporate green features as early in the process as possible, in large part because of a number of studies demonstrating that overall costs are lower when green elements are not simply added as an afterthought (Davis Langdon 2007).

A number of credits require reliance on outside standards and/or careful calculations. For example, numerous technical standards from the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) are incorporated, as are regulations from the American Society for Testing and Materials (ASTM). Outside standards are used for roof reflectivity, paint and carpet emissions, and certified wood. In a number of CIRs, design teams are told that they may be able to substitute other standards or comply with the spirit of the credit in an alternative way—as long as they use proper documentation.

The complexity and comprehensivity of the LEED standards mean that expertise in a wide variety of subjects is necessary to complete a project: architecture and landscape architecture; civil, hydrological, and electrical engineering; ecology; urban planning; etc. One of the main reasons a credit can be achieved for using an Accredited Professional is to integrate this diversity of approaches and requirements. (Another reason is to put

someone in charge of the paperwork who is not invested in a single area of the project.) The fact that 98 percent of all certified projects use an AP underscores the value of this means of dealing with the demands of documentation.

However, APs themselves are likely to be experts in only one area. For example, engineering expertise is often orthogonal to design or planning experience. One of the mandatory points for certification therefore comes from using a commissioner. Building commissioning—use of a third party to verify building systems function as they are supposed to—has become increasingly popular as heating, lighting, security, and communications systems have grown more complex (Houghton and Covington 1998). Testing and verification are used to make sure that energy-saving technology does, in fact, use less power (e.g., automatic lights actually turn off when no one is in the room). The commissioner's role is to test the systems while the AP's role is to make sure that all of the boxes are properly checked. Both document and incorporate a vast amount of information concerning the functioning of the building relative to the standards it is supposed to meet.

In short, the green city is well-planned and documented from the start, incorporating green materials and processes into the design at an early stage and not adding them on as superficial finishes at the end. In part, this is because of the emphasis on keeping costs down, but also to make it easier to mesh together the complex systems that go into a modern building. The LEED standards also promote a well-documented city, with resource savings calculated and displayed (Figure 1).

[insert Figure 1 here]

Social sustainability?

Most definitions of sustainability have three components: economic, environmental, and social (Whitehead 2007). The first two components are generally emphasized with social sustainability often coming as an afterthought. Green buildings are no exception. While anecdotal evidence indicates that they are not exclusively inhabited by the elite, there is, by and large, a lack of social considerations. The LEED standards can therefore be said to be socially neutral at best.

One of the positive aspects of LEED with regards to social sustainability is the emphasis on workers' health. A number of the Indoor Environmental Quality points are predicated on reducing exposure to harmful emissions for both construction workers and building inhabitants. This is because most Americans spent the bulk of their time indoors and improving human health therefore depends on improving the indoor environment. At the same time, capitalism is never far from the surface: studies show that worker productivity increases when indoor air quality and access to sunlight and outdoor views are increased (Davis Langdon 2007). Speculative developers even use this in their advertising (Figure 2).

[insert Figure 2 here]

One way in which the LEED standards are socially equivocal is in terms of transportation. Four credits are devoted to encouraging alternative transportation: public transit access (either through direct proximity or by providing a dedicated shuttle), encouraging alternatively-fueled vehicles, encouraging cycling, and minimizing parking. These credits rely on discouraging automobile use, not necessarily on increasing accessibility. Workers who are carless will benefit from only some of these credits.

One of the major criticisms of LEED is that the increased cost puts green buildings out of reach of lower-income inhabitants. However, anecdotal evidence from existing homebuilding programs indicates that builders who are interested in doing green buildings are also often interested in providing affordable housing. For example, San Francisco's first residential project was a low-income apartment complex that included homeless transitional housing. Additionally, citywide requirements for public buildings to meet LEED criteria, such as those instituted in Chicago and Los Angeles, mean that schools, libraries, and police and fire stations in *all* neighborhoods are increasingly environmentally-friendly. Still, while the additional cost of meeting LEED requirements is generally less than 5 percent (Davis Langdon 2007), that might make it too expensive for communities or organizations whose budgets are already tight.

The green city promoted by LEED is at best socially neutral. On the one hand, the health of building inhabitants is explicitly considered, although this is largely aimed at improving worker productivity (or increasing student test scores, in the case of schools). At the same time, transportation improvements are largely concerned with reducing automobile use and only tangentially with enhancing accessibility. Social considerations are generally not explicitly considered, leaving sustainability with only two legs of its three-legged stool.

Planned as a socio-natural hybrid

Finally, the city that the LEED standards help to construct is deliberately designed to be a socio-natural hybrid. LEED calls on multiple standards and definitions from the human and biophysical environments; incorporates micro-local features, regional connectivity,

and global environmental concerns; works to improve both human and non-human habitats, and incorporates both performance and process.

Buildings certified under LEED are explicitly expected to meet both social and biophysical criteria, thus making them examples of socio-natural hybrids. Outside standards come from the EPA, USDA, FEMA, California Air Resources Board, and relevant state and local zoning, endangered/threatened species, brownfields, or wetland definitions and codes. Certain credits are meant to serve double duty: for example, Site Development is described as increasing natural habitat and worker productivity, while Light Pollution Reduction is intended to protect both nocturnal habitat and star-gazing. Buildings are conceptualized as inhabiting and producing socio-natural spaces, with flows of energy, water, and other resources neither purely biophysical nor purely manmade.

Related to the idea of a hybrid is an emphasis on process and performance rather than static qualities, which is also seen in the LEED standards. For example, many of the transportation credits require a long-term investment with the goal of changing commuters' habits. Stormwater credits are designed to provide alternatives to the traditional retention pond by encouraging rain gardens, vegetated roofs, and other strategies to increase infiltration onsite and reduce demand on municipal systems. This is the flip side of the earlier criticism about using percentage reductions rather than meeting specific targets. Focusing on reducing or increasing flows rather than on meeting target amounts keeps the emphasis on process and allows for steady improvement.

The vision of the city produced by LEED is integrated with the human and biophysical environments. Its builders are aware of their regional and global footprint and try to

reduce both through dealing with wastes within the metropolis rather than exporting them and by obtaining local resources rather than reaching out into surrounding territory (Gandy 2002). For the most part, the human is not "purified" from the natural; concepts like green roofs and incorporating views of open space take for granted the socio-nature that is produced by the built environment. Looking at green buildings and the built environment in general is therefore a useful way of considering how socio-natural hybrids are literally constructed in today's cities.

Conclusions

This article has used urban political ecology to examine how the built environment is being constructed by the LEED standards of the U.S. Green Building Council. The vision of the city that these standards produce is reflexively and flexibly green; is well-documented and planned in detail; emphasizes the economic and environmental over the social in terms of sustainability; and is planned as a socio-natural hybrid. Through the flexible and dynamic LEED standards, the USGBC is producing both a discourse and a material reality that is intended to change the way the building industry functions, not only in the U.S. but in other nations that have established their own versions of green building criteria.

Political ecology asks us to consider not only how the socio-natural environment is being produced, but who is benefiting from that production and who is not. The USGBC is a non-profit organization, comprised of members from the public, private, and non-profit sectors. Its goal is to reduce the environmental impacts of buildings, which obviously benefits a broad range of people. However, the emphasis on changing business as usual, but not *too* much, suggests that economic motivations are still at the fore. As Figure 2

shows, capitalist development has no problem incorporating greenness as a way to increase profit. The fact that nearly every newspaper article on green buildings mentions the slight increased cost but follows it quickly with mention of long-term energy savings confirms this. The USGBC's stated goal of transforming the building industry to the point where "all buildings are green" also implies that a win-win scenario is possible, where the building industry gets to continue functioning and profiting as it does now, simply integrating more aspects of green design. As governments initiate or tighten regulations that encourage or mandate LEED certification of public or private buildings, it is important to consider why these regulations are in place, what they are meant to achieve, and what aspects of urban sustainability and livability are being omitted.

The USGBC has recently argued that the U.S. needs to spend significantly more money on building research, especially in light of growing concern over global climate change (Baum 2007). While much of this research is aimed at the traditional areas of material and design improvements (Guy and Shove 2001), there is also increased emphasis on the users of green buildings. Initial studies show positive results in terms of worker satisfaction and student performance (Davis Langdon 2007), but now that more than one thousand LEED-certified buildings are in place and occupied, more work needs to be done to understand how inhabitants understand and relate to these socio-natural hybrids of which they are a part. Future work should also consider the science that is being mobilized in the definition of these credits and their interpretations; the EPA, USDA, and other organizations have their own stories in terms of how prime agricultural soil or wetlands are defined (Engel-Di Mauro 2006, Robertson 2006), and those need to be better understood as well. The built environment in the form of green buildings therefore

offers significant opportunity for further exploring the socio-natural, hybrid nature of our modern world.

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Table 1. Possible LEED credits and achieved credits, 2000-2007.

	Credits by category as a percentage of all possible credits	Credits achieved by category
Sustainable Sites	21%	19%
Water Efficiency	7%	9%
Energy and Atmosphere	24%	19%
Materials and Resources	19%	16%
Indoor Environmental Quality	22%	26%
Innovation in Design	7%	11%

Source: USGBC data and author's calculations.

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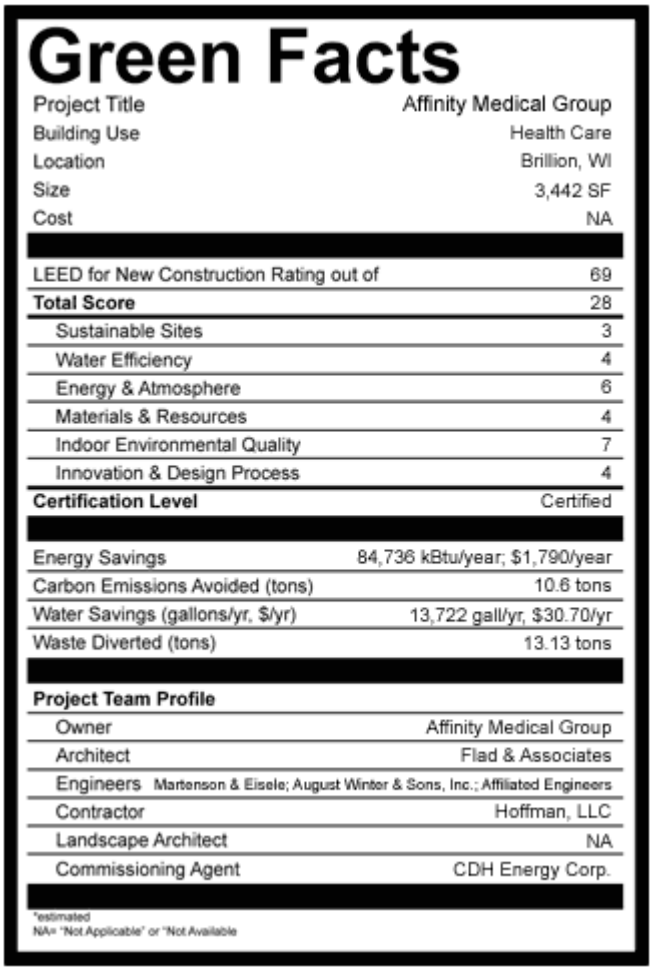

Green Facts

Project Title	Affinity Medical Group
Building Use	Health Care
Location	Brillion, WI
Size	3,442 SF
Cost	NA
LEED for New Construction Rating out of	69
Total Score	28
Sustainable Sites	3
Water Efficiency	4
Energy & Atmosphere	6
Materials & Resources	4
Indoor Environmental Quality	7
Innovation & Design Process	4
Certification Level	Certified
Energy Savings	84,736 kBtu/year; $1,790/year
Carbon Emissions Avoided (tons)	10.6 tons
Water Savings (gallons/yr, $/yr)	13,722 gall/yr, $30.70/yr
Waste Diverted (tons)	13.13 tons
Project Team Profile	
Owner	Affinity Medical Group
Architect	Flad & Associates
Engineers	Martenson & Eisele; August Winter & Sons, Inc.; Affiliated Engineers
Contractor	Hoffman, LLC
Landscape Architect	NA
Commissioning Agent	CDH Energy Corp.

*estimated
NA= "Not Applicable" or "Not Available

Figure 1. "Green facts" for the Affinity Medial Group building in Brillion, WI. Image used with permission of the USGBC.

Figure 2. "Indoor Environmental Quality. Give your employees the benefit of working in a LEED Gold certified building. 2009 Office Space Availability." Street-level advertising for 300 North LaSalle, Chicago, IL. Photograph by author.