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Green Building and Sustainable Design

Description of the Field

"Part of the idea of majoring in environmental studies is to be bettered prepared for a wide array of challenges" (Ruhl, 2004). Environmentalists face various challenges and have great concerns about many areas, specifically things like energy usage, greenhouse gas emissions, and other aspects of sustainability. These particular areas of concern have caused building and design professionals to promote and establish standards and practices that help buildings to lower their environmental impact. This has led to a field called "green building". Green building is a growing field and understandably so. Buildings in the U.S. account for seventy percent of electricity consumption, thirty-nine percent of energy usage, and twelve percent of potable water usage, generating thirty-nine percent of green house gas emissions (Cidell, 2009).

[Introduction clearly introduces field and background]

Green building is nothing new, if it considers a building designed with local climates and building materials in mind. However, the current standards *are* new. A well-known set of these standards was created by the USGBC (United States Green Building Council) in 1998 known as LEED (Leadership in Energy and Environmental Design). These standards were produced to help builders, designers, and inhabitants lower their environmental impacts (Cidell, 2009). LEED certified buildings must meet a number of criteria and are ranked by their "greenness". LEED accredited professionals help facilitate these design standards by taking a course and then a test. They receive a stamp saying that they have learned these different concepts and understand how they fit

[More background on green building, specifically what makes it different from other types of building based on certification]

together, and understand processes that allow for different thinking in regards to design. The number of LEED Accredited Professionals is in the ten thousands.

Individuals have also implemented smaller scale standards of design. For example John and Nancy Todd created the nine precepts of biological design, which they elaborate on in their book from Eco-Cities to Living Machines: Principles of Ecological Design. To make their work more ecologically sound all designers can use their nine precepts as a set of guidelines. The nine precepts are as follows: the living world is the matrix for all design; design should follow, not oppose, the laws of life; biological equity must determine design; design must reflect bioregionality; projects should be based on renewable energy sources; design should be sustainable through the integration of living systems; design should be coevolutionary with the natural world; building and design should help heal the planet; and design should follow a sacred ecology (Todd & Todd, 1993). This book is helpful in describing the motives of the green building and sustainable design field as it shows many examples of ways communities can make themselves more sustainable. The Todd's use their environmental creativity to create prospective designs of things like inner city/suburban farms inside of warehouses, sidewalk gardening, and vacant lot bioshelter parks.

David Gottfried founded the USGBC in 1992 and its work ignited the spark that became the green building movement. He also started the World Green Building Council in 2000 with a mission to accelerate the transformation of the built environment towards global sustainability. In addition to these councils he also started Regenerative Ventures, which assists in small-scale green technology start-ups (Gottfried and Malik, 2009).

Gary Flomenhoft is a professor and the head of the Green Building and Community Design minor at the University of Vermont. Upon interviewing him I learned his specific role at UVM uses applications of current green building technologies with students. Gary defines green building/design as "the redesigning of our buildings and communities so they are sustainable, use renewable energy, and stop the depletion of resources". There are four main areas taught at UVM in the Green Building and Community Design minor; building, energy, landscape, and communities. This demonstrates the opportunity for variety within this field. Gary listed some specific jobs in each area. In the building/design area there is opportunity to be an architect or a builder; in the energy area there is opportunity to work for an energy company; in the area of landscape there is the option to be a landscape designer or participate in waste water treatment; in the area of communities one can be a design planner, participating in city retrofits, planning, and design.

[Introduces an interviewee and a bit about their background, as do the following few paragraphs. It is okay to have separate paragraphs to introduce each interviewee, or even combine them. Here, the separate paragraphs work well because each have very different careers]

A specific job in the green building field could be that of Michelle Smith's. She is the Green Building Coordinator at UVM. Her specific role is to implement and track the LEED process at UVM, oversee the design and construction of facilities, and to work with various groups on campus such as campus planning services, the maintenance people, capital management, and the physical plant to make sure green building concepts are in mind. Her job has a lot to do with coordinating and understanding lessons learned, for example figuring out the best product like the highest quality windows.

Kate Stephenson is the Executive Director at Yestermorrow. Yestermorrow is a small nonprofit design/build school. She supervises the fifteen staff members at the

school and works with the board of directors and various committees. She represents the school and manages the financial budgeting.

Another professional in the green building field is Jesse Robbins. He is the president of the Vermont Green Building Network (VGBN) and is an architect at the firm Freeman, French, and Freeman. As the president of the VGBN he meets with board members and committee members. For example he recently had a joint meeting with the VGBN and the engineers of heating, refrigeration, and air conditioning in the state of Vermont to encourage their use of sustainable practices and to elaborate on specific methods. As an architect he works on a diverse range of projects but focuses mainly on healthcare buildings. Healthcare facilities weren't the earliest adopters of green buildings so Robbins does what we can to implement sustainable design into these facilities. Mainly he does what he can to make sure the buildings he designs are energy efficient. He is currently working on a health center on Riverside Avenue that is aimed at being LEED certified.

Issues

There are many emerging areas in the field of green building and sustainable design. According to Gary Flomenhoft "net zero" is an emerging topic with its main goal being that a building produce as much energy as it uses. Buildings account for a huge percent of energy consumption in the U.S. and for more greenhouse-gas emissions than automobiles. We can "zero out" our energy consumption so that "we generate as much power as we use, and sometimes even achieve a surplus that can be fed back into the power grid and used by someone else" (Steffen, 2008). This can be done by using things

[This section has a great combination of in text citations from books/journals also with an integration of interview sources]

such as natural ventilation, plants as shade/insulation/leisure space/edibles, and solar and wind energy. The one downfall of net zero as is the same for the entire field of green buildings is that it is easier to implement these building strategies during the construction process than it is to add them to existing buildings.

Other emerging topics mentioned by Flomenhoft were the embodied energy of materials and the use of sustainable building materials, from carpets to siding. Embodied energy refers to the amount of energy it takes to produce a product. Many building materials used heavily in the past and still used today are detrimental to our health and to the environment. For example "particleboard is usually pressed together with formaldehyde-a known carcinogen, foam found in sofas/loungers etc. is usually treated with fire-retardant chemicals which are particularly harmful to fetuses and can even cause brain and reproductive disorders in adults, and "exotic" woods like teak and mahogany usually come from endangered old growth forests in Myanmar or Brazil" (Steffen, 2008).

The biggest issue in this field seems to be the difficulty of greening existing buildings but besides that the emerging topics seem to greatly dominate the issues. An emerging topic that comes from this issue is defeating the challenges of greening already existent structures. What do we do beyond just greening them up these existing structures? Michelle Smith brought the Living Building Challenge to my attention during our interview, which was created by the Cascadia Green Building Council to further the goals of green building. This challenge is facilitated by an organization called the International Living Building Institute. The purpose of the challenge is "to define the most advanced measure of sustainability in the built environment possible today and act to diminish the gap between current limits and ideal solutions" (Groundwire, 2010). At

whatever scale a project may be the Living Building Challenge provides a framework not only for design and construction, but also for the idealistic relationship between the people and the built environment.

A new class taught at Yestermorrow is on regenerative design meaning to shoot for better than sustainability. This goes along with the general idea of the Living Building Challenge to go beyond the normal standards of green building. Kate Stephenson describes the regenerative design class as looking into how we can make buildings better than before and how we can perform deep energy retrofits in existing buildings.

Reuse centers are a relatively up and coming idea. These centers collect used building materials, organize and store them, and then resell them at a reasonable price. Although some of the products collected may be old building materials potentially harmful to human health, the centers contribute to environmental sustainability in a number of ways. They can be identified as sustainable through "the reuse of otherwise landfill-bound materials, by making materials accessible to all income levels, by creating local jobs with living wages, and by educating the community about the benefits, both environmental and social, of reuse" (Steffen, 2008).

Concern with a building's envelope is very imperative in its design and this could be considered an issue or an emerging topic in design. The envelope of a building is the structure separating the inside from the outside. It is important for the building to be tightly enveloped so there is no problem with moisture entering the walls or any of the numerous, potential ventilation problems. Robbins stated that many houses built in the 50s and 60s are starting to face problems because of their poor envelopes. Renovations can be made but considering the envelope in the first place saves money and energy.

Robbins also mentioned how the mechanical systems and controls of buildings are becoming a lot more sophisticated. One of the main reasons of having meetings with the heating, refrigeration, and air conditioning engineers is to discuss these systems. Robbins encourages all project owners to have a commissioning. Commissioning is a process where an expert comes and tests the plumbing, electric, etc. of a building to make sure they are functioning how they were designed to. Everyone involved in the construction of the design should be there when systems are selected so they understand the design's intent. Robbins stated that seventy-five percent of systems don't run efficiently. He proposes that if an expert were to come into buildings to tune-up and set the systems correctly we would use forty percent less energy than currently use.

Other emerging topics referenced in the Worldchanging book are prefab homes, which allow for cutting-edge, modern, minimalist, ecologically conscious designs. They use sustainable materials and green design. These homes are compact and efficient and can show up oversize, energy-intensive homes. Mass customization, mobility, and versatility in building materials make prefab homes ideal for low-income communities and areas that have been struck by disaster. The designs include solar shingles, tankless water heating, bamboo flooring, energy-efficient appliances, etc. "Off-site fabrication reduces waste and energy expenditures during construction" (Steffen, 2008). Abito, a UK-based company, has developed a high-rise apartment template with stand alone central pods that serve all the functions that usually go into multiple rooms. The pod comes with a bathroom, washer/dryer hookups, wardrobes, and a kitchen unit on each side of pod. The bed folds up into the wall bed and additional storage or bed space is available on top of the pod. "If building green houses is good, then building green

[Clearly there are lots of issues in the field of green building and design! One suggestion might be to cut this section down a bit and choose the most pressing issues. But, there are great sources throughout this section.]

housing developments is even better" (Steffen, 2008). Recycled furniture from salvaged wood scraps is a hot topic and Aalto Colour has developed a low emission thermal-insulation paint that reflects radiant heat. The paint is supposed to help reduce energy consumption and cost by acting as another layer of insulation.

Jesse Robbins mentioned a hot topic in the green building world. LEED and the USGBC have recently had a lawsuit placed against them for allegedly using deceiving practice (Brown, 2010). The lawsuit is concerned with LEED buildings not obtaining "promised energy savings". Robbins informed that LEED never promised energy savings.

Work Conditions and Lifestyles

[Again, this section is organized by interviewee, and tells lots about the person, which is one way to organize. If it had been more combined, it might flow a bit better and be a bit more concise, but this is a good way to organize generally speaking]

Gary Flomenhoft supposes that people in this field are more likely to work for companies. He states that they could really work for any level of government or any level of company from nonprofit to large-scale but that they are least likely to work for themselves. Green building and sustainable design is a broad field but Flomenhoft approximates that the expected level of income in this field is medium income or higher.

Michelle Smith works for UVM but she created her job by writing up a proposed job description. In 2002 she was a student representative for ecological living and on the building committee for a building that didn't end up being constructed because University Heights was constructed instead. During her involvement in these committees and during the construction of University Heights and the planning of the Davis Center she got to know Bob Vaughn. He later hired her in 2004 as his assistant director of capital planning and management. She was labeled the Green Building Coordinator as of

October 2006 after her proposed job description was approved. Smith learned a lot about construction and processes through the building and planning of University Heights, the Davis Center, and Wing Davis Wilks. Her job opens up the opportunity to work on the weekend or evenings if she desires, evening work being more likely. There are sometimes evening meetings to go to with the city of Burlington and there are green building tours of UVM on the weekend. According to Smith sustainability coordinators have a salary of somewhere between 70 or 80 thousand and her job is pretty much on par with that. She states that if a professional has a masters or architectural degree their expected income may be higher.

Kate Stephenson obtained her position at Yestermorrow by first working as an intern in 2002 in the community outreach internship program. After the internship she went to UVM with intentions of obtaining her Graduate Degree. She left UVM after one semester and went back to Yestermorrow as a full-time member. Her job calls for a lot of weekend and evening commitments though it does not call for a lot of travel. Her small amount of travel is mainly in Vermont and the New England area. The budget doesn't allow for much travel but if this were not the case the travel boundaries would probably extend outside of New England. Most of the programs are based at Yestermorrow so she is not required to travel to them. She lives thirty minutes away from her job, in Montpelier.

Jesse Robbins' interest for green building started in high school and he did his thesis on green building in 1998 at Syracuse when LEED didn't yet exist. During his summers of University he interned at the firm he currently works at. After University he spent two years with a firm in Washington, DC called the Smith Group where he was

slightly involved with a LEED project but more so looked enviously over the shoulders of other architects. He then came back to Freeman, French, and Freeman where he currently works at this small Burlington firm that has been a leader in sustainable design since 1937. During World War II when energy was rationed and energy prices skyrocketed the original owner of Freeman, French, and Freeman designed passive solar techniques for houses. After this owner retired and passed the firm on to the next generation it kind of lost its sustainable touch but has regained it back since about 1990. Vermont has some of the strictest codes and Robbins helps keep his firm in touch with the latest trends of sustainable design. He is able to do this as the President of the VGBN, what he calls "basically a twenty-five hour a week unpaid job". His work finds him mainly in Vermont, the Adirondacks, and Maine. He worked really hard as architecture major and went to school for free. If he hadn't, he stated that he surely would still be paying off loans. He is also currently a landlord. Robbins thinks that a lot of people have a skewed vision of the amount of work it takes to be an architect. The schooling is not so easy once and it remains difficult once you are out in the field.

One way to see where professional are located in this field is to look at the distribution of LEED buildings and professionals and how it has changed over time. There is a clear shift from an original concentration in major coastal cities to a more even distribution across the country. Designers and builders of green buildings seem to be more spatially concentrated than the buildings they produce. The green building professionals that fall into the highest quartile are concentrated mainly in the Pacific Northwest, the Rocky Mountains, and the Upper Midwest and scattered East Coast locations. Miami, New Orleans, and Nashville are the largest metropolitan areas with no

certified green buildings. Seattle, Portland, Pittsburgh and Salt Lake City have the greatest number of green buildings and LEED accredited professionals. The per capita rankings include a number of smaller cities that are state capitals or university towns such as Burlington, Corvallis, and Madison. A basic statistical analysis shows that high population, a well-educated and well-paid populace, and certain geographic factors make a metropolitan area more likely to have green buildings. Green buildings and green builders are not generally located in the same locations. "LEED APs can be found in all 50 states indicating a strong interest on the part of architects, engineers, and designers in building sustainably (Cidell, 2009)". Similar to LEED is BREEAM in the UK and Green Star Program in New Zealand and Australia. More than forty countries including Brazil, Canada, India, and South Korea have adopted LEED standards. All of this information shows that green building and sustainable design professionals have the potential to work in many locations all over the world.

Comment: This paragraph is clearly written from research, a good way to incorporate some outside sources besides the interviewees.

Career Paths

The education and experience varied between each professional that I interviewed. It is definitely beneficial to have at least an undergraduate degree in this field. Gary Flomenhoft has his undergraduate degree in Mechanical Engineering and his graduate degree in Public Policy and Ecological Economics. Michelle Smith has her undergraduate degree in Environmental Studies. Kate Stephenson has her undergraduate degree in Anthropology and Environmental Science and her graduate degree in Organization Management and Nonprofit Leadership. And Jesse Robbins has his

Where the issues section could have been shortened, this section could have been lengthened a bit. It might be good to discuss which universities offer green building and design degrees and other certification programs]

Master's in Architecture from Syracuse and also studied architecture for a year in Italy through Syracuse.

Networking/Communication

Gary Flomenhoft subscribes to Home Power magazine. Home Power magazine, launched in 1987, focuses on the different sections of solar, wind, hydro, design, and build. Home Power has become "the editorial venue for homeowners, business owners, and renewable energy professionals to exchange equipment, design, installation, and system performance experiences. This information exchange has helped create an industry with not only cutting-edge technology, but also the common goal of reducing the use of polluting fossil fuels and replacing this generation capacity with the infinite supplies of renewable energy that surround us" (Home Power Magazine). Over the last 20 years there has been over 120 issues of Home Power published. Each issue contains comprehensive, technical coverage of solar, wind, and microhydro electricity, energy efficiency, solar hot water systems, space heating and cooling, energy-efficient building materials and home design, and clean transportation options. Home Power prides themselves for being able to help inform people to make sound decisions about energy generation and use. They want everyone to prosper from the benefits that renewable energy has to offer.

[This section also does a good job incorporating the interviews with outside sources.

Flomenhoft also belongs to the Vermont Green Building Network, which sends regular information to keep him updated. Other networks he belongs to are Building for Social Responsibility (BSR), Solar Energy International, and the Home Builders Association.

Michelle Smith subscribes to Green Source, the Magazine of Sustainable Design. This magazine provides news, blogs, events, forums etc. and she uses Brattleboro's Building Green Website which provides a tenfold of information.

Kate Stephenson subscribes to the NESEA (North East Sustainable Energy Association) magazine. "For more than thirty-five years, NESEA has supported and inspired a growing network of sustainable energy and sustainable building professionals committed to responsible energy use". NESEA is committed to advancing a multi-disciplinary network of professionals, sustainable energy solutions for the built environment, and proven results in the field (NESEA, 2001-2010). Environmental Building News also provides her with cutting edge green building information. And efficiency Vermont is a great source that helps Vermont residents to lower their energy use.

The Green building network, which deals exclusively with LEED, keeps Jesse Robbins along with Gary Flomenhoft and the people of Vermont up to date about new green building ideas and information. Before this there were other green building rating systems to help advocate for sustainability.

A great network to belong to if you are a green building or sustainable design professional is USGBC's Emerging Green Builders program. This program links together young architects, designers, builders, and planners who have a passion for sustainability; through an email listserv and through cool events in a number of cities.

Web-based tools are changing what is possible for communicating information and ideas. The Internet works as a connection point for people all over the world. There are many things on the Internet relating to green building and sustainable design. The

weblog inhabitat offers “future-forward design for the world you inhabit” (Steffen, 2008) covering sustainable furniture, interior design, and architecture that’s both really stylish and truly green. This weblog helps professionals to stay up-to-date with current sustainable style (Inhabitat, 2005-2010).

Flex Your Power is a campaign that includes a comprehensive website, an electronic newsletter, a blog, and many educational materials. This campaign is a one-stop-shop for energy efficiency (For Your Power, 2010). Although it was created with California in mind it’s a powerful resource that anyone can learn from. You can access information on how to buy most efficient appliances, how to light your home, how to insulate/weatherize, how to save water, how to find how to qualify for rebates and tax credits, how to find demonstration models in your area.

The Congress for the New Urbanism is one of the best urban-planning resources. If you are a professional or an architect, it is wise to become a member and attend CNU’s conferences. Anyone can use the Web site to find a wealth of materials on sustainable design, green building, and traditional neighborhood planning. Members of CNU promote walkable, mixed-use neighborhood development, sustainable communities, and healthier living conditions. CNU also has an annual Charter Awards competition. The awards recognize designs that have been used to transform communities for the better and that emphasize the entirety of the built and natural environments. These designs must prove how they have improved both “the human experience of place and the relationship between the built and natural environments” (Congress for the New Urbanism).

Methods of Inquiry in the Field

Information gathered from interviews shows that professionals in this field use conferences as one of their main ways to obtain new information. Gary Flomenhoft attends the Renewable Energy Conference in Burlington and Wisconsin's Better Building Conference. Michelle Smith attends the USGBC Conference (this year in Chicago from November 17-19) and she also attends conferences for sustainability coordinators and physical plant conferences. She goes to a variety of conferences because for her job it is beneficial to understand what is going on at a comprehensive level. Kate Stephenson also attends the Better Building Conference and the NESEA Conference on green building, which is in Boston in March.

[Clear, concise section. There's not much material here, but each section does not have to be super in-depth. The reader gets a good idea of what the methods of inquiry are]

Also Michelle Smith is forced to research current issues for the classes she co-teaches so she is prepared with up to date information. This year she is co-teaching Campus Sustainability at UVM and Toxics Policy to the greater public.

Yestermorrow allows for professionals to educate themselves further by taking classes focused on green building and design. UVM has a partnership with Yestermorrow that allows for students to take summer courses and transfer the credit back to UVM. Most of the classes are listed as continuing education and not all of them count for transfer credit, mainly the ones with the focus on green building. Yestermorrow also has internships geared more towards graduate students or people mid career. This internship is a six-month commitment and can have a focus on designing and building.

Conclusions

Green building and sustainable design is an attractive career path because it provides a vast array of opportunities. I have found that there is almost an overwhelming amount of available information on this topic. Countless conferences can be attended, innumerable websites can be browsed, and many networks can be joined to gather relevant information. I feel the need to be more educated and connected to the green building and sustainable design network if I plan to pursue a career in this field. To start the furthering of my education I am considering taking the continuing education class offered by the green building certification group, through UVM, that prepares students to be certified as a LEED accredited professional and courses offered at Yestermorrow.

[While this reflection is pretty good, it could certainly be expanded, as it is the only part of the paper where your personal opinion can be expressed]

This assessment has not led me to know which specific career path I would like to follow but after speaking with Jesse Robbins I know that architecture is not for me. Interviewees were more than interested to meet with me. This encourages me to meet with professionals in the future before committing to a job.

By practicing this information gathering process I feel prepared to research other environmental fields that I am interested in, such as environmental education and sustainable hospitality. While questions still remain about green building and sustainable design I have found sources that will lead me to my answers. I would like to speak with more professionals that design landscapes and interiors in a sustainable way and educate myself on these topics. I have learned that topics are constantly changing in this field and it is more than important to keep yourself up to date. I can see myself fitting into the lifestyles of a green building and sustainable design career but this assessment has broadened my interest to explore careers in other environmental fields.

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