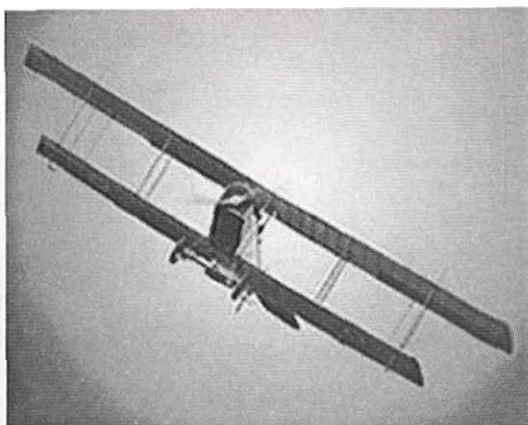

EXPLORATIONS

The Journal of Undergraduate
Research and Creative Activities
for the State of North Carolina



Volume III

www.explorationsjournal.com

SNCURJournal@ecu.edu

Office of Undergraduate Research
Brewster Building D 107
East Carolina University
Greenville, NC 27858

The Unplugged Office Space and the Role of Sustainable Design in Higher Education

Alicia Stewart and Krista Radspinner
Interior Design

Faculty Advisor
Hunt McKinnon

Additional Credit
Stacey Evans and Megan Poteat

According to the US Green Building Council, during the next 25 years, CO₂ emissions from commercial office buildings will increase more rapidly than any other segment of architecture. Carbon dioxide is the leading cause of climate change and is also how we measure the impact that an individual, a building, or an organization has on the environment. We make this calculation by taking into account the energy that goes into the creation of products used and the energy that the individual or individuals within an organization consume. Out of the many sites available for calculating carbon footprints, we chose the website www.thegreenoffice.com, which asks a series of questions regarding the activities, supplies, and furniture consumed and used within the office space. For an office space with 20 employees like that of the Voice of America Center for Excellence at East Carolina University's West Campus, the carbon footprint would emit 111 tons of CO₂ annually. Simple, inexpensive changes to construction methods and office design can drastically reduce the impact this footprint has on the environment. If only half of the new commercial buildings reduced their energy consumption by 50%, each year, we could rescue our environment from 6 million metric tons of CO₂ emissions.²³³ In the United States alone, 65% of the nation's electricity consumption, and 30% of greenhouse gas emissions are directly attributed to conventional office buildings.²³⁴

With the growing concern of global warming and the effects that civilization has on our environment the role of the emerging designer has greatly increased in order to develop products and spaces that are sustainable and do not jeopardize the human element. With the design of our "Unplugged Office Space," we have accomplished many of those goals and have taken the necessary steps towards a sustainable space. We will have discussed the changes to the interior of the existing structure that are necessary to decrease

²³³ Leah B. Garriss. *Four Ways to Shrink Your Building's Carbon Footprint*. August 2007. Retrieved 27 December 2007 from, <http://www.buildings.com/articles/detail.aspx?contentID=4986>.

²³⁴ Norman Foster, et. Al. "The Rise of the Green Building," *The Economist*, 4 December 2004. Printed 27 December 2007.

carbon footprint, as well as the monthly utility bill, of the Voice of America Center for Excellence by 75%.

What is Sustainability?

Miriam - Webster defines sustainability as, "of, relating to, or being a method of harvesting or using a resource so that the resource is not depleted or permanently damaged."²³⁵ Sustainability is also respecting and learning from the natural process. With our growing knowledge of the earth's processes, we can use the ideas of cyclical nutrients and the abundance of the sun's energy to create commerce that is in harmony with our environment.²³⁶ The cycle of a deciduous tree illustrates the idea of cyclical nutrients: the tree grows leaves, and in the fall, those leaves fall and die. As they deteriorate, they are providing nutrients into the soil that return to the tree. Sustainability is living within limits and not living in abundance as our society currently does. Sustainability accounts for full costs, which means taking in to account not only the energy costs in the use and maintenance of a space, as well as the embodied energy in the construction and transportation of materials in the manufacturing process. It is all of these values that collectively define sustainability. "Sustainable development is development that meets the need of the present without compromising the ability of future generations to meet their own needs,"²³⁷ is the definition by the United Nations World Commission on Environment and Development of Sustainability as published in 1987 in the Brundtland Report. Through the development of the energy-saving ideas, we can provide for the present without compromising the future.

Responsibility for educating students because it is our world

As the designers of tomorrow, we have a responsibility to our clients to provide spaces that are sustainable and do not jeopardize the quality of living. If we do not take responsibility then who will? There is also a responsibility from the architectural and interior design educators to inform students about the effects of energy usages on the environment. Some may excuse the universities from this responsibility because their purpose is not about social reform, but rather their role is simply to educate. Nevertheless, if education is about progress, and progress is about providing for our future as humans, then is it not the responsibility of our universities to provide our future working public with the knowledge necessary to sustain our civilization? Universities have influence in communities, they have the ability to set the example and show the public that gradual changes can make an immense difference in human's impact on the environment. This responsibility lies not only on an administrative level or with the educators, but also with the students who gain

²³⁵ www.m-w.com, Online Dictionary.

²³⁶ *Cradle-to-Cradle*, William McDonough & Michael Braungart

²³⁷ United Nations World Commission on Environment and Development of Sustainability, *Brundtland Report* <http://www.un.org/esa/sustdev/csd/review.htm> printed, 3 March 2008

this knowledge as they will be the emerging designers and will have the responsibility to educate those around them.

From the leadership of university presidents and chancellors of 507 colleges and universities in the United States have made the commitment to change and promote change in their communities by signing the American College and University Presidents Climate Commitment, which provides a timeline for the changes needed to reduce global warming emissions and promote sustainability. This commitment illustrates the role of the university as one of leadership in their community and describes the necessity of such a role:

We believe colleges and universities must exercise leadership in their communities and throughout society by modeling ways to minimize global warming emissions, and by providing the knowledge and the educated graduates to achieve climate neutrality. Campuses that address the climate challenge by reducing global warming emissions and by integrating sustainability into their curriculum will better serve their students and meet their social mandate to help create a thriving, ethical and civil society. These colleges and universities will be providing students with the knowledge and skills needed to address the critical, systemic challenges faced by the world in this new century and enable them to benefit from the economic opportunities that will arise as a result of solutions they develop.²³⁸

By signing of this commitment, these universities are providing society with citizens that will be able to contribute to society in an ethical and socially responsible way.²³⁹

In addition to the signed commitment, we can look at several universities in the United States that have taken the initiative in setting an example on sustainability, and have been successful in accomplishing not only economic goals but environmental goals as well. The Sierra Club is America's oldest, largest, and most influential grassroots environmental organization. In the November/ December issue of the club's monthly magazine, author Jennifer Hattam provided a list of the top ten universities in the United States that contribute to sustainability and sustainable education. With 2,800 students, the small college of Oberlin in Oberlin, Ohio currently sets the bar for universities.²⁴⁰ With accomplishments that range from hosting the first car-sharing program in Ohio to a monitoring system that tracks the usage of energy of their 17 dorms, Hattam has ranked Oberlin University as number one. Last

²³⁸ American College and University Presidents Climate Commitment.

²³⁹ <http://presidentsclimatecommitment.org/index.php>

²⁴⁰ Sierra Club Magazine November/December 2007. Jennifer Hattam, p32-39.



Fig. 1 Waste equals food: The Living Machine on Oberlin College's campus cleans wastewater for reuse.
<http://www.sierraclub.org/sierra/200711/coolchools/ten.asp>

year, Oberlin switched to biodegradable utensils in their cafeterias. The entire University of California system with upwards of 200,000 students has a statewide green policy that includes the pledge to produce ten megawatts of renewable power by 2014.²⁴¹

We can also look locally in the state of North Carolina to Duke University (number five on Hattam's list), which has mandated that all new construction be certified by the United States Green Building Council.²⁴² The new French Family Science Center has waterless urinals, recycled carpet, and a green roof, full of plants.²⁴³ Duke also has on-campus bike trails and donates money to various wind and hydropower projects.²⁴⁴ Also in North Carolina is Warren Wilson College in Swannanoa at number three on the list. Warren Wilson College promotes sustainability with a sustainably managed farm, garden, and forest that provide food and lumber for the campus.²⁴⁵ Other universities on the list included:

- Number 2: Harvard University in Cambridge, Massachusetts
- Number 6: Middlebury College in Middlebury, Vermont
- Number 7: Berea College in Berea, Kentucky
- Number 8: Pennsylvania State University with 24 locations
- Number 9: Tufts University in Medford Massachusetts
- Number 10: Carnegie Melon University in Pittsburgh, Pennsylvania²⁴⁶

Here at East Carolina University we have taken steps towards sustainable awareness with the "Purple and Gold Go Green" program. ECU has purchased both a GEM truck for facilities and grounds maintenance as well as a \$550,000 hybrid bus with hopes to purchase more in the following years. The GEM truck is an electric vehicle that travels no faster than 25 miles per hour.²⁴⁷

²⁴¹ *ibid*

²⁴² *ibid*

²⁴³ Jane Stancill, Campuses join green bandwagon *The News and Observer* 13 November 2007, printed 20 December 2007

²⁴⁴ *Sierra Club Magazine* November/December 2007. Jennifer Hattam, p32-39.

²⁴⁵ *ibid*

²⁴⁶ *ibid*

²⁴⁷ ECU Reports, East Carolina University buys 'green' vehicles *The Daily Reflector*



Fig. 2 Photo of the Hybrid Bus and the GEM truck from <http://www.ecu.edu/cs-admin/news/releases/2007/12/greenvehiclesecu12182007.cfm?RenderForPrint=1>

ECU will build two new campuses that include a Dental School and a Coastal Studies Institute, which are designed with the requirement to meet the Leadership in Energy and Environmental Design (LEED) silver certification level.²⁴⁸ ECU has also implemented a policy of going trayless in the dining halls on campus. After implementing the new policy, ECU saved approximately 404 gallons of water at West End dining hall and 380 gallons of water at Todd dining hall the first two days. However, after surveying students 30% said that they were unwilling to go trayless in order to conserve water and energy, even though 71% of students surveyed said that sustainability is an increasing issue. The positive side to the survey is that ECU has determined that further education in the importance of sustainability is necessary and important to the students.²⁴⁹

The Unplugged Office Space – Ecological Excellence

Humans have a consumptive desire to build, destroy, dispose, and rebuild. This sequence is harmful, unsustainable, and one that we as future designers must put an end to. In the United States alone, 50 % of the 200,000 buildings destroyed each year are reusable.²⁵⁰ The demolition of these buildings results in debris that amounts to 124 million tons of waste into our landfills annually. This is enough construction debris to build a wall around the entire coast of the United States that is 30 feet tall and 30 feet thick.²⁵¹

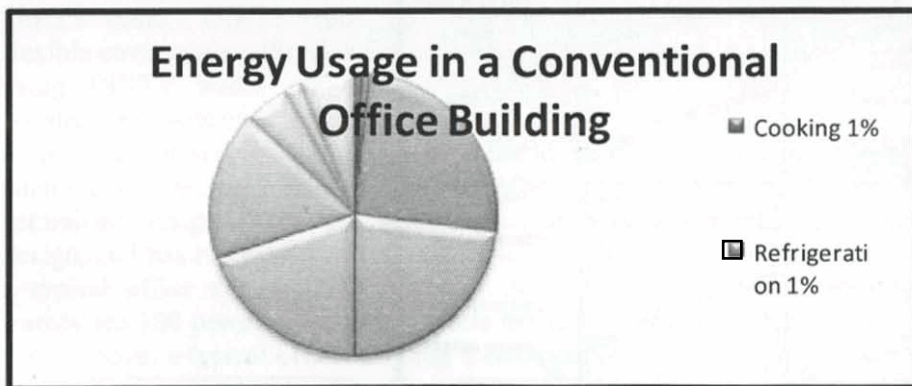
²⁴⁸ Hill, Kay on behalf of Kevin Seitz, Vice Chancellor of East Carolina University. Email Correspondence. 19 December 2007.

²⁴⁹ "Going Tray less at ECU" 19-20 November 2007

²⁵⁰ www.TheRe-store.com

²⁵¹ *ibid*

Statistics like these inspired projects like our “Unplugged Office Space.”²⁵² The Unplugged Office Space project that our class completed called for the adaptive reuse of a inactive short-wave radio station for the Voice of America. The inaugurated in 1963, the structure is located in a vast field just west of Greenville, North Carolina. This building facility was a listening post active in intelligence gathering up until the first Persian Gulf War and since then, it has been underutilized and determining the best use of the space and land has been an ongoing task. East Carolina University obtained the building about five years ago, and a portion of the building is still occupied by the Voice of America’s Center for Excellence. The term ‘unplugged office’ means that the renovation of this building will maximize the use of solar day lighting, wind power, natural ventilation, and water source heat pumps with the goal of unplugging it from the utility grid. The use of these energy efficient elements will reduce heating/cooling and lighting usage by at least 75%, which will dramatically lower commercial utility costs. Many people will argue that constructing green buildings that are efficient enough to achieve certain certifications to make it a beneficial investment are too costly compared to conventional office buildings. According to the US Green Building Council, there is only a 2% increase in essential costs to obtain a “LEED Gold rating.” Building owners will regain this 2% difference in building costs within only two years through reduced energy costs.²⁵³ The main idea is that green buildings dramatically save money on a long-term basis so new construction should begin to be built with a progressive way of thinking past the first initial cost. Below is a pie chart displaying the electricity use in commercial buildings in the U.S. (This clearly depicts how much energy goes into heating/cooling and lighting a typical office building.)²⁵⁴



There are many elements one can add to an existing space to maximize the use of solar day lighting. One of these elements is the location of windows,

²⁵² IDSN 3999 Building Systems, East Carolina University

²⁵³ Norman Foster, et. Al. "The Rise of the Green Building," *The Economist*, 4 December 2004. Printed 27 December 2007

²⁵⁴ Madison Gas and Electric.

http://www.mge.com/business/saving/madison/art/CEA_03_1.gif

which can determine the amount of light and heat gain emitted in each room. Our design team determined to place the majority of our windows in the renovation to this building on the north side for the best level of diffused light with minimal heat gain. Placing windows along the south and west side would have resulted in large amounts of light, and increased the solar heat gain from the harsh sun. By using special coated glass windows this building will have reduced the amount of heat loss during the colder months, as well as minimized the need for artificial interior lighting.

Another way our group decided to utilize and maximize natural sunlight was the incorporation of solar tubes. Solar tubes are very efficient skylights, which refract, reflect, and focus sunlight through reflecting and concentrating solar light into a small tubular structure using lenses and mirrors.²⁵⁵ Solar tubes are very beneficial, because they “utilize light that is not necessarily in the direct path of the tube and redirect it to provide optimal light from sunrise to sunset.”²⁵⁶ The use of natural daylight in office buildings not only is beneficial to operating costs, but it has been proven to have a positive impact of productivity, and health and wellness. At the University of Michigan, environmental psychologists, Rachel and Stephen Kaplan studied and found that “employees with views of a natural landscape report greater job satisfaction, less stress, and fewer illnesses.”²⁵⁷

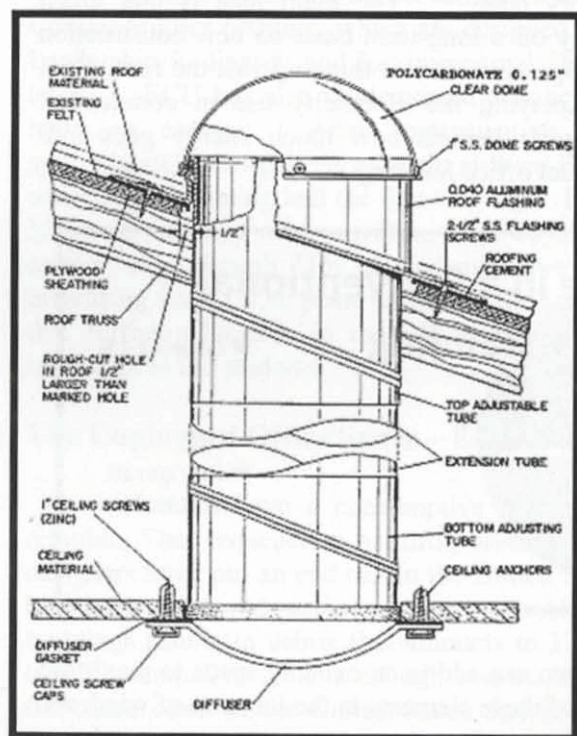


Fig. 4 Image of the construction of a Solar Tube from www.inhabitat.com

²⁵⁵ www.inhabitat.com

²⁵⁶ *ibid*

²⁵⁷ Norman Foster, et. Al. "The Rise of the Green Building," *The Economist*, 4 December 2004. Printed 27 December 2007

To generate enough electricity to power this sustainable office building, our design team used solar panels and wind turbines. Solar panels convert sunlight directly into electricity, while wind turbines on the other hand use the wind to generate electricity.



Fig. 5 Image of a Solar Panel tree from <http://commons.wikimedia.org/>

Our design team felt that the best use of the relatively flat land that surrounds the V.O.A. site was to place wind turbines in different parts of the property, and place solar panels close to the office building.

During the hotter months experienced in Greenville, NC, cooling is a major factor that must be taken in consideration as a vital cost to eliminate for our sustainable office building. To help improve natural ventilation, our design team designed a spiral stair case that leads up to the green roof located in the center of the office building, which has adjustable glass panels to move air down the stairs and throughout the cubicles. The interior of the office which now after renovation has a more open free form design is furnished with all sustainable products from the carpet to the cubicles and walls. The most innovative aspect of the redesign of the interior space was the incorporation of DIRT walls. DIRT walls, the next generation of modular walls, are a flexible environmentally friendly solution to office and commercial design. By using DIRT walls, we eliminated the need to use drywall or other construction materials that would be permanently set. To stray away from unnecessary offices, our group designed the new floor plan to be more open by strategically placing cubicles from the Vivo series by Herman Miller in a centralized design. Vivo is a leading office system because of its sustainable design, and has recently received GREENGUARD certification. Compared to a typical office system, which is only 36 percent recyclable, Vivo's steel frames are 100 percent recyclable, while the rest is 69 percent recyclable. As stated above, a typical office building's electrical bill can be broken down into by heating, cooling, and lighting costs, so with the simple incorporation of the above renewable energy sources, our group eliminated the office building's utility bill by 75%.

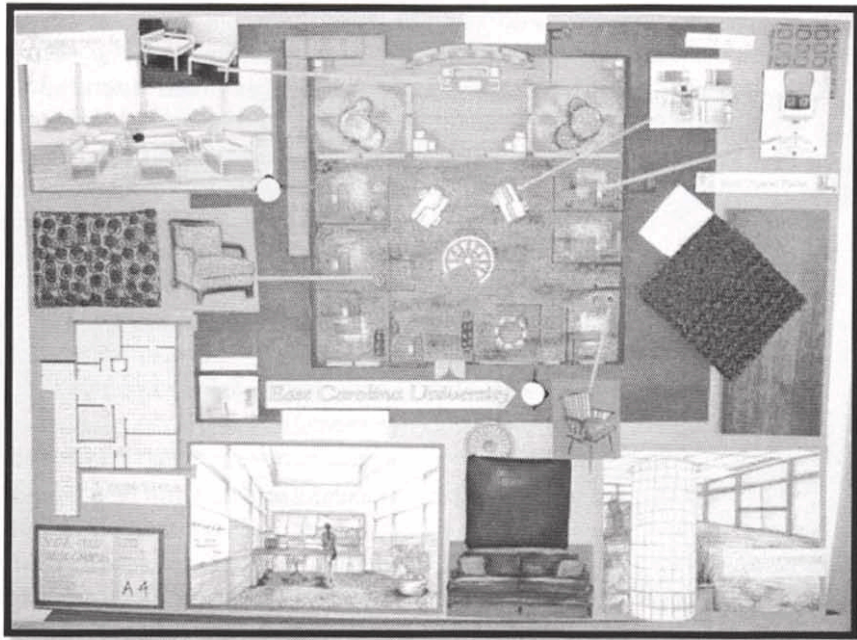


Fig. 6 Photograph of the presentation board that shows the open floor plan, centralized staircase for ventilation, and sustainable materials. The carpet is 100% recycled and is 100% recyclable.

With the trayless experiment at East Carolina University, we have learned that the majority of students realize that sustainability and environmental issues are important, yet they are unaware of simple, easy ways of promoting a gradual shift to sustainability. This is why United States colleges and universities must utilize the influence that they already have to shift the paradigm into a more ecologically intelligent way of existing.

With the recent acknowledgement by the United Nations of global warming as a real threat to human beings, we as future designers must seek to continue to develop products and spaces that are able to heal the present and promote the future, and as those who educate, we must also take on the responsibility to share our knowledge with all who will listen.

Works Cited

- American College and University Presidents Climate Commitment. 2007-2008 <<http://www.presidentsclimatecommitment.org/>>.
- ECU Reports, ECU gets 'green' vehicles. 18 December 2007. Printed 6 April 2008 from, <<http://www.ecu.edu/cs-admin/news/releases/2007/12/greenvehiclesecu12182007.cfm>>.
- Garris, Leah B. Four Ways to Shrink Your Building's Carbon Footprint. August 2007. Retrieved 27 December 2007 from, <<http://www.buildings.com/articles/detail.aspx?contentID=4986>>.
- "Going Tray less at ECU" 19-20 November 2007.
- Hattam, Jennifer. Sierra Club Magazine November/December 2007.
- Hill, Kay on behalf of Kevin Seitz, Vice Chancellor of East Carolina University. Email Correspondence. 19 December 2007.
- McDonough, William and Michael Braungart. Cradle-to-Cradle. New York: North Point Press, 2002.
- Norman Foster, et. Al. "The Rise of the Green Building," The /economist, 4 December 2004. Printed 6 April 2008.
- Stancill, Jane. Campuses join green bandwagon. *The News and Observer* 13 November 2007, printed 20 December 2007 from <<http://www.newsobserver.com/>>.
- United Nations World Commission on Environment and Development of Sustainability. Brundtland Report 3 March 2008. <<http://www.un.org/esa/sustdev/csd/review.htm>>.

Works Consulted

- Bird, Anne-Marie. "Circumventing the Grand Narrative: Dust as an Alternate Theological Vision in Pullman's *His Dark Materials*." *His Dark Materials Illuminated: Critical Essays on Philip Pullman's Trilogy*. Ed. Millicent Lenz and Carole Scott. Landscapes of Childhood. Detroit: Wayne State UP, 2005. 188-98.
- Caldecott, Leonie. "Paradise Denied: Philip Pullman and the Uses and Abuses of Enchantment." *Touchstone Magazine* 16.8 (2003).

- Hatlen, Burton. "Pullman's *His Dark Materials*, a Challenge to the Fantasies of J.R.R. Tolkien and C.S. Lewis, with an Epilogue on Pullman's Neo-Romantic Reading of *Paradise Lost*." *His Dark Materials Illuminated: Critical Essays on Philip Pullman's Trilogy*. Ed. Millicent Lenz and Carole Scott. Landscapes of Childhood. Detroit: Wayne State UP, 2005. 75-93.
- Lewis, C.S. "Sometimes Fairy Stories May Say Best What's To Be Said." *Of Other Worlds: Essays and Stories*. New York: Harcourt, 1966. 36-8.
- O'Brien, Breda. "Narnia Critics Risk Secular Fundamentalism." *Irish Times* 24 December 2005.
- O'Rourke, Meghan. "The Lion King: C.S. Lewis' Narnia Isn't Simply a Christian Allegory." *Slate* 9 December 2005. 13 April 2007. <<http://www.slate.com/id/2131908>>.
- Wood, Naomi. "Paradise Lost and Found: Obedience, Disobedience, and Storytelling in C.S. Lewis and Philip Pullman." *Children's Literature in Education* 32.4 (2001): 237-59.