

Bears Breaking Boundaries: Green Cities

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Master of Architecture / Master of Landscape Architecture

Concurrent Degree Program

Dear Committee,

I respectfully submit this project for the Bears Breaking Boundaries: Green Cities Contest. I am concurrently pursuing a Master of Architecture and Master of Landscape Architecture within the College of Environmental Design. Over the course of my study and practical experience in the field, I have developed a focus on the use of ecological systems, specifically water and energy, as sources of inspiration in design. In studios, I have had the opportunity to combine alternative energy research with specific design interventions. In seminar courses, I have learned about settlement patterns and the development of urban and suburban living conditions. Through an independent study, I have researched how a natural wastewater treatment system could be integrated with our landscapes and building forms. The project I propose here has grown out of a passion for design, a commitment to sustainability, and a curiosity about how market forces control development. My project proposal: *Urban Eco-Blocks: an Emerging Opportunity in Sustainable Development* investigates how design at the block scale is: 1. Able to integrate sustainable water and energy systems, and 2. Is poised to be a powerful strategy for both developers and city governments.

Thank you for your consideration,

Erin O'Mahoney Cubbison

Urban Eco-Blocks: an Emerging Opportunity in Sustainable Development

Research Question / Project Intent

How can design at the urban block scale accomplish the integration of sustainable systems, considering environment, equality, and economy? The intent of the project is to make a significant contribution to sustainability in the built environment: Research + Design = Prototype Eco-Block.

Objectives

My objectives are to investigate the cycles of water, energy, and waste, and their impact on design. I will explore how they can be generators of form, structure, aesthetics, and human interaction. The concept of the "Eco-building" has existed for decades, and the "Eco-city" is currently a very popular topic. It seems that the scale of the "Eco-block" has rarely been explored but has great potential as a form of sustainable design implementation. In this project, I will develop the design of an eco-block prototype and present the economic case for its implementation.

Project Significance

The significance of this project lies in the environmental crisis that we face today:

Impending Energy and Water Shortages

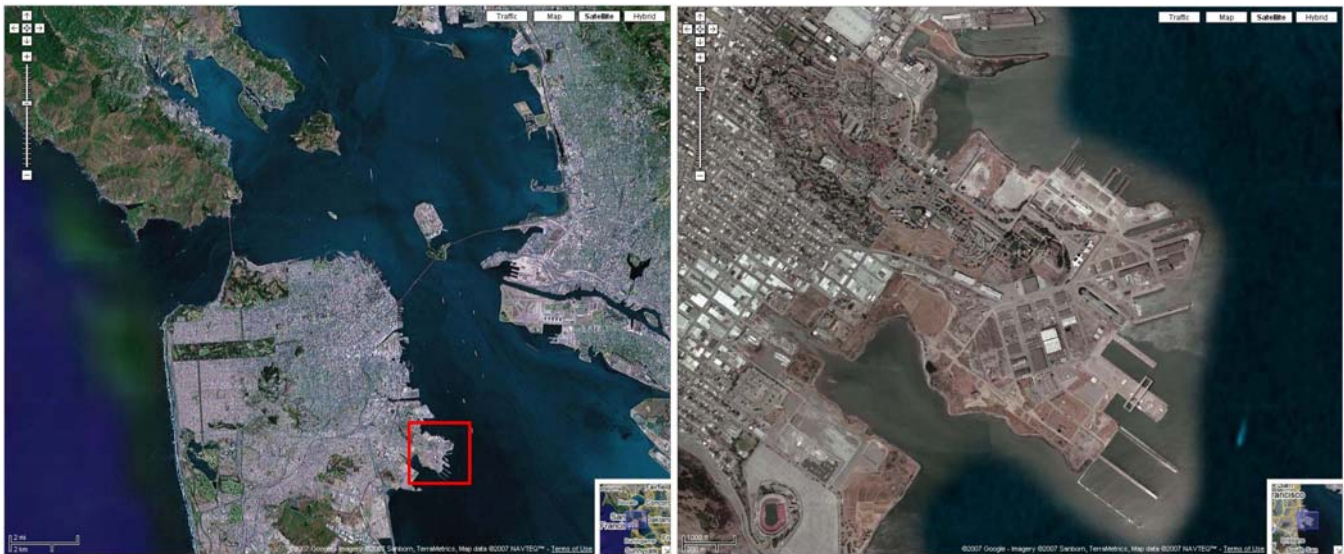
Population Growth

Global Climate Change

The built environment has significant impact on our environmental crisis, and at the same time has incredible potential to be a positive source of change. Within the last year, we have seen a dramatic increase in sustainable products, strategies, and even places. The proposed project is significant because it targets our current appetite for sustainability. Soon most cities, municipalities, and neighborhoods will begin to set stringent environmental goals. The task to achieve these goals, as they relate to the built environment, belongs to both designers and developers. It is critical to understand what the motivations are or could be for these two disciplines and how they can work together.

Site

I will use a site in San Francisco to develop the eco-block and test it in a real context. The site will be a block within Hunter's Point San Francisco. I will determine which specific block during May, 2007.



Hunter's Point is currently under redevelopment, and the team members are Lennar Corporation, WRT, and the City of San Francisco. The plan involves many sustainable strategies and I would like to build on this momentum through this project. I am especially interested in this site because there is an existing relationship between developer, architect/planner, and city. I hope to learn more about how these disciplines work with and without one another in order to accomplish sustainable goals.

Methods

I will perform research by conducting case studies and interviews; I will develop the design of the eco-block and a schematic building design within the block; and I will perform an economic analysis of the sustainable strategies.

Method	Benefit
Case studies	Establish and organize information on what has been done or currently under development in systems-integrated sustainable design.
Interview those working on sustainable development projects: Architects, Planners, Non-Profits, Developers	Find out what projects are currently happening and why. What are the limitations, agendas, and goals of the different team members?

Design eco-block prototype	Develop key strategies in a block design and schematic building design. Focus on the synergies between Energy, Water, and Waste cycles.
Analyze eco-block prototype financial benefits	Research and present all known financial benefits of the eco-block concept. Perform specific economic evaluation of the prototype design.

Context + Literature Review

Designing Sustainable Communities: Learning from Village Homes.

Village Homes is a 242-unit mixed-use residential "garden village" on 60 acres in Davis California. When compared to other ecologically planned communities of the 1970s, Village Homes, in the words of its authors, was a planning experiment, which "has proven the most successful, having achieved build-out and met its twin goals of helping people live more lightly on the land and creating a sense of community" (8). Homes are designed to be highly energy efficient and utilize solar energy for hot water (and now photovoltaic cells also). Common areas, pedestrian paths and bike paths are the guiding elements of the master plan, and the automobile has a minimal presence. There is a natural drainage system built into the creeks and ponds, and parks serve a dual purpose of recreational space and integrated agriculture. Variety in units encourages a range in the economic level of the residents.

The book outlines chapter by chapter how the different sustainable strategies were developed into one holistic master plan, including their process, which relied on citizen participation and close communication with the local government. The book finishes with case studies of other sustainable communities around the country, including Haymount, Virginia; Civano, Arizona; Coffee Creek Center, Indiana; Davisville, California; and Prairie Crossing, Illinois.

Relevance to project

This informs the project in two ways. First, in the early chapters, it provides a brief history of the development of sustainable communities (from about 1900-2000). This serves my project by introducing the context, the key theorists and designers, and how over the years they have built the conditions of sustainable design/planning that we know today. This includes the key historical events in policy as well as built projects. Second, this text informs the project as one of the most important examples of *low-density* sustainable communities. A key criticism of Village Homes is that it was developed on a greenfield and is has low density. My proposed project will focus on the design of/need for *high-density* sustainable communities at the block scale.

"Cost, Savings and Value." *Environmental Design and Construction, Nov 2006-Jan 2007*

This article covers three main points within the topic of "green building": benefits of green buildings and market share, construction costs and operating savings, and financial value. The article uses Leadership in Energy and Environmental Design (LEED) to define "green buildings."

Benefits of green building and market share. The article presents market acceptance of green building and supports the case with data on the increasing incidence of LEED buildings. It also shows survey data collected by McGraw-Hill Construction on the business reasons for Green Building. This data is based on the opinion of the respondents, and there is still uncertainty about the "cost-benefit equation" (Nov 116).

Construction costs and operating savings. Cost data is presented for 33 LEED Projects and presents that a Certified (the lowest LEED level) rating adds 0.66% to the construction cost, Silver 2.11%, Gold 1.82%, and Platinum 6.50%. The article then includes operating costs savings for the energy optimization (ranged from 29.4% to 55.0%) and water efficiency (ranged from 30.1% to 34.4%). These

factors can be translated into dollars in a straightforward way, but some related effects cannot, such as lower utility *rates* due to lower peak demand, lower management costs due to reduced churn, property tax incentives, increase employee efficiency/morale/recruiting, etc.

Financial value. This section of the article covers specific issues in real estate and finance. It discusses a significant study performed by the Royal Institute of Chartered Surveyors (RICS), which found that green building features translate in greater asset value. Using the assumptions described in the article, "the green building developer can create a return on 'green' invested capital of 146 percent if the property is sold. Building green nets \$1.46 of additional after-tax profit for each additional green \$1 invested. If the developer chooses to operate the property, it is very likely they can increase the mortgage amount because the appraised value will be higher" (Jan 22).

Relevance to project

This article is one of several sources that have come out very recently on the case for sustainable design from the perspective of the developer or investor. It outlines several of the key factors in the economic argument in favor sustainability. It includes examples of dollar figures, companies, and example projects, which I will use for guidance as I perform an economic analysis of the eco-block prototype.

Cradle to Cradle: Remaking the Way we Make Things

These authors describe that our current practices are "cradle to grave," meaning resources are used and discarded, without consideration of negative environmental impact or the potential economic benefit of material cycling. The authors propose the strategy of "eco-effectiveness," which is based on the idea that in nature, waste equals food. As such, they propose that we redefine our concept of waste and consider materials to cycle through different stages. McDonough and Braungart argue that all materials (in an ideal world) would fall into two categories: Biological Nutrients and Technical Nutrients. The Biological Nutrients are materials for human use, for example disposable spoons made out of potato starch or houses made out of rammed earth, which eventually return to the earth and are literally food for decomposers and plants. Technical Nutrients are materials which are used in products, for example a plastic which can be formed, melted, and re-formed, that are eventually returned to the manufacturer for re-processing.

The book also includes examples of companies which have bought into McDonough and Braungart's ideas, literally. McDonough designed a green roof for the entire corporate campus of the Gap Inc. Even more encompassing of the book's ideas is the Ford Motor Company site. The "River Rouge Plant" in Dearborn, Michigan, is a \$2 billion, 20-year design for a regenerative facility. This example addresses self-sustaining energy production, water use, and materials cycling.

Relevance to project

I recognize at least three concepts that this book will offer my project. First, its definition of the ideal design triangle (environment, equity, economy) helps establish the framework for my criteria in sustainability. Second, the companies described in the book's examples will be included in my discussion of market shift, anchor tenant demand for sustainability, and probably the promotional value of sustainability. Third, the concept of waste=food/fuel will be a guiding principle in the design phase of my project. In the eco-block prototype, this will mainly take the form of methane generation from sewage.

"Building in Green." *Newsweek*, Sept 26 - Oct 3, 2005

This article describes the Huangbaiyu project by William McDonough, which is located near the city of Benxi in Northern China. It is a prototypical village design, with the ultimate goal of being implemented all over the country, and "improving" the lives of 800 million rural Chinese. McDonough is

the co-chair, together with Deng Xiaoping's daughter, Deng Nan, of the China-U.S. Center for Sustainable Development.

The article describes Huangbaiyu as an experiment which changes the organizational structure of rural villagers' lives. In this design, families would move into a town center and therefore increase the amount of land available for farming. Currently homes are scattered over agricultural land. Homes have a budget of \$3,500 and consist of pressed earth and straw. They also include built-in water and gas lines, which inhabitants are not currently accustomed to in the existing housing.

The article continues to explain that McDonough has completed designs for six new districts in cities such as Beijing and Guangzhou in addition to the village, which are scheduled to be occupied in a few years. McDonough has earned the approval of China's leaders and even the President has adopted his "Cradle to Cradle" expression. From a later article, however, I learned that the Huangbaiyu experiment is thought to be a failure because no farmers have been able to occupy the homes. The homes themselves are too expensive, the utility costs are far out of reach, and the new master plan does not allow extra outdoor space for each family to raise livestock, a secondary form of income, which was not considered in the overall design.

Relevance to project

The article provides a contemporary example of a low-density eco-community, an idea which had its start in projects such as Village Homes, during the 1970's. The example of Huangbaiyu helps illustrate the point that there is a scale that is under-represented in this trend for sustainable development, the scale of a high-density urban community. A secondary way this example is relevant to my project is that it addresses both the "economy" and "equality" facets of sustainable design. It demonstrates how critical it is to take into account the cultural considerations of one's site and the economic/vocational needs of its proposed occupants.

"Zero-Carbon Cities." *Architectural Record* vol 03, 2007

Dongtan, China, is just north of Shanghai and being designed by London-based Arup and the Shanghai Industrial Investment Corporation (SIIC). The island is three-quarters the size of Manhattan and is expected to accommodate 80,000 people by 2020. "As a strategic partner, Arup is responsible for a range of services, including urban design, sustainable energy management, waste management, renewable energy process implementation, architecture, infrastructure, and even planning of communities and social structures" (164). Additional considerations for Dongtan are the existing residents' need to farm, both for their own livelihood as well as the need for food production for the city, and the existing geographical conditions, which include great areas of wetlands.

The master plan will use a 2-mile buffer zone of "eco-farming" between the city development and the wetland area. The city government is planning for a broad range of new jobs and sustainable industries, including new technology, food research and production, health care, and even an Institute for Sustainable Cities.

Relevance to project

This article provides a contemporary example of the other extreme in the scale of sustainable development, the "eco-city." The design of Dongtan demonstrates the maximum implementation of sustainable development that I have found thus far. It is a specific example of how urban planning is moving toward sustainable design at a large scale and how the different elements of the city can work together in a sustainable way. In the meanwhile, however, the vast majority of our cities lack a city-wide, system-wide "eco-plan." As such, the scale of the city block or cluster of blocks will be a highly effective strategy for implementing sustainable systems for water, energy, and waste.

Plan for Funds

If I am awarded a Bears Breaking Boundaries prize, I will apply the funds to the research, design, and analysis segments of the project. I will use the award to travel to sites which integrate

design with innovative, sustainable strategies for renewable water and energy systems natural wastewater treatment. In order of priority, these sites include: Oberlin College, OH, which has a natural wastewater treatment facility integrated with selected campus buildings; On Site Power Facility, in Davis, CA, which is innovating the process of biogas production; Lloyd's Crossing development in Portland, which has integrated several renewable energy strategies into its urban fabric; and, If funds permit, the BedZED development in the London borough of Sutton, which is the UK's largest carbon-neutral eco-community. For the design phase I would use a small portion of the award to help pay for model materials and printing costs. Finally, to assist me in the analysis phase, I would like to attend a seminar organized by the Building Owners and Managers Association (BOMA) on techniques for evaluating the real estate implications sustainable strategies.

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Bio (including text from introduction)

Erin O'Mahoney Cubbison is a graduate student in the College of Environmental Design, pursuing concurrent Masters degrees in Architecture and Landscape Architecture. Over the course of her study and practical experience in the field, she has developed a focus on the use of ecological systems, specifically water and energy, as sources of inspiration in design. In studios, she has had the opportunity to combine alternative energy research with specific design interventions. In seminar courses, she has learned about settlement patterns and the development of urban and suburban living conditions. Through an independent study, she has researched how a natural wastewater treatment system could be integrated with landscapes and building forms. The project proposed here has grown out of a passion for design, a commitment to sustainability, and a curiosity about how market forces control development.

Consent

I consent to public, online dissemination of my white paper.

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