2012, Light

MASTER OF SUSTAINABLE REAL ESTATE DEVELOPMENT

The Best Practices of Eco Districts:

Reinventing the Walter Reed Army Hospital Site

Prepared for:

The University of District of Columbia: Department of Sustainability

May 2012

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"Here's to the crazy ones, the misfits, the rebels, the troublemakers, the round pegs in the square holes…the ones who see things differently….You can quote them, disagree with them, glorify or vilify them, but the only thing you can't do is ignore them because they change things…they push the human race forward, and while some may see them as the crazy ones, we see genius, because the ones who are crazy enough to think that they can change the world, are the ones who do".[1]

Steve Jobs, CEO, Apple Inc.

[1] Southeast False Creek Art Master Plan. March 2007, http://www.bustersimpson.net/southeastfalsecree/SERCArtMasterPlan.Final.03.01.07.pdf.pg3

Executive Summary

This paper examines the on-going transformation of the former Walter Reed Army Hospital site into one of four Eco Districts located in our nation's capital. Washington, DC, like most cities in the United States, is new to Eco Districts. But, while there aren't many examples of Eco Districts in the United States, Europe has been building them for twenty years. Keeping that in mind, an examination of other Eco Districts around the world was undertaken with the purpose of looking at their best practices and how they could be applied to the Walter Reed site. These Eco Districts are: Bo01 in Malmo, Sweden, South Waterfront in Portland, Oregon, Southeast False Creek in Vancouver, British Colombia, Canada, and the tenuous Living City Block in Denver, Colorado.

Significant consideration was given to the format of the paper. Like so many projects, the more thought that went into it, the broader the topics became. Eventually, ten subgroups of each district were determined: demographics, community involvement, financing, recycling, water management, education, environmental impact, energy and monitoring and maintaining. The subgroups were determined by looking at what are the vital components in making Eco Districts work. In order to determine what was important, it was ascertained whether the Eco District could hold together or achieve its environmental goals if that subgroup was eliminated. However, in each Eco District, some subgroups are more important than others. Most of this is because of the climate where the Eco District is located. Demographics of each district were included to provide a reference point for the reader. All in all, the role of each subgroup is important to explore because they could have an impact on the development of future Eco Districts.

The analysis of each subgroup is important to understanding how Eco Districts operate. For example, how an Eco District is financed can show the level of commitment from government and city officials, it can predict success or failure, and it can show the creativity of the administrators. Demographics are important to understand as they show how big a district is, what the climate is, and what the demand for housing could be in that area. As mentioned earlier, some subgroups are not as important as others depending on the district. For instance, recycling in Denver is not as extensive as it is in Malmo, but for Denver's purposes it hasn't been as important to them as community involvement.

The final sections of the paper are the heart of this project. After looking at all the subgroups of each case study, attention is turned to the Walter Reed site. Existing conditions and future plans for the site are examined. Included are plans for building demolition, construction, and future residential density. Landscape plans are also included because the site's parks, gardens

and open spaces are integral to the character of Walter Reed and have been since its construction. The current plan calls for significant changes. Because of demolition and construction, Walter Reed will have a new look. As the site becomes denser, open space will become more important in order to maintain the "park-like" atmosphere that it currently enjoys.

Recommendations for Walter Reed are based on the best practices of other Eco Districts and research done in the course of writing this paper. Comments from professors, class speakers, books, lots of city documents, articles and conversations have all contributed to recommendations. Most of the recommendations made for Walter Reed could be easily integrated. Some would save money, all are Eco District friendly practices. As the United States population grows, development of future and existing cities will need to be smarter if we are to keep our standard of living. Eco Districts are an answer to smart growth and a responsible use of resources that not just maintain, but increase resident's standards of living.

Introduction

It seems that every day we look in newspapers, on television, on-line or at the gas station and see the effects of rising energy costs. It's hard to miss. Rising gas prices have become a referendum on the President's approval ratings and opposing candidates are quick to refer to their opponents support or lack of support for alternative energy sources. Promises by politicians for affordable energy sources have become a hot topic as Americans continue to pay an increasing percentage of their income for energy. It is becoming more important than ever not only to conserve energy, but to find alternative sources of energy that don't negatively affect the environment. "Drill baby drill" is not a responsible or practical alternative.

In looking for a solution, many urban planners and sustainability professionals are looking to other countries that have successfully found and implemented viable options. Eco Districts are such an option. What are Eco Districts? The standard definition is "a neighborhood or other distinct district with a broad commitment to accelerating district scale sustainability. Eco Districts commit to achieving ambitious sustainability performance goals, guiding district investments and community action, and tracking the results over time."[2] Imagine a neighborhood or district in your town such as a downtown stretch of retailers, or even a designated historic neighborhood of fifty homes. The owners in this area have committed to making their area an Eco District. They start with the goal of reducing heating costs. As a neighborhood they work together to help each other to find solutions. It could be as complex as applying for state and federal grants for new thermal windows (has been done in Portland, Oregon). Or it could be a group of retailers who petition for federal funding to install solar heating roof top grids. Whatever form it takes, Eco Districts are specific groups of people working together to establish ecologically sound practices in a designated area.

While Eco Districts have been around for a while in Europe, (Eco Districts were forming in Sweden starting in the 80's), they are just making their impact in the United States in the last five years. Of course, while some cities in the United States like Seattle, WA and Portland, OR have been at it for longer, Eco Districts are now catching on to other major US cities like Washington, DC, Austin, TX, and Cleveland, OH. Sound ambitious? It is. But as cities like Portland, OR are proving, it is economically and environmentally sound practice.

But first I'd like to do a quick comparison of how an Eco District is different from other programs that are similar. The US Green Building Council (USGBC) has a designation called LEED for Neighborhood Development, LEED ND. In addition, the American Society of Landscape Architects (ASLA) has a program called Sustainable Sites. The difference between an Eco District and ASLA's program is that Eco Districts look at a district and take into account all the

[2] WWW.pdxinstitute.org/index/php/whatwedo/ecodistricts

variables that impact that district; energy consumption, traffic flows, residential facilities, and most importantly the people who live there. Sustainable Sites looks at an individual site, the planning of it and the operation of individual places. So, they would look at a school, or a brownfield site or a park. An eco district would look at multiple buildings all in one area. It is a broader undertaking.

The difference between an Eco District and LEED ND is that LEED ND focuses on location and community patterns, where people live and work and how they get there. Its focus is more comprehensive than an Eco District. LEED ND also has a checklist that developers follow to achieve certification of their project. Certification is based on a point system. Because LEED ND is so broad in coverage, there are things that a developer does not have to do that you would do in an Eco District, such as water efficient landscaping or district heating sources. So to sum up, ASLA's Sustainable Sites program is more specific to a particular building or area within a district and LEED ND is a broader program focusing on overall aspects of a district.

Eco Districts have been around in theory for a long time. As early as 1956, Jay Forrester, known as the founder of Systems Dynamics, introduced the idea of systems thinking and how it could be integrated into more complex social systems. He said that "The only way to properly address problems arising in community systems is to first understand that they are organic, dynamic, and emergent-the whole is greater than the sum of its parts."[3] He realized that it is important to understand the relationships between elements of a place; that they are more important than the individual elements themselves. Just a few years after Forrester, Jane Jacobs echoed this idea when she said that cities are made up of "organized complexity…in which a half-dozen or even several dozen quantities are all varying simultaneously and in subtly interconnected ways".[4] What has emerged from this philosophical train of thought is the Eco District. The whole of a neighborhood is greater than the sum of the individual parts. No longer do we focus on just one building in a neighborhood, or improvements to just one street. Sustainability professionals, civic officials and local planners are today focusing on how to re-purpose older buildings and create more efficient districts. In other words, rather than looking at single buildings, the focus has changed and the thought that elements in a neighborhood are symbiotic has taken center stage.

So the next question is, "Why are Eco Districts becoming so popular now?" Well, there are many reasons. Have you gotten gas lately? Notice anything shocking? Yes, the price of fuel is rising higher than it's ever been in this country. But, it's not just the price of fuel. Energy prices in general are rising. According to the Bureau of Labor Statistics, the Consumer Price Index for Energy costs for this past year has risen all across the country: Seattle- up 2.7%, Miami-Fort

[3] http://johnstonarchitects.wordpress.com/2010/05/20/contextualizing-the-ecodistrict-the-philosophy-of
[4] Ibid. pg. 8

Lauderdale-up 2.9%, Chicago-2.0%. [5] And the infrastructure necessary to keep it all going is aging as well. So, people are looking for an alternative. While some people are looking at natural gas or "clean" coal, urbanists are looking for a bigger solution, one that addresses the multitude of issues in an Eco District. For instance, Eco Districts are not just concerned with energy sources. They look at how people can live more efficiently in that area. Recycling, water management, the landscape and its needs, as well as transportation are all some of the concerns of an Eco District. The focus is on how the district can operate more efficiently as a whole. Eco Districts by design are geared towards being self sufficient neighborhoods that work within cities. And the ultimate goal of an Eco District is to become Net Zero, which means they use no more energy or water than they generate or collect.

A second reason is that the Federal, State and City governments have put in place a number of tax credits that developers and property owners can use to retro fit their buildings. While Eco Districts are not solely building focused, it makes economic sense to make a building more energy efficient. Buildings can be a big piece of the pie.

And finally, companies are discovering that having a healthier building means healthier employees. The end result is absenteeism is reduced and productivity is increased in healthy buildings thereby saving money.

Every once in a while a city is presented with an opportunity to create something unique and special. The former Walter Reed Hospital site in Washington, DC is such an opportunity. Walter Reed was put into action in 1909 and served the Army for over 100 years as its flagship hospital. Over time the facility was neglected and with the process of BRAC or the Base Realignment and Closure program, it was determined that the Walter Reed site would be turned over to the District of Columbia. The site is comprised of 67 acres and 3.1million gross square feet of development, all in, what has been described by the Mayor as a "real jewel" of a property.[6] The plan below shows the approved usage of each building.

[5] U.S. Bureau of Labor Statistics. "Consumer Price Index, Chicago-Gary-Kenosha, Ill.-Ind.-Wis., CMSA-February 2012", pg. 2, "Consumer Price Index, Miami-Fort Lauderdale, February 2012", pg. 1, "Consumer Price Index, Seattle Area, February 2012"pg. 1.

[6] Rebecca (pseud.), comment on "Mayor Gray on WTOP: no bus garage at Walter Reed", The Brightwoodian Blog, comment posted July 12, 2011, http://thebrightwoodian.blogspont.com/2011/07/mayor-gray-on-wtop-no-bus-garage.at.html

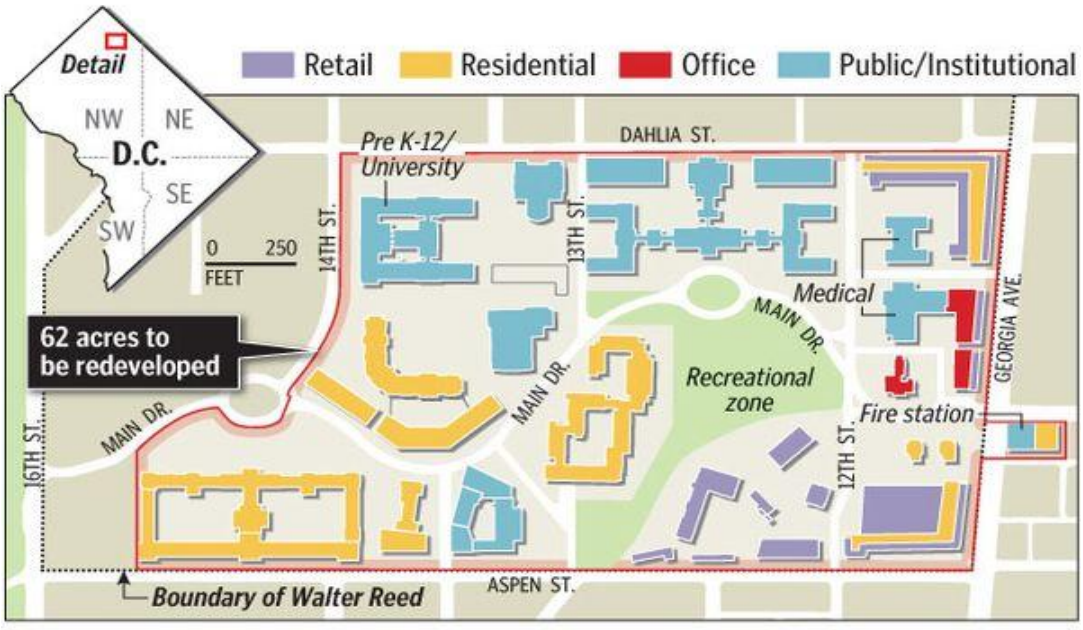


Photo from The Wash Cycle

As seen from the diagram, a comprehensive plan has already been put in place and was recently approved by the Local Redevelopment Authority, which is in charge of preparing the plan for reuse of the site. Over half of the 3.1 million square feet will be residential, a quarter of it office space and the rest retail and "creative " space. Washington Yu Ying Public Charter School will get 100,000 square feet for a middle and high school, Latin American Montessori Bilingual charter school gets 30,000 square feet, So Others Might Eat will maintain 40 units of housing for homeless seniors, HELP USA will build 75 units of low income housing, and the Transitional Housing Corporation will get 6,000 square feet of office space. [7] In addition to some new buildings, the streetscape is designed to change in order to improve traffic flow throughout the site. A new fire station will be established across from the site on Georgia Avenue.

There is a sustainability plan for the site. Not yet named, it was presented at the Council of Governor's Meeting in February of 2012 by Martine Combal, the Walter Reed LRA Director. The plan establishes goals for energy, water, and transportation usage as well as green building standards for all new construction. [8] However, exactly how to reach those goals and how they are going to be measured, has yet to be determined. In gathering clues as to how Walter Reed can be transformed into an Eco District, it is sometimes good practice to look at those who have

[7] DePillis Lydia, comment on Walter Reed Plan Approved, On Its way to Council, The Washington City Paper Blog, comment posted on January 26, 2012, http://www.washingtoncitypaper.com/blogs/housingcomplex/2012/1/26/walter-reed-plan-approved

[8] Combal Martine, Council of Governors Meeting, power point presentation, Washington, DC, February 21, 2012

done it before and what worked well for them. In choosing to make the Walter Reed campus an Eco District, planners at the District's office are at the forefront of environmentally responsible urbanism. Therefore, with the eyes of many planners, environmentalists, politicans, and citizens on them, it is crucial that Walter Reed become a shining example of what an Eco District can be. This paper will examine four different Eco Districts and their cities: Malmo, Sweden, Vancouver, British Columbia, and Portland, OR and The Living City Block in Denver. I will then illustrate the best practices of each district as well as the host city itself.

Case Study One-Malmo, Sweden


Malmo's Turning Torso

Malmo is located in southern Sweden on the western coast. It has a population of 269, 142. The population is very diverse. After WWII, Malmo became a destination for a lot of immigration. It is said that over 100 languages are spoken in Malmo. Another distinctive characteristic of Malmo is that it has multitudes of parks. One of its nicknames is "The City of Parks". The ratio of park acreage to resident is 17:1. [9] Malmo is directly across from Copenhagen, Denmark and was part of Denmark for centuries. It is now connected to Copenhagen by the Oresund Bridge and since 2010, the Oresund Tunnel. By train, it is 35 minutes from Malmo to Copenhagen. The Eco District in Malmo originally started out as a housing exhibition in Vastra Hamnen (the western harbor) along the waterfront in 2001. It was meant to show Swedes examples of energy efficient housing and how such housing would fit in a neighborhood. There were over twenty –six different architectural firms involved in designing and building the homes. Variation was critical to the design. Planners wanted people to explore the neighborhood and discover what was around the corner. [10]However, the popularity of the homes had developers and city officials asking "Why couldn't the 'exhibition' become the new model for sustainable neighborhoods? Why couldn't people live here?" The new housing met all the latest standards for energy conservation, the area had excellent transportation routes previously established for the exhibition, and all utilities were connected. Certainly, the homes were in demand. Soon after the decision to re-invent the exhibition, the area was re-named Bo01, Bo means "to live" and '01 is the year it was created.

[9] Malmo, Sweden, The City of Parks, Dara O'Byrne, pg. 2
[10] City of Malmo, Vastra Hamnen The Bo01-area: A city for people and the environment, http://www.malmo.se/vastrahamnen pg. 2-4 och www.ecostaden.com

Homes in Malmo's Eco District Bo01.

Different styles, designs and heights add to the variety and character of the neighborhood while allowing for sea views and light maximization.

Thus, Bo01 was born. Today Bo01 is not just a neighborhood. It has become a tourist hot spot. Malmo and Bo01 are frequent stops on Sustainable Study Tours and conferences for scientists wanting to learn more about sustainability are held in Malmo. [11] People going to Bo01 want to see how it is to live in a place that has such high environmental standards. What they find out is that it isn't all that different from an ordinary neighborhood. Homes tend to be smaller and you are closer to neighbors, but it is also brighter and quieter. The area is dominated more by pedestrians rather than cars. Local transportation for residents is more frequent and available than you might see elsewhere. [12] Outside spaces are more open and welcoming and there is a sense of community that is not found in ordinary neighborhoods.

While the project has always been led by city officials, it's the demand from the public that has driven the creation of such neighborhoods. The people who live in Bo01 are very committed to a sustainable way of life. While the buildings are designed and monitored for energy conservation, it is ultimately the residents themselves who make it work. Keeping the windows open and forgetting to turn off the heat will not conserve energy. Some programs have been introduced gradually to residents as improvements are made to the district. For example, in Bo01, residents not only recycle the usual paper and plastic, but recycle food scraps as well. They are used as an energy source. The point is that no one will care more about the

[11] The City of Malmo. " Sustainability City Development, Malmo, Sweden", http://www.malmo.se/sustainablecity

[12] The City of Malmo. "Mobility in Malmo", http://www.malmo.se/English/Sustainable-City-Development

neighborhood than the people who actually live there. So, if residents don't integrate with sustainable living practices, the district doesn't function as well as it could.

Financing

Financing an Eco District is an expensive undertaking. In Malmo, some of the major problems were already solved. As in the Walter Reed site, the City of Malmo already owned the land under Bo01. The area had been a former ship building and industrial area that had fallen on hard times and had been turned over to the city. The housing exhibition was an attempt to bring people back to the waterfront and revitalize the area. Because of the success of that project the idea to make it a functional, working neighborhood was a quick jump. Even so, it is expensive. Fortunately, the City of Malmo has won numerous awards and grants for innovation in building and urban design. In 2000, the City of Malmo was the first city to win the European "Campaign for Take-Off Award" for the development of renewable energies. [13] They also have the support of the Swedish government. In order to speed up sustainability projects in Sweden, the government allocated 7.2 billion SEKs ($1.1 billion dollars) for the period 1998-2003.[14] While the amount was for the entire country, Malmo benefitted substantially receiving 147 million SEK or $21.6 million dollars. The City of Malmo has also adopted the United Nations development plan, Agenda 21, that lays out sustainable development objectives. One of the ways Malmo is meeting its Local Agenda 21 goals is through their own Environmental Program. The plan has fifty-eight environmental objectives with fourteen general topics. The topics range from reduced climate impact to thriving wetlands and healthy forests. [15] A Green Plan for Malmo was created in 2003 as a supplemental support document to the Environmental Program. Its focus is more on future projects involving the parks and highways departments, the planning department, the leisure department and the estates department . [16] Because of the strong leadership of the Swedish government and the City of Malmo, bankers are more confident in making loans and developers are more willing to take risks.

[13] Zinkemagel, Roland, Bo01City of Tomorrow (Malmo-SE), pg. 2
[14] O'Byrne, Dara, Malmo, Sweden, The City of Parks, www.depts.washington.edu/open2100/Resources/1_OpenSpaceSystems/Open_Space_Systems/Malmo_Case_Study.pdf
[15] O'Byrne, Dara, Malmo, Sweden, The City of Parks, http://depts.washington.edu/open2100/Resources/1_OpenSpaceSystems/Open_Space_Systems/Malmo_Case_Study.pdf
[16] Borg, Katrina, Green Plan for Malmo 2003 Summary, http://www.malmo.se/download/18.1c002f7b12a6486c372800012902/Groplan_summary+ENG.pdf

Recycling

Ninety-six percent of household waste in Bo01 is recycled.[17] They have bins for glass, newspaper/paper, card board, metal, plastic and batteries. They also recycle food scraps. Today approximately 10% of the residents recycle food waste. Malmo's city goal is to have 40% of all food waste recycled by 2015. In Malmo's landmark building, The Turning Torso, all the 147 apartments have a garbage disposal which digests food waste and then disposes it to a central collection tank within the building. Organic sludge collected from buildings in Malmo is used to generate biogas which is used to fuel the city busses. [18]

Water Management

Bo01's rainwater channels are also used for bike parking.

Water management practices throughout Malmo as well as Bo01 are comprehensive. In the neighborhood streets of Bo01, they have constructed rainwater troughs. The troughs run like a typical gutter system in the US but they don't dispose of rain water through the sewer system. The troughs meet at a purification post where all grey water is treated within the district and reused for watering needs or in the district's parks. The district's water and sewage systems are connected to the Malmo network. The rainwater channels are also used by residents as bike parking. While they weren't designed for that use, the residents have adapted them to their own use.

[17] Malmo Stad, 2009, Recycling in Malmo, pg. 1, http://malmo.se/English/Sustainable-City-Development/Recycling.html
[18] Ibid., pg. 1

Transportation

Two of the biggest challenges that cities face are transportation and energy use. [19] Malmo is called Sweden's Cycle City because of the proliferation of bike transportation. There are 410 km of bike paths in Malmo, more than any other Swedish city and 5 km more than Copenhagen, which is well known for its bicycle culture. In Malmo, 30% of all transportation and 40% of all work related transportation occurs by bicycle. [20] In Malmo and Bo01, bikes and pedestrians are given precedence over cars. In Bo01, the streets are so narrow that cars can't drive through them. Therefore, they are parked at the outer edges of the Eco District. Public transportation around Bo01 is so prolific that it doesn't make sense to own a car. City officials hope to spread that idea throughout the entire city.

There are several ways that the city is trying to promote bicycles over cars.

> "At 28 different intersections throughout Malmo, sensors are built into the pavement in bicycle lanes. When a bicycle approaches an intersection which is not heavy with cars, sensors signal the lights to change to green to accommodate the cyclist. At most intersections, there are also handrails for cyclists to hang onto. "[21]

Most of this has happened through the lobbying of the bicycle organizations in Malmo. But the city itself started a campaign called "No Ridiculous Car Trips". They claim that 50% of all car trips are under 5km, about 3 miles. The campaign, which is in its fifth year, is aimed at getting people out of cars and onto bikes. To promote it, organizers have taken to putting attention drawing orange seat covers on bikes when it rains. They have held contests where people write down their most ridiculous car trip. The winner gets, of course, a new bike. They also put suction cupped orange flyers on people's car window's encouraging bicycle ridership. And they campaigned heavily for handrails, orange of course, and wider bike lanes. All of these efforts have paid off as ridership has increased to 30% of the city's population. [22]

Education

A vital component of Eco Districts is that they educate their citizens about sustainability and how to protect their environment. In addition, learning how the buildings in an Eco District

[19] Campoli, Julie, Visualizing Density, lecture in The Business of Real Estate Development class, Tulane University, March 1st, 2012.
[20] Malmo Stad, 2009, Mobility in Malmo, pg. 1, http://www.malmo.se/English/Sustainable-City-Development/Mobility.html
[21] Ibid. pg. 1
[22] Copenhagenize.com, September 29, 2010, pg. 1, http://www.compenhagenize.com/2010/09/no-ridiculous-car-journeys-malmo-sweden.html

function is vital to achieving optimum energy performance over time. In Bo01 and throughout Malmo, they have created several innovative ways to teach and periodically update their citizens about new sustainable practices. For example, Malmo has an environmental newspaper called "Green City" which has been in publication for over 10 years. The city also has an education television channel which broadcasts environmental news. In addition, Malmo hosts the Regional Center of Expertise which is tied to the United Nations goal of establishing the "Decade for Education for Sustainable Development" (2005-2014). The Center is a regional network that disseminates information on sustainability. [23]

Outside of Bo01, the City of Malmo has a facility called the Helix. The Helix is the home to Malmo's Center for Sustainability. It links stakeholders working in urban sustainability and provides a common meeting place to discuss and exchange information and ideas. It is just another example of Malmo's commitment to the continuing education of its citizens as a whole. The City of Malmo and Malmo University are also linked to The Institute for Sustainable Urban Development. They collaborate on research and with practitioners. And lastly, Malmo was declared a "Fair Trade City" in 2006 and the city continues to pursue ethical consumption of imported goods. All of these examples are things that the City of Malmo as a whole is undertaking to educate their citizens. Because Malmo has set high environmental goals, it is important that city officials take a leadership role in educating all citizens, not just the people who happen to live within the Eco District.

Environmental Impact

Bo01 was designed to have a positive environmental impact on its surrounding area. The district has natural habitats called "green areas". These areas are planted with natural vegetation and are designed to retain as much storm water run-off as possible. They are also created to attract native species of birds, insects and animals. The overall effect is one of a "natural" habitat that has a bucolic atmosphere; country living, privacy, and beauty all in one.

[23] http://malmo.se/English/Sustainable-City-Develoopment/Education-and-Fairtrade.html

Neighborhood in Bo01 illustrating natural vegetation and storm water channels.

The City of Malmo also has a "Green Points" list it provides to developers and construction companies about how they can help as many species as possible to become established in a particular area. Each unit in Bo01 is provided with a bird box and planters. Frog biotypes are established where possible and nesting boards are set up for birds against the sides of buildings.

In the Bo01 neighborhood, there are 7,000 square meters of green roofs with moss and stonecrop plants. When the area was planned, they used a "green surface factor" system in order to qualify as a green neighborhood. [24] In addition to Bo01's vast green roofs, the City of Malmo is home to the world's first and largest botanical roof garden in the neighborhood of Augustenborg outside of Bo01. It was constructed in 2001 atop the Scandinavian Green Roof Institute. It covers 102,258 square feet and is open to the public. The garden is designed as both a demonstration garden and a research garden. The test gardens reflect different greenroof systems as well as different designers. [25]

[24] Grona tak-Bo01, http://www.opengreenmap.org/greenmap/malmos-klimatsmarta-karta/grona-tak-bo01-6948
[25] Velazquez, Linda, Augustenborg Botanical Roof Garden, pg. 1, http://www.greenroofs.com/projects/pview.php?id=60

The World's First Botanical Green Roof Garden at Augustenborg, Malmo, Sweden

Photo City of Malmo

Energy

Energy usage goes to the heart of why Eco Districts are being created. It is fast becoming a reality that our current energy sources, primarily fossil fuels, are not only major contributors to climate change, but are also fast running out. It is estimated that oil production will begin a terminal decline this year. Recent discoveries of oil have been of lesser quantities and lesser quality. The rate of crude production is projected to fall at 5% per year. That is roughly the equivalent of losing the entire production of Latin America or Europe every year. [26] According to the Paris-based International Energy Agency, to keep up with our current consumption, we would have to discover the equivalent of six Saudi Arabias by 2030. [27] Since the likelihood of that happening is slim, it is urgent that we find alternatives to fossil fuels. However, it is important to note that we must not only find alternative sources of energy, but that we need to adjust our behaviors so that we consume less energy as well.

[26] Nelder, Chris, The End of Fossil Fuel, Forbes.Com, July 24, 2009,pg. 1, http://www.forbes.com/2009/07/24/peak-oil-production-business-energy-nelder.html
[27] Ibid.

Solar array on Sege Park. Installed in 2007 on a former hospital, today the building serves as an environmental workshop.

Malmo is an example of a city that is learning to do both; contain its thirst for energy while obtaining it from non fossil fuel sources. Malmo is the city with the largest area of solar panels in Sweden. They have more than 4,000 square meters with solar thermal collectors and 2,500 square meters with photovoltaic facilities that collect solar power. [28] In addition from 2005-2008, the Swedish government subsidized 70% of the installation costs for photovoltaic panels on public buildings. [29] The result of this leadership and support from the Swedish government is that public buildings are the leading examples of energy efficiency throughout Sweden and Europe.

Being a northern city, heat is a crucial part of the infrastructure. Malmo was constructed on the concept of district heating. District heating was first introduced in Malmo in 1959. They have doing this for a long time. Malmo is one of Sweden's largest heating district networks. Many apartments in Malmo have their electricity meters so they can adjust their own energy consumption. All of the energy used in Bo01 is produced locally. They use a combination of wind, solar and ground and seawater heat extraction. [30] Wind turbines provide much of the electricity, the rest comes from solar panels. Solar collectors on buildings provide 15% of the heating, but heat pumps connected to underground aquifers are a more important resource providing heating in winter and cooling in the summer. [31]

[28] Train of Ideas: Visions For Future Cities, Malmo-With solar Power Into A Sustainable Future, http://www.train-of-ideas.net/en/stations/malmoe/

[29] City of Malmo, Department of Internal Services, Peter Adamsson, February 1, 2008, pg. 8, http://www.solarregion.se/files/solarcitymalmoeng080410light.pdf

[30] http://www.malmo.se/English/Western-Harbour/Plans-and-on-going-projects/Bo01-expo-area/Ecology

[31] Do Something.org, The World's Greenest Cities, http://www.dosomething.org/timpsandtools/the-worlds-greenest-cities

The Lillgrund Wind Farm off the coast of Malmo, Sweden produces enough electricity to power 60,000 homes.

Photo courtesy of Hans Blomberg/Vatenfall

Malmo also has a city incinerator that produces up to 25% of their energy needs via waste-to-energy. Also using the waste-to-energy concept, Malmo's sewage system treats the organic waste from food scraps and yard trimmings. It is converted to "sludge" from which energy and nutritive substances are extracted and phosphorus is separated. The nutritive substances are then spread onto arable land and the sludge is used as an energy source. And 16% of district heating is provided by hot water warmed by excess heat released from major industrial activities in the city. [32]

Monitoring and Maintaining

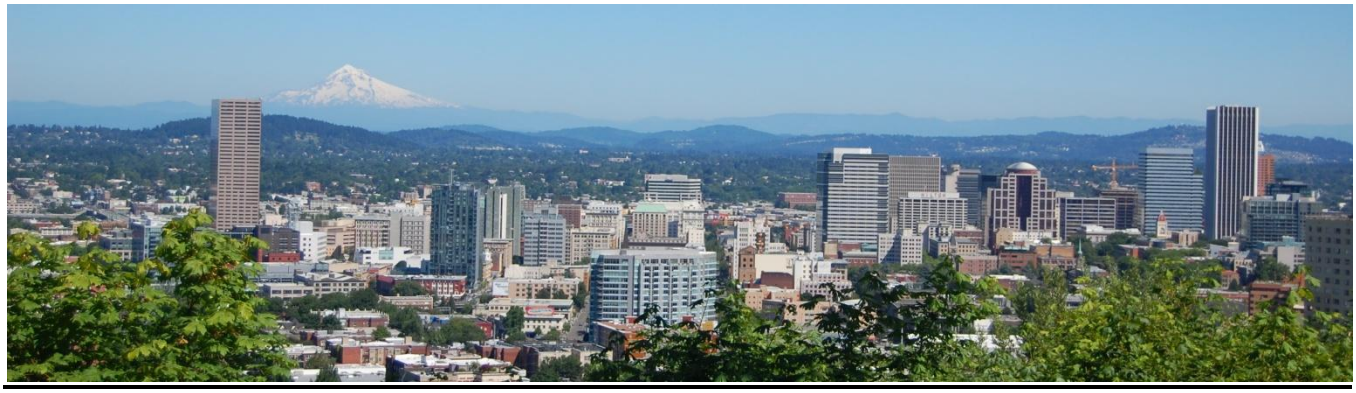
Much of what is built, designed and operated in an Eco District relies on residents' actions. The buildings are built to be energy efficient, but it is the residents that operate them. The urban planners in Malmo realized that even as an exhibition, any potential residents in the buildings would be a critical component to the overall success of the energy efficiency of the building. A monitoring program was drawn up in the early stages at first to set high level targets for ecological sustainability. [33] For example, they wanted the district to reach net zero and they wanted the district to be free of cars. The document was created by the City of Malmo together with construction companies and the local governing structure of Bo01. It includes binding agreements among the three as to how buildings are to be constructed and used. The document also includes recommendations to keep the environment pristine as well as suggestions on how to improve it and suggestions on how to maximize building performance over time. There is on-going research to measure the success of the buildings and further recommendations to residents on how to keep the spirit of Bo01 alive.

[32] Malmo stad, Recycling in Malmo, pg. 1, http://malmo.se/English/Sustainable-City-Development/Recycling.html
[33] Malmo stad, Ecological Sustainability, Knowledge and Facts, pg. 2, http://malmo.se/English/Western-Harbour/Plans-and-on-going-projects/Bo01-expo-area/Ecological-Sustainability

It was also agreed by the City of Malmo that future development would be monitored by the quantitative and qualitative indicators set by the cities' committees. The Environmental committee coordinates this work and sets the indicators for the whole municipality. Committees and steering boards are responsible for the checking and communicating the state of the environment in Malmo.[34]

In addition to their own oversight, the City of Malmo has connections with the Institute for Sustainability and with the United Nations program on the Sustainable Decade. Both of these institutions are also monitoring and studying Malmo as an example of what other urban areas can accomplish. It is in everyone's best interest that they report accurate and honest results so that the programs established in Malmo can be duplicated elsewhere. Since Malmo was built, several other Eco Districts have been built and improved on. Hammerby Sjostad, is Stockholm's largest urban construction project. It will be completed in 2017 and will house 26,000 people. Finally, the Stockholm Royal Seaport is now being launched as the next Eco District. When it is completed in 2025, there will be 10,000 homes and 30,000 offices. It is designated to be completely free of fossil fuels by 2030 and be carbon positive.[35]

Portland, Oregon



Demographics

Portland, Oregon has been called the "greenest city in the United States" by some environmental pundits. Portland is located in the Northwestern US near the confluence of the

[34] City of Malmo, *Environmental Programme for the City of Malmo, 2009-2020,* adopted by the Malmo City Council, December 17, 2009, http://www.malmo.se/download/18..6301369612700a2db9180006235/Environmental-Programme_for-the-City-of-Malmo-2009-2020.pdf

[35] SWEDEN.SE, The official gateway to Sweden, Sustainable living: Living for the future, March 2012, Swedish Institute, http://www.sweden.se/eng/Home/Society/Sustainability/Facts/Sustainable-living/

Willamette and Columbia rivers. It has a population of 583, 776 residents. Approximately 1,260,000 people live in the Portland area. [36] Portland is also home to the Portland Sustainability Institute. PoSI, as it is called, is one of the premier institutes in the US that concentrates on Eco Districts. As a result, Portland has worked hard to have five Eco Districts: South of Market, Lloyd District, Gateway, Foster Green and the newest one, South of Waterfront.

In the South Waterfront built environment, there is a total of 934,630 square feet with 26% being residential, 31% commercial and 4% institutional and the rest is currently a mix of green space and brownfields. Out of this they boast a total of 9 LEED certified buildings and growing. South Waterfront has a population of 891, total area of 153.5 acres. The district is located along the Willamette River and like other Eco Districts, it is also located in an old industrial neighborhood.

View of South Waterfront District, looking south from the Ross Island Bridge

South Waterfront District-Yesterday and Today

Community Involvement

PoSi has been instrumental in creating the Eco Districts in Portland. Early on, in 2009, they engaged with the newly formed neighborhood organization, the South Waterfront Community Relations, or SWCR. The SWCR also acts as the Transportation Management Association for the area. The SWCR's responsibilities have been to structure the Eco District's priorities and goals. They have been working closely with PoSi to implement a plan for these goals since the summer of 2011. SWCR's other mission is to "…develop and promote community building

[36] http://en.wikipedia.org/wiki/Portland,_or

activities…which will mitigate community deterioration and benefit the community as a whole."[37] So, the South Waterfront district is still in the process of determining their boundaries and working to strengthen them at the same time. An important issue is to make sure that the governing body, whatever form it takes, has the capacity and resources to set goals for the residents that live there. It needs to have "everyone on the same page" in order for processes to move smoothly. Also, having a solid relationship with the other Eco Districts in the city can be very helpful. Several Eco Districts working together can be much more effective than one alone. And finally, the governing body of the Eco District must have a shared vision with the City of Portland as well as other agencies. Eco Districts are often extensions of the City as well as other agencies and need to work closely together. Frequently the City and these agencies can be the source of funding for the District's projects.

Financing

In general, financing Eco District projects is more difficult in the United States than in European countries. We don't have as much governmental support as the Europeans. So often, environmental projects need to be funded by state and local sources in addition to federal agencies. This can be a problem for if one lives in a state where environmental issues are not a priority for the state legislature. In such a case, environmentalists become more dependent on shrinking federal programs as a source of funds.

In the last twenty years, Oregon has made environmental issues a priority. Because of a combination of state funding and citizen activism, Eco Districts and organizations like PoSi and Cascadia are the results. Funding for projects in Portland has come through many different sources. Grants have come from the Bullitt Foundation in Seattle, the City of Portland, the State of Oregon, in addition to Federal agencies. PoSi has been instrumental in guiding Eco Districts and the City towards getting funding.

In the South Waterfront District funding for major buildings has been a result of a public/private partnership between developers, the Portland Development Commission and the Oregon Health and Science University. As part of the public/private partnership, developers are required to provide affordable housing units to lower income persons. Currently there are 209 affordable housing units. Overall there are six residential towers of which some are rental apartments and some are condominiums. The mix of residents is important because one of the

[37] South Waterfront, Portland, Oregon, About Us, South Waterfront Community Relations, Block 38, LLC, 2012, http://ww.southwaterfront.com/about/

tenants of Eco Districts is residential diversity. Each Eco District discussed in this paper has affordable housing in its mix.

Funding for infrastructure such as parks, bike ways and utilities can be more difficult. At the Eco Summit held last fall in Portland, funding for projects was on the list of concerns for every Eco District. [38] Partnerships between the City of Portland and certain utility companies has worked in the past to get projects finished whether its installing streetcar lines or district power sources. Recently, South Waterfront's Community Relations (SWCR) new district energy plant has been planned to be developed, planned and operated by a third party district energy provider. Property owners would commit to buy power from the system for a set period of time in order to bring in a third party developer.

PoSi has put together a "tool kit" which provides an overview for financing projects for Eco Districts. They include an array of tax incentive programs such as Tax Increment Financing or TIFs and District Bonds.[39] The Portland Metro Climate Prosperity Project is currently strategizing a way to develop a "green bank" which would explicitly fund projects that are "green" in nature. This would be very important to the green community and Eco Districts in particular because it is difficult sometimes to get loans for projects that don't show a profit in the short run.

Bulk purchasing of materials also is a way individual homeowners can retro fit their homes. An example is the Solarize Portland! program. This program was sponsored by Solar Oregon, Oregon Department of Energy, Energy Trust of Oregon and the City of Portland's Bureau of Planning and Sustainability. The program was extremely successful in getting residents together to bulk purchase solar electric panels.

Finally, Portland and the State of Oregon received $20 million in Federal Grants from the Department of Energy in 2010 for projects designed to increase energy efficiency. Clean Energy Works Oregon also received $120 million from the Federal Retro Fit program for their projects. One thing you notice when you start to examine these cities and their Eco Districts is that they have a lot of infrastructure in terms of organizations in place. Another thing you notice is that each city has strong leadership which is committed to sustainability and the establishment of Eco Districts. Portland's mayor, Sam Adams, is fully committed to each and every project. Leadership in Malmo, and as we'll see, in Vancouver too, comes from the top down. Another important aspect of this support though is that even though political administrations change through the years, as they are bound to, the commitment to the

[38]Portland Sustainability Institute, The Eco Districts Summit, Accelerating Sustainability at a District Scale, October 26-28, 2011, http://www.ecodistrictssummit.com/program_2011_archived.html
[39]Portland Sustainability Institute, www.pdxinstitute.org/ecodistricts

environment has not changed. This is due not only to on-going citizen activism, but a shift in thinking and lifestyle changes that takes place over the years.

Recycling Programs

Oregon has been recycling as a state since 1983 when it was passed in the State legislature. Currently Portland's recycling rate is at 50%. It has gone down from a high of almost 60% in 2007. As a consequence, the City of Portland started a new recycling program in 2008 with a goal to reach 75% by 2015. Even so, the statistics are impressive. Other programs are also underway to reach this goal. Portland Recycles, a city program, offers small grants up to $2,500 for waste reduction and recycling programs started by residents. The City also requires any construction project above $50,000 in value recycle 75% of their waste. [40]

Green Portland Composts!

Composting isn't done everywhere, but if you live in Portland, now you do. Green Portland Composts! started October 2011. And, it doesn't just include residents. Business waste takes up 75% of landfill space and 1/3 of that is food scraps and lawn trimmings. Green Portland Composts! offers businesses free training for employees, free posters and stickers. All compost waste goes to a composting facility where it undergoes a two month decomposition process. After that, residents are invited to take as much composted material as they need.

[40] Bureau of Planning and Sustainability, New Requirements for Portland Businesses, www.portlandonline.com/bps/index.cfm?c=47899

Water Management Policies

Even though South of Waterfront is in an area of the country that is considered "wet and gloomy", it has lots of reasons to be concerned about water management. The whole Portland area receives the majority of its water supply from the Bull Run Watershed. In the years from 1964-2004, there has been a decline of the inflow into the reservoir. The City is working with other western cities on developing its rights to the Columbia South Shore Well Field to provide summer supply and emergency backup capacity. Since 1985 to March 2008, the City has used groundwater from the CSSWF 7 times and has had to augment the Bull Run supply 12 times. All predictions show that the Portland area will become increasingly dependent on the CSSWF as a supply of water. [41]

In addition, an increase in population in recent years in general puts additional stresses on an already taxed water system. South Waterfront was designed with water conservation and management in mind. As of April, 2012, South Waterfront has just been certified as Salmon Safe. This certification is a reflection of the district's commitment to responsible practices that have reduced storm water runoff and non-point source pollution, which help to protect Pacific Northwest salmon watersheds. [42] In addition, there are bio-swales throughout the development.

The Portland City Council has reduced water usage in Portland Public Schools, including the brand new South Waterfront Charter School, through water metering and water efficiency improvements. In addition, South Waterfront is working with the Water Bureau and the City to decrease its overall water use in its parks by 16%.

Education

Part of an Eco District's success is to continually educate their residents. South Waterfront is no exception. The Water Bureau, in particular, has been very active. For instance, the Water

[41] www.portlandonline.com/water/index/cfm?c=46238&a=1795
[42] South Waterfront, Portland, Oregon, Green Living, Block 38, LLC, April 2012, Http://www.southwaterfront.com/category/green_living/

Bureau, in conjunction with Wolftree, Inc., has developed a joint curriculum in a math and science outdoor learning experience for middle and high school students. Since 1996, they have educated approximately 1,000 students, which is impressive. In 2006-2007 three schools participated with bureau staff at Cascade Streamwatch and toured the Bull Run watershed as part of a project based learning experience. The Water Bureau has also participated in a large youth education effort, The Children's Clean Water Festival. This event is attended by over 1,100 students each spring. Again, in 2006, the Water Bureau partnered with the City Corps program at Open Meadow, an alternative school. Conservation and education staff worked with City Corps to develop strategies for engaging youth in water conservation.

Just recently, middle school students at the new South Waterfront Charter School completed a research and policy project that resulted in a first-place finish last month at the state competition for Project Citizen. Their project was entitle, "Poop Problem in Portland". [43]They surveyed residents in the South Waterfront district asking them if they knew about the $150.00 fine for not cleaning up after their pets. Over a three-day period, they counted, and collected 260 piles of dog poop in a three-by-five block area of South Waterfront. Their recommendation: increase the fine amount to $500.00 for residents who fail to clean up after their pets.[44]

And lastly, the Water Bureau partnered with Ladybug Theatre to perform puppet shows to elementary schools on water conservation. Since 1996, they have performed an average of 22 shows a year for a total of over 9,502 students.

Environmental Impact

There are specific programs encouraged by the City of Portland that make an environmental impact. For instance, the City hosts a number of farmers markets during the spring, summer, and fall seasons. The City also encourages residents to eat more whole grains and vegetables rather than red meat. The reasoning is that red meat production is significantly more carbon intensive because, 1) the digestive process produces more methane gas and 2) over 30 calories of inputs are needed to generate 1 calorie of beef. In addition, the United Nations report Livestock's Long Shadow highlights the severe land degradation, climate change, air pollution, water shortage and pollution and loss of biodiversity associated with meat consumption. [45]

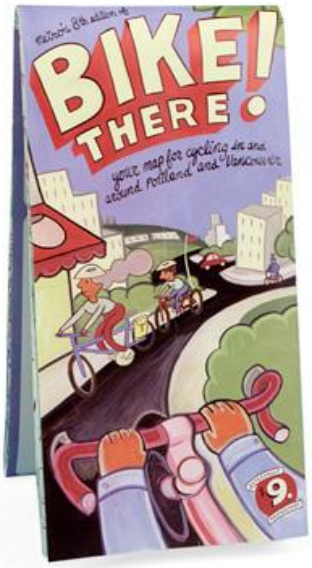
[43] Mayer, James, Students from school in Portland's South Waterfront say raise poop scoop fines, *The Oregonian,* June 18, 2011, http://www.oregonlive.com/portland/index.ssf/2011/06/south_waterfront_middle-school.html
[44] ibid.
[45] http://web.multco.us/sustainability/green-meetings-and-event-policy

This is relevant because it speaks to the depth of commitment that Portland, and all its Eco Districts, has to reach net zero.

The South Waterfront Eco District has developed several programs that have a direct environmental impact. In 2009, they started a community garden with 30 raised beds. Last year they were up to over 100 raised beds.

> The deal is that you "buy" a 4 X 10 raised bed for $125.00 per season, plus a $25.00 initiation fee for new members. Discounts are available for members who volunteer long hours to work in the garden. Plus they do offer financial assistance. The goal is to not turn anyone away. All members have access to shared tools, seeds and help with maintenance. Businesses in the District are also welcome to join and buy a raised bed.[46]

The District is also working with the Water Bureau on increasing the urban canopy over the Willamette River. Recently the temperature of the river has exceeded what is normal and healthy for the system. The goal is to reduce the temperature so that its 7 day average is 68 degrees or less. Planting more trees to shade the river will help replace what has been lost to development and other sources. In conjunction with the development of the Eco District, there are plans to restore habitats for wildlife by providing shelter and food, increasing plants in bioswales, and installing green roofs where possible. There are also plans to lessen the Greenway riverbank grade and provide improved plant cover along the shoreline that will benefit local salmon.[47]



Transportation in Portland

Portland is a city that strongly values bicycles. In fact, Portland's bicycle ridership is 8 times the national average and they have a total of 318 miles of bikeways.[48] Portland is the only large US city to receive a platinum status from the League of American Bicyclists. They have two strong bicycle organizations one called the Bicycle Transportation Alliance and the other Bike Portland. They are both very active in City politics and advocate for a number of things that European countries take for

[46] http://www.southwaterfront.com/green_living/south-waterfront-community-garden/
[47] http://www.soutwaterfront.com/green_living/wildlife/
[48] http://www.portlandonline.com/transportation/index.cfm?c=34

granted such as real bike lanes and not the typical three foot wide strip along the side of the road. But they also offer education programs, free legal clinics for cyclists, and bicycle shows for enthusiasts. One last word on bicycles: the City of Portland will install free bicycle racks to any business that requests it.

Some quick facts about Portland and its successes in transportation: Portland has seen no increase in emissions from transportation since 1990, in fact they have had a 26% drop in emissions since then.[49] They lead the nation in the number of hybrid cars per household. And Portland has adopted a fuel standard that all diesel gasoline sold in the city include at least 5% biodiesel and all gasoline contain 10% ethanol. [50]

As far as availability in transportation, Portland offers four different modes: streetcars, light rail, busses, and commuter trains. [51] And, they are expanding service. The South Waterfront district is now connected with the central city by streetcar. The City continues its aggressive promotion of public transit. The routes cover much of the downtown retail district. Not surprisingly, streetcar ridership continues to grow.

Energy

Energy is one of the major issues that cities are facing today. In 2009, Clean Energy Works: Portland was launched. It's a partnership with the City of Portland, Multnomah County, the Energy Trust of Oregon, NW Natural, Portland General Electric and Pacific Power. The program provides low-interest financing to homeowners who improve the energy efficiency of their homes. Frequently no money down is required so homeowners can get started right away on their renovations. [52] They also offer rebates on products.

Portland has initiated other energy saving commitments. By the end of 2012 the City has made a promise to purchase or generate 100% of all electricity required for City operations from renewable sources, with at least 15% from on-site or district renewable energy sources such as solar or biogas. Also, by the end of 2012, the City will convert all street lighting, water pumps, water treatment and other energy intensive operations to more efficient technologies. And, the City is purchasing either electric plug-in hybrid vehicles for all city and county fleets.[53] Quite ambitious. It will be interesting to see if they actually meet these goals.

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[49] Giegerich, Andy, Portland carbon emissions down 26 percent since 1990, sustainable business oregon , April 11, 2012, http://www.sustainablebusinessoregon.com/articles/2012/04/portland-carbon-emissions-down-26.html
[50] Office of the City Auditor, Biofuels Requirements For Petroleum-Based Fuels Sold In Portland And City-Owned Vehicles, Binding City Policy, Code Chapter 16.60 Motor Vehicle Fuels, July, 2006, http://www.portlandonline.com/auditor/index.cfm?a=128766&c=26882
[51] http://trimet.org
[52] http://www.cleanenergyworksoregon.org/how-it-works/
[53] http://www.portlandonline.bps/index.cfm?c=42399

As of 2007, haulers in Portland are required to use at least 20% biodiesel in trucks used to collect waste in Portland. This is something I find interesting about Portland and all the cities mentioned in this paper. Each city takes it upon themselves to enforce laws that require people to change their lifestyles. While they can't force people to recycle, maybe that's coming, they take steps to make sure that if you want to do business in their city, you have to follow by their rules. I don't think that this is something we would've seen 25 years ago. I think it's a good thing overall because it raises the standard of living for all, but I also think some would argue it comes very close to infringing on people's right to live the way they want to.

Monitoring and Maintaining

Every year, the Bureau of Planning and Sustainability and the Multnomah county Sustainability Program reports to the Portland City Council and the Multnomah County Board of Commissioners on local carbon emission trends, fossil fuel use and progress in implementing the actions of the climate Action Plan. In addition, the City of Portland and Multnomah County have entered into a partnership with individual bureaus, departments and programs to monitor progress of their individual programs and goals. Every three years, the Portland City Council and the Multnomah County Board of Commissioners revises the Climate Action Plan and identifies new problems and sets new goals.

Where does South Waterfront fit into all of this? They are following a ten step Eco District Assessment Method written by PoSI which are designed to not only keep Eco Districts focused on designated projects, but to ensure that they meet performance objectives. [54] The steps are as follows:

1. Gathering information to understand the district conditions and develop a performance baseline
2. Setting specific performance targets
3. Identifying strategy opportunities based on the unique characteristics of the district
4. Screening a menu of potential Eco District projects to identify those appropriate for the district
5. Assessing potential projects to determine ease of implementation
6. Comparing assessed projects across performance areas
7. Prioritizing projects for implementation
8. Conducting feasibility studies on priority projects

[54] Portland Sustainability Institute, South Waterfront EcoDistrict, Pilot Report, June 2011, http://www.pdxinstitute.org/index/php/whatwedo/ecodistricts

9. Implementing projects
10. Monitoring projects against established performance metrics

In 2020 the City of Portland and the MCBC will re-examine the Climate Action Plan and develop a new one with 2040 goals and objectives. The ultimate goal is an 80% reduction in carbon emissions by 2050. While this may seem unreachable, it is not unlike most plans created. The challenge will be to reach the goal while confronting a rising population.

Southeast False Creek, Vancouver, BC

Demographics

Vancouver, BC has long been known as one of the best planned cities in North America. [55] An overhead view of the city shows the typical gridded streets with lots of high rise towers like any city. But it also shows large areas of forest, open spaces, and lots of green. Vancouver is home to one of the largest urban rain forest in the world: Stanley Park. Stanley Park covers 1,000 acres in the

[55] Punter, John, University of Cardiff, Cathays Park, Cardiff CF10 3WA, Wales, UK, "Urban Design as Public Policy: Evaluating the Design Dimension of Vancouver's Planning System", *International Planning Studies, Vol. 7, No. 4, 265-282,* (2002), http://www.tandfonline.com/doi/abs/10.1080/1356347022000027710

heart of the city and covers almost half of its downtown peninsula.[56] Vancouver has a population of 603,000 according to the 2011 Canadian census. There are 13,590 people per square mile, making it the densest city in Canada.[57]

Southeast False Creek is in an area of Vancouver that was an old industrial and commercial area. Shipbuilding was the prime industry. There was also an old salt building and a rail yard there as well. Most of the industry had long been abandoned and taken over by the City. Then, in 1999 Vancouver made the decision to bid on the 2010 Olympics. The decision to build the Olympic Village at False Creek seemed natural. It was a prime piece of real estate with beautiful water views and large enough to contain all the buildings they needed for the village. Plans for SEFC were drawn up in 2005 and amended in 2006. Various re-zoning measures were adopted throughout 2006. From the beginning, the City decided that after the Olympics were over, they would convert the village to mixed income housing. [58]

Today Southeast False Creek is divided into three separate historic areas: the Shipyard, the Rail Yard and the Works Yard. Each neighborhood will have its own identity reflecting what industry was there originally. The Ship Yard has been completed and as of 2011 the Rail Yard and the Works Yard are in the early stages of development.

Sub-area 2A, a small part of South East False Creek, was the first phase of City-owned land to be developed for the 2010 Winter Games with 15-20 permanent buildings. The former Olympic Village is now 1,100 units with 250 units for low income. Currently there is a 45,000 square foot community center, 6,000 square foot commercial/restaurant space and underground parking. By 2020 SEFC is expected to be home to 12,000 people with 1250 units of low income housing and over 6 million square feet of development.[59]

Community Involvement

Southeast False Creek has been, from the beginning, a City driven development. And from the beginning, there has been a commitment to sustainability. City planners have taken the lead on designing buildings, parks and ecological features. The City's Master Plan for SEFC has a goal of high community participation. At this point it is difficult to determine what level of community involvement there is because only one of the neighborhoods is fully complete. Even so, there are three neighborhood committees

[56] Kandell, Johnathan, "Vaunted Vancouver", *Smithsonian* magazine, April 2004, http://www.smithsonianmag.com/travel/vancouver.html
[57] http://en.wikipedia.org/wiki/Vancouver
[58] http://vancouver.ca/commsvcs/southeast/neighbourhood/index.htm
[59] http://vancouver.ca/olympicvillage/about.htm

that contribute to their specific areas. Their aim is to provide community input during and after development. The committees are made up of residents, property owners, businesses from the neighborhood, and community advisors in the issues of sustainable development and community issues.

Financing

Much of SEFC was built for the Olympic Village, so much of the infrastructure for the Shipyard neighborhood was financed by the City. Since then, though, the City has had to come up with new means of obtaining funds since Olympic funding has expired. Elements of the financing plan approved in 2005 and amended in 2006 include the following:

- A contribution from the Property Endowment Fund (PEF) that included 25 acres of industrial land for parks and open public space, 335,000 square feet of development density at no cost for non-market and market rental housing, a site suitable for an elementary school at no cost, fee land and outfitting costs for the community centre, a contribution towards the retention of the heritage Steel building and Sawtooth building and the rehabilitation and commercial re-use of the Salt building.
- A private lands contribution to the cost of the public infrastructure amenity package through the payment of Development Cost Levies (DCLs) and Community Amenity Contributions (CACs)
- Re-investment of contributions from the PEF, DCLs and CACs to fund the public infrastructure and amenities planned for the neighborhood
- Active pursuit by the City of funding from senior governments, community partners, and the private sector to achieve the financial, accessibility, environmental and sustainability objectives of the project.

What this shows is that the City is heavily invested in the development of SEFC. They provide multiple means of financing development in addition to active pursuit of support from other community entities. Overall, the public lands were re-developed by the City of Vancouver based on a "self-financing" model through which the City will provide serviced development sites for market and non-market residential and commercial uses, with all costs covered plus an expected return of $50 million. Redevelopment of private lands will be completed on a timetable to be set by individual private owners.

	Net Present Value (2006)
Development Revenues	$217.9 million

Site Serving and Amenity Costs	(153.4) million
Net Income	$64. 5 million
Compared to Target Return of	$50.0 million

Private properties are now being developed. Private land owners will incur all costs of development. In addition, the private sites will be required to contribute to the public infrastructure and the amenity package through a combination of direct charges, city-wide and area specific Development Cost Levies (DCLs), and Community Amenity Contributions (CACs). These financial contributions will offset the costs that the City will incur in the developing the public SEFC site.[60]

Recycling

When Southeast False Creek was re-zoned, recycling requirements were also established. These include separating recyclable trash and separating organics. There is an on-site organic composting facility for landscaping needs. And in this case, the City is following SEFC in recycling food scraps. The City has just started an expanded pilot program to recycle food scraps in the neighborhoods of Riley Park and Sunset in Vancouver. [61] About 2,000 households are participating and there is no increased cost to homeowners. In addition, the City will sell you a worm composting kit for $25.00 for use in apartments. It comes with a bin, lid, tray, worms, bedding and instructions. If you'd rather get hands on instructions, you can go to the Compost Demonstration Garden for a free one hour workshop. [62]

The City has just started another program aimed at cutting down construction waste. They are encouraging deconstruction as an alternative to demolition for single & duplex family homes.

[60] http://vancouver.ca/commsvcs/planning/financinggrowth/pbs
[61] http://vancouver.ca/projects/foodWaste/rileysunset-about.htm
[62] http://vancouver.ca/engsvcs/soldiwaste/index.htm

In addition to supporting the diversion of demolition waste, they have also instituted new rate structures for demolition waste. Rates went into effect March 1, 2012.[63]

Finally, Vancouver has a recycling program for small appliances. They have over 100 drop-off locations across the City where you can drop off old vacuum cleaners, blenders, toasters, hairdryers, even old smoke alarms. And if you have a large appliance, they will come and pick it up from your house. Refrigerators, they will pick it up and pay you $30 dollars if it is working.[64] You can't beat that.

Water Management

Vancouver is an example of a city, like Portland, where one would think they don't have a problem supplying enough water for their residents. After all, they are on the water, and they get run-off from the mountains that surround them. That may be, but as population increases, as in Portland's case, water needs increase too. To help conserve water resources, Vancouver has taken some advanced measures. The official Southeast False Creek development plan states that water efficiency is to be a key design consideration. "All water systems, in compliance with the green building strategy, are to minimize the use of potable water from the municipal water system. All water systems are also to minimize irrigation, and, where necessary, each individual site is to make irrigation form potable water sources unnecessary. Where practical, water features are to use storm water or other non-potable alternatives."[65] They go on to mention the use of green roof systems and drought tolerant landscaping.

Southeast False Creek has set district a district goal of 190 liters per capita per day based on reductions in water use resulting from Green Building strategies. They include dual flush toilets, low flow fixtures and high efficiency irrigation systems. They also have a goal of 50%

[63] Ibid.
[64] Ibid.
[65] City of Vancouver, Official Development Plan By-laws, pg. 14, SEFC April 2007

recapture of storm water. In order to achieve that, the plan calls for limited use of impervious systems for one. They have existing underground parking, and plan on reducing the width of existing roadways as well as recapture from green roofs, parks and open spaces. In the master art plan, they plan on incorporating water features that use hydraulic systems in the design. One such design calls for the plumbing of the building to be on the exterior.

Finally, False Creek has a system of natural bogs, streams and ponds. Storm water is shunted through the system where it is naturally "cleaned" before emptying into False Creek. Residents can learn about the process from educational signage and city officials who monitor the system carefully.

Transportation in Southeast False Creek

Careful attention has been paid to how residents will move through Southeast False Creek. Like Bo01 in Malmo, Sweden and South Waterfront in Portland, Oregon, transportation alternatives are one aspect of Eco Districts that is carefully planned. This is because transportation of residents accounts for large amounts of energy expended through fuel costs as well as time costs and it is one area where people can change their habits willingly.

According to the City of Vancouver's Official Development by-laws, the movement system through SEFC is prioritized in descending order: pedestrians, bicycles, transit, goods movement and automobiles. Movement system planning is to support transportation alternatives to vehicles by requiring dedicated space for bicycle lanes, greenways, and tramways, and limited automobile ownership through parking demand management and the proactive appication of neighbourhood transportation demand management. [66] And in keeping with that, SEFC has three greenways/bikeways, narrowed streets, north and south pedestrian links to street cars, reduced parking requirements for developers and regional transit within walking distance of SEFC. Currently there is a rapid transit Canada Line at the edge of the development. There is also a Skytrain at the Main Street Station and a bus route along the outer edge of SEFC and a ferry dock to top it all off. [67]

Sustainability was a key factor in designing mobility throughout SEFC. Permeable surfaces have been utilized wherever possible. Streets are permable pavers and brick, there are 26 acres of park land, a mid-sized grocery store, community retail services, a farmer's market, one elementary school, three child-care facilities, eight family day care centers, and an inter-faith spiritual center. The point is that SEFC is designed so that you rarely have to leave the district

[66] Http://www.vancouver.ca/commsvc/bylaws/odp/SEFC/pdf
[67] Ibid.

unless you want to. SEFC has also initiated a Transportation Demand Management policy. Like many cities facing parking problems, SEFC has determined that charging varying rates for parking based on demand for spaces has helped to not only reduce the number of cars coming into SEFC, but has generated revenue for local businesses and residents to improve their sidewalks and store facades.

Car sharing and car co-ops are popular in Vancouver as a whole. Vancouver has three car-sharing companies, car2go, Modo The Car Co-Op, and ZipCar. Since 2008, the City has a contract with Modo to locate additional lower emission Modo vehicles at City Hall to serve the work-related travel needs of employees, replacing a number of City –owned fleet vehicles. During work hours the car share vehicles are used by City employees. On evenings and weekends, the vehicles are available for car sharing by Modo members.[68]

The City has recently started requiring all new single-family homes to have electric-car plug-ins and is considering supplying outlets for new and existing multi-family homes. The costs are the main concern though the city has proved in the past its dedication to sustainability and goal of becoming a net-zero city.

It goes without saying that Vancouver is a bike friendly city. Since 1990 Vancouver has been building an extensive network of bikeways and improved bike lanes. Bikeways/Greenways have seen a huge increase as the city becomes more and more bike and pedestrian oriented. Greenways, as they're called in Vancouver, are dedicated paths just for pedestrians and cyclists. More recently, Vancouver has started to invest in separated bike lanes. Below is an illistration that shows what they look like.

[68] http://vancouver.ca/sustainability/building_trans.htm

Photo City of Vancouver

Ridership has increased every time a new separated bike lane like this is created. And, even with the increase in bike congestion, injury rates on separated bike lines either tends to remaind similar or lower than that of parallel street bike routes. [69] Something like the image above would be very welcome by cyclists in the US. But Vancouver has gone even farther than separate bikeways. Since 1995, the City has required secure bike racks and publicly accessible bike racks be provided for all new developments. In 2008, the City passed new bylaws that will support bicycle and e-bike ownership. The new bylaws address much needed security for bikes and include a provision for charging electric bikes in storage rooms in condos and other retail/commerical off-street bike storage locations. A 2008 electric bicycle survey indicated that there are now more than 10,000 electric bikes in the Greater Vancouver area. And, since 2006, the City has supported bike valet services that provide temporary secure bicycle parking at special events.[70]

[69] Mozes, Alan, "Separate Bikes-Only Lanes in Cities Cut Injury Rate: Study", *Bloomberg Businessweek* , February 18, 2011, http://www.businessweek.com/lifestyle/content/healthday/650047.html
[70] Http://vancouver.ca/sustainability/building_trans.htm

Education

Like most Eco Districts, SEFC realized from early on in the project that resident education about sustainability was integral to the Eco District remaining sustainable. Urban designers also recognized the need to educate residents about the history of the place in which they are living. Sometimes this is called "placemaking". Whatever the name, designers wanted residents to be able to identify with their community in a special way. This is an important characteristic of Eco Districts; that people resonate with the place where they live. They have pride in it's history and as a result tend to care about maintaining the environment which makes it special. Wherever you look in SEFC you'll see signs of what each distinct neighborhood used to be. For example, there are three heritage medallions in the sidewalks that mark the beginning and ending of each neighborhood: the Works Yard, the Ship Yard and the Rail Yard. They symbolize the area's rich ecological heritage of reich estaruial hunting grounds and trade route for the Coast Salish people and shipbuilding, metal fabrication and salt refinery. [71] Each area is characterized by art, trails, and buildings preserved from demolition. One such building, the Salt building, is now a pub and restaurant.

Art is woven throughout each district as well. Careful consideration was taken to show the history of the region. Sparrows were used to show native species.

Salmon are engraved in the steps of the amphitheatre to reflect historic spawning routes.

Photos courtesy of The Challenge Series

The Ship Ribs art project in the Ship Yard neighborhood reach back to the shipbuilding era of the neighborhood. The Salt building restaurant is in the background.

While heritage plays a major role in educating residents and tourists about SEFC, planners also acknowledged that even though resident engagement in maintaining an Eco District is so important, it is also a factor that is often overlooked in creating them. In order to live sustainably residents need to understand what it means. In trying to meet a goal of Net Zero carbon output, designers had to consider how occupants would use the building. As a result,

[71] http://www.thechallengeseries.ca/chapter-03/place-making/

part of the occupant agreement includes stipulations that the residents understand the building's objectives and that they agree to their role in achieving the building's goals. As David Ramslie, Sustainable Development Program Manager for the City of Vancouver noted, "You know you've achieved a successful green building not when you get the plaque, but when the occupants are engaged."[72]

While not integral to Eco Districts, more information for residents comes in the form of an E-newsletter, www.sefalsecreekliving.com. The newsletter informs about upcoming special events in False Creek as well as vacant apartments and condos for sale. Retailers also contribute to the newsletter informing residents about wine tastings and sales on merchandise. False Creek will also have its own elementary school. It is planned, but not yet built.

Environmental Impact

The goal of SEFC and Vancouver overall is to become a NetZero city by 2020. One of the mandates for SEFC is that all new buildings in SEFC are built to a minimum standard of LEED Silver with a goal of LEED Gold. The existing Community Center is LEED Platinum. Many may argue that requiring LEED buildings of any level will not achieve the goal of NetZero. Vancouver city planners would agree. Accordingly they have more strategies to implement to reach that goal.

The approach to achieving Net Zero, as Vancouver sees it, includes three elements: energy efficient design, occupant engagement and energy generation. [73] To start with the design team from gBL Architects determined that they needed to find the typical energy needs of the conventional high rise which they planned on building in SEFC. They used data from BC housing and BC Hydro for typical senior-housing buildings because the City had designated senior housing as a priority. Once they established base line data, then they began to plan their building especially taking into account the seniors that would live there. Many features of the new building have passive design strategies. They maximized cross-ventilation and daylighting from two sides. Corridors and stairwells are in the center of the building to allow as much light into the building as possible.

[72] The Challenge Series, "Millennium Water: The Southeast False Creek Olympic Village-Vancouver, Canada, Buzzword: Net Zero", http://www.thechallengeseries.ca/chapter-07/net-zero/
[73] Ibid.

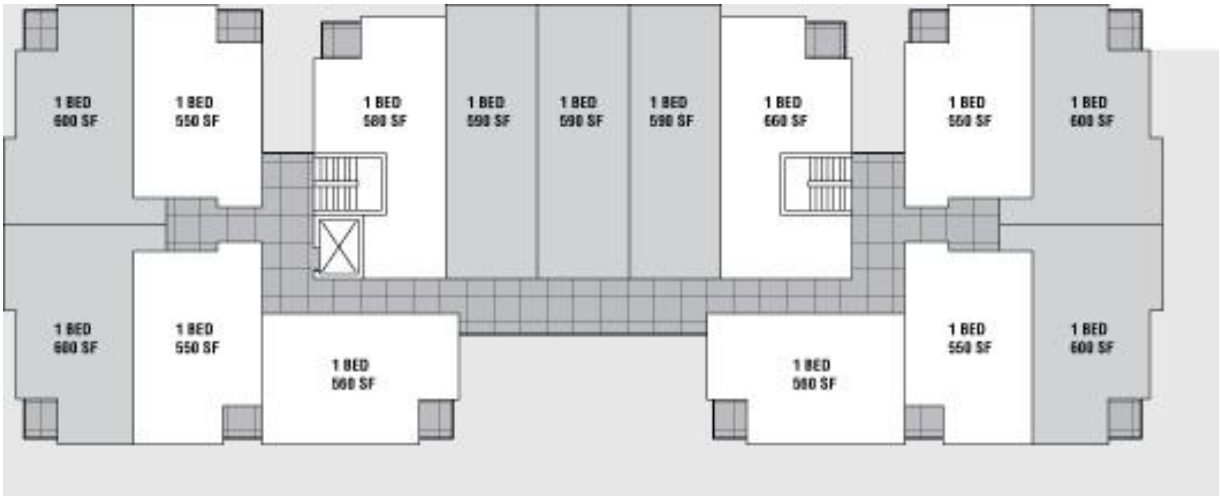


Photo courtesy of The Challenge Series

The resulting building is eight stories with 67 units, including 6 street-level townhouses. The building was designated to be LEED Gold, but designers knew from the beginning that the real goal was NetZero. The building has some innovative features; for instance, it has vertical ventilation shafts which are kept to a negative pressure so that air is expelled up and out of the building. The building also has exterior insulation, which while expensive due to complex installation methods, has been key to achieving energy efficiency. A comment from one of the designers summed up the whole experience, "In many senses, the more we rely on technology, the worse off we are. Take this building. Years from now, the technology applied on this building will be obsolete—but the smart design will remain."[74]

Southeast False Creek has implemented many landscape and habitat measures in an attempt to restore native wildlife to this urban area. They have enhanced the shoreline and built it up to prevent erosion, all previously contaminated soils have been removed, all plants in the district are either native, edible, or drought tolerant, or all three. There is a firm policy that no pesticides are to be used within the district.

To restore natural habitats, planners in conjunction with biologists created an island with an inter-tidal fish habitat. The photo at left shows the Olympic Village from the island.

Southeast False Creek has a three stream waste separation system with on-site composting for local gardens. Water flows from one stream to another, each time flowing through native plants and grasses. By the time the water reaches False Creek, the water has been "scrubbed" clean

[74] Http://www.thechallengeseries.ca/chapter-07/net-zero/

and is suitable to become part of the creek.

Energy

With a goal of NetZero by 2020, Vancouver's energy policy is aggressive. The goal of SEFC in terms of energy usage overall is the following: "…establish an energy efficient green house gas neutral neighbourhood based on renewable resources."[75] The plan goes on to list three inter-related design approaches including:

- Conservation strategies such as efficient building envelope, green roofs, building orientation and configuration, unit energy metering, user controls, manual ventilation, and day-lighting.
- Core system strategies such as heat pumps, green hydro-electric, hydronic slab heating systmes, thermal storage, and building mass; and
- Heat source and stystem strategies such as horizontal ground-source loop, district heating, sanitary sewer heat recovery, waste hot water recovery, solar hot water, and passive solar gain.[76]

Many of these systems, they admit, are basic "to dos" in constructing green buildings. But when they're used in combination, you end up with a building that tends to be more innovative than your standard green building. Plus, this plan is for an entire district. Every building. When you take it altogether, they just could reach NetZero.

Another aspect of SEFC's plan involves establishing green roofs. The goal is for SEFC to have 50% of buildings covered with green roofs, including the senior building. The building is also home to a solar array. The senior housing building is the flagship residential building in SEFC. It couldn't have been built, though, without the strong support of the City and Canada Mortage and Housing Corporation.

The final big project in SEFC that deals with energy is generating energy onsite. According to the engineers for SEFC, "The best move is to first look for opportunites to recycle energy. You need to think outside of the box: look for synergies, turn waste into a resource".[77] One of the innovative ideas they came up with is to use heat that is already produced and recycle it for a

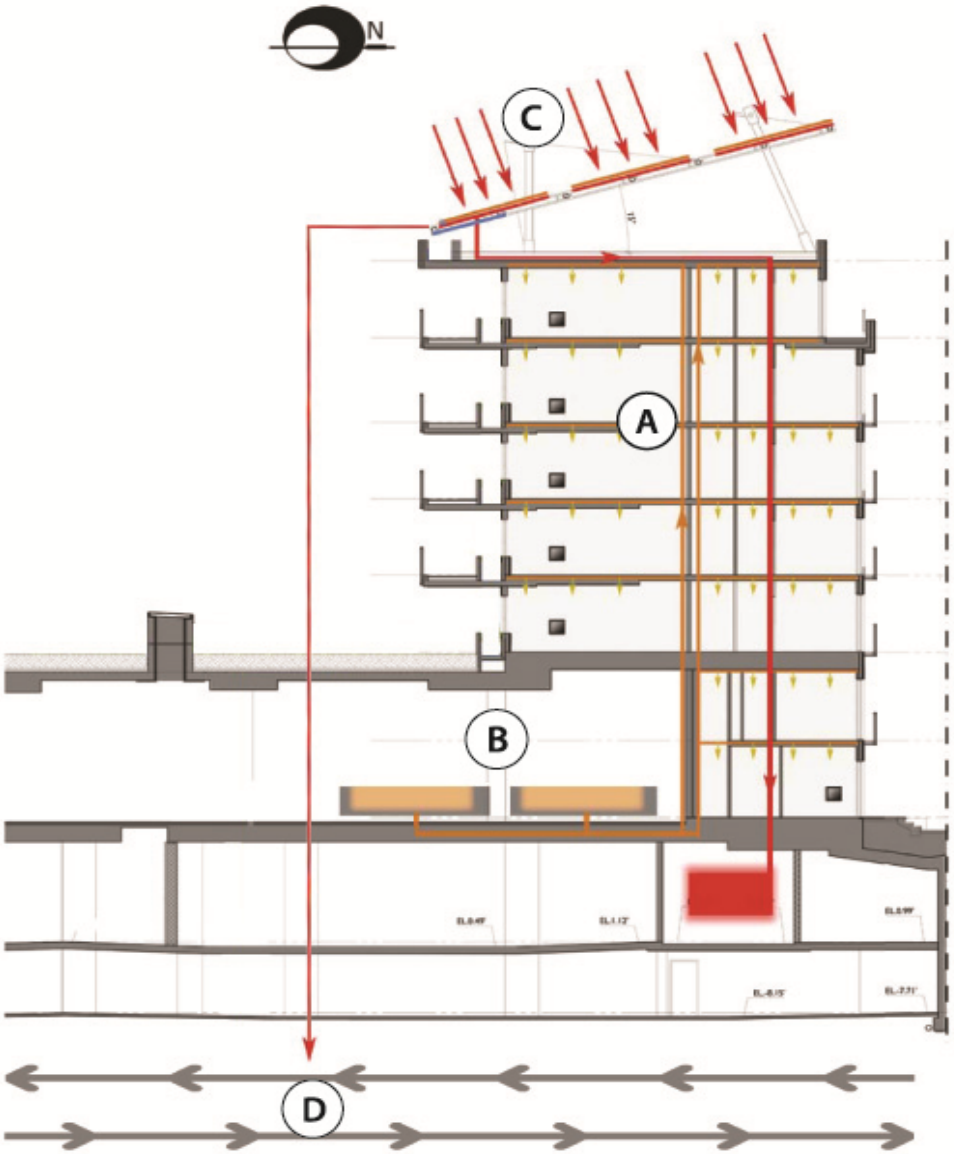
[75] Canada, City of Vancouver, "Southeast False Creek Official Development Plan, 2007", http://www.vancouver/.ca/commsvcs/bylaws/odp/SEFC.pdf
[76] Ibid.
[77] Http://www.thechallengeseries.ca/chapter -07/net-zero/

second use. The ground floor of this NetZero building is occupied by a grocery store. The engineers designed a heat recovery system that takes the heat discarded from the grocery store and re-purposes it it to preheat the residential hot potable water. [78] This design is important because this configuration can be easily replicated for other Eco Districts as well as for any developer looking for highly efficient energy returns.

[78] Ibid.

The diagram below shows how each component works to make the senior building a NetZero energy building:

Integrated Energy Strategy



A. DESIGN & OCCUPANT ENGAGEMENT Energy consumption is reduced through efficient building design and occupant engagement. B. HEAT RECOVERY Heat recovered from the grocery store's refrigeration system provides space heating for the building C. SOLAR HOT WATER ARRAY Arrays on two buildings provide the remainder of energy to meet the net zero balance. The solar installations provide hot water to the building and excess heat is sold to the Neighborhood Energy Utility (NEU) (D) and used in adjacent buildings. Energy Savings Before the addition of renewable energy, the Net Zero building's annual energy savings compared to a conventional building is 68%. With the energy production from the solar hot water system as well as the heat recovery from the grocery store refrigeration system, the building achieves Net Zero energy. Including the renewable energy contribution, the predicted annual GHG savings for the building compared to a baseline model is equal to roughly 280 tons of carbon dioxide equivalent. Credit: Modified from gBL, 2006

Monitoring and Maintaining

How does SEFC monitor and maintain all the green features of their neighborhood to make sure they meet energy goals? As in other districts we've looked at, community involvement is always key. SEFC has three neighborhood associations, one for each community. When residents meet they discuss problems and issues with meeting energy goals: Is the building saving energy? Are people driving less because everything they need is here in the district? Are people taking care to recycle? . They also talk about the economic health of the businesses. Are they thriving? Are people taking advantage of everything that SEFC has to offer? As mentioned earlier in this case, SEFC has an e-newsletter that they publish.

In addition, the NetZero building has a monitoring system in place that will record its performance over time to measure the success of each technology installed. Even though it is currently the only NetZero building in the district, there are further measuring systems are planned for other buildings in the district.

Denver's Living City Block

Demographics

Denver is called the City of Surprises and indeed there are several things about Denver that are unexpected. Denver's population is 554,636, its 45 square miles in area, and is in fact one mile high in elevation. What I found surprising though is that Denver actually gets more sun than Miami, Florida, an average of 300 days per year compared to 249 in Miami.[79] They also brew more beer than any other city and have the largest city park system in the US with 206 parks. Denver is also the nation's highest educated city with the highest percentage of high school and college graduates.[80]

LoDo, or lower downtown Denver, is home to the focus of this case, the Living City Block. LoDo used to be a district of old warehouses and neglected retail buildings. It was a place you didn't go unless you absolutely had to. That started to change in the 1990's when the City rebuilt infrastructure and started to invest heavily in the area. Some savvy residents started to move in, buy property cheap, and renovate. The Living City Block became a result of this increased

[79] Current Results: research news & science facts, Days of Sunshine Per Year in Florida, http://www.currentresults.com/Weather/Florida/annual-days-of-sunshine.php
[80] http://www.hometodenver.com/Stats_Denver.htm

interest in the downtown area the summer of 2010. Started by Llewellyn Wells, a former Hollywood producer and Vice President at the Rocky Mountain Institute, an independent, entrepreneurial nonprofit that aims to foster efficient and sustainable use of resources, Living City Block is best described as a mini version of an eco district. [81]

Denver's version consists of:

- sixteen buildings, primarily brick and timber construction built between 1890 and 1920, the majority of which are described as historic.
- 40 different property owners
- 600,000 aggregated square feet
- Mixed-use at 57% office, 32% residential, 7% retail and 4% restaurant
- Currently, 80% of building owners are on board with Living City Block objectives. [82]

Living City Block's goal is to have a 50% reduction in energy savings block-wide by the end of 2012. By 2014 they want a block-wide energy savings of 75-80%, with Full Measurement and Verification Programs in place. And by 2016 they want two NetZero historic building retrofits which will have low water use and be a zero waste neighborhood. They also plan on having Places, Spaces and Urban Agriculture Programs running.[83] In addition, LCB will also have it's own district power source.

Community Involvement

Eighty percent of property owners are currently on board with LCB's goals. Some property owners have had reservations because they lack the capital or because some doubt that such ambitious goals can be reached. This is a common problem when working with infill in creating an Eco District. Hopefully, in time, all property owners will be on board. Even so, LCB is putting together a consortium of building tenants that act as one. It has been one of their challenges. Quoting architect Paul Todd, one of LoDo's first building owners and members of LCB, "… getting everybody together and trying to think about the block holistically without scaring people about giving up property or development rights—that has been a big challenge." [84] However, they have gained the valuable support of some key industries: AT&T, Wells Fargo, United Technologies, Alliance For a Sustainable Colorado and McKinstry. This is an important and key step if LCB wants to have its own district power source. All of these industries provide some form of infrastructure support that will help LCB achieve their goals much faster.

[81] http://www.livingcityblock.org
[82] http://www. Archfoundation.org/2011/10/the-whole-is-greater-than-the-sum-of-its-parts/
[83] http://www.livingcityblock.org/living-city/denver-lodo-2/our-work-in-denver/
[84] http://www.grist.org/cities/2011-11-29-the-next-small-thing-how-neightborhood-level-sustainability-effor/

Financing

Living City Block got an injection of much needed cash when in 2010 they were awarded $600,000 from the U.S. Department of Energy under the American Recovery and Reinvestment Act of 2009. The award went for energy analysis and modeling work. "Workers are now outfitting buildings with new meters so that the block can monitor its energy savings over time." [85] However, the real work of retrofitting the buildings once the data comes in, is another challenge. Like all Eco Districts that don't have a lot of funding support, LCB will need to convince financial institutions to lend money based on future savings. That is a tall order and emphasizes the need for "green banks", banks that work primarily with organizations and homeowners that are fiancing green projects. As mentioned earlier in the Portland case, the State of Oregon is currently working on establishing just such banks. If they can make it happen, it will be a huge step forward for "greenies" across the nation.

The State of Colorado has been making strides in trying to help organizations and homeowners finance green projects. In 2011, the Governor's Energy Office (GEO) had a budget of $13 million for finance programs that would help leverage energy efficiency and renewable energy. Their target markets included:[86]

- Industrial
- Small Commercial
- Multifamily
- 501c3/Non Profit
- Residential
- 3rd Party Solar
- Colorado Carbon Fund

This will dramatically help organizations such as the LCB. Building owners who have had difficulty financing retrofit projects can now find the money. The GEO fund also created a partnership with Colorado Housing Finance Authority (CHFA) for two loan programs: [87]

- "Green" Colorado Credit Reserve: Leveraging private lenders to promote energy efficiencey with a loan loss reserve of 15-20%

[85] Hanscom, Greg,: " The next small thing: How sustainable neighborhoods could reshape cities" , Grist, http://www. Grist.org/cities/2011-11-29-the-next-small-thing-how-neighborhood-level-sustainability-effor/
[86] http://www.rechargecolorado.com
[87] Ibid.

- Direct Lending Program: A revolving loan fund in which the GEO can be the direct lender for larger non-residential loans

For both programs the GEO is the direct lender.

The GEO also offers Qualified Energy Conservation Bonds or QECBs. They are a finance tool allocated by the Colorado State Treasury to promote the finance of an array of capital improvements that promote clean energy. Thirty percent of each state allocation may be used for private projects. Recently they have also introduced Traditional Build America Bonds or BABs into the process. When used in conjunction with the QECBs, borrowers have been able to receive a 70% reimbursement on qualified expenditures. As of January 2012, Colorado had issued $27 million in QECB's with another $24 million available.[88]

Finally, one more program that the state offers is the "Green" Colorado Credit Reserve Fund. This program is basically for mom and pop types of loans. Loans must be <$100,000, though the average is closer to $30,000. Fifteen percent is held in reserve for a 7 to 1 leverage. Currently twenty banks participate in the program. Banks can aggregate loans in need be to reduce their risk of default. There are other state programs for loans >$100,000 that are gap financing type projects.[89]

One of LCB's goals towards financing is to build a business case that would lead to new commerical financing products to allow for up-front funding of deep energy retrofits in the small to medium sized building category. This would help other Eco Districts that are working with infill retro fits to duplicate LCB's financing methods. In addition, since most of America's neighborhoods fall into that category and it could change the finance game for those buildings that don't seem to fit into other descriptions.

Recycling

Recycling in Denver is not as extensive as it is in other cities. Recycling service is every other week in Denver compared to weekly pickup in other US cities such as New Orleans, Louisiana and West Palm Beach, Florida. In addition, they do not offer recycling pick up services for businesses or multi family homes that are larger than seven units. However, there are recycling businesses that will take business waste. A few of them will even pick up

[88] Bellis, Elizabeth, Energy Programs Consortium, *QECBs,* (February 2012), http://naseo.org/resources/financing/qecb/EPC_Memo.pdf
[89] Recharge Colorado, "Small Business Resources" 2012, http://rechargecolorado.org/index.php/commercial_and_public/small_business_resource/

materials such as phone books, paper, ink cartidges and cell phones if you purchased the products from them. For a district such as LCB, which has a significant amount of businesses, this is not encouraging. Recycling programs need to be user friendly if people are to use them frequently and efficiently.

Water Management

In the LCB, the orginal idea of creating green roofs to divert stormwater run-off was popular. However, in an area that receives little rain, green roofs are not practical. In addition, Denver gets about 13 inches of rain a year from storms. Denver receives most of its water from the Rocky Mountain snow melt. [90] As a consequence, stormwater run-off diversion is not as cruical a problem as it is in other cities. Though snowmelt from the Rockies is a reliable source, Denver water mangagement officials know that as Denver's population increases, more water will be needed than is currently in supply.

Transportation in Denver and the LCB

Denver has an active biking community. Currently, Denver has more than 850 miles of paved off road bicycle trails. Also available is Denver's bike sharing program called B-Share. It is seasonal and starts every year on March 15th. Bikes can be found at various places around the city. As far as the LCB district, plans call for narrowing the streets to two lanes of car traffic to accommodate extra wide green bike lanes.

There are five light rail lines that access LoDo and the LCB all the way out from the suburbs. There are more than 140 bus routes into the city. And, along 16th street, which runs next to the LCB, transit is free of charge all the way to the mall. [91] These options are a major reason why LoDo has had such a renaissance in the past ten years. This is important for areas such as LCB because having such an availability of alternative transportation choices reduces the need for cars. As we have seen in our previous examples of Eco Districts. If residents in the LCB need to take a car somewhere, Denver has two car share programs: E-Go Car Share and Occasional Car.[92],[93] Both have programs for hourly or longer term use. Both are available seven days a week, twenty-four hours a day.

[90] Denver Water, "Water Supply", http://www.denverwater.org/SupplyPlanning/WaterSupply/
[91] http://www.rtd-denver.com/LightRail_map.shtml
[92] http://carshare.org
[93] http://www.occasionalcar.com

Education

Living City Block is in uneviable position of proving to many people that their project will meet their goals. Unfortunately Denver isn't at the same level of green sophistication that Portland or Seattle is. On the other hand, as Llewellyn Wells stated " We're pioneers—we're out there taking the hits. We've learned that there has to be an involved community on the ground for this to work. What we care about in the end are better communities, not just better buildings."[94]

With LCB the purpose of creating a mini Eco District is to make it to a scalable level so that it can be easily duplicated on other Denver blocks and in other cities. The hope is that it will happen faster and easier on a smaller scale and therefore, more cities will be encouraged to attempt the same thing. LCB also hopes to create an "open source position" where anyone who is interested can access information. Their position is that it will take too long to implement Eco Districts one at a time and that damage to the planet could be irreversible.

Living City Block also sees itself as an entity that can educate financial insitutions on "green" loans. It is often difficult for homeowners to get loans where borrowers can pay back loans based on savings from new energy savings products.

> LCB is working to "…develop a business and finance model to ensure that the fiancial markets wll provide competitive financing for energy efficiency and renewable energy. They are doing this by:
>
> - Packaging equity and debt financing in unique ways and serving as a 3rd party aggregator for block-wide consortiums
> - Attracting energy "investors" through aggregating larger amounts of building square footage, thus creating returns that are acceptable to all parties, and
> - Providing finance and energy account management services for shared utility rebates and tax credits[95]

There are some programs like that in Oregon, but it is not an idea that has spread.

[94] http://grist.org/cities/2011-11-29-the-next-small-thing-how-neighborhood-level-sustainability-effor/
[95] Living City Block, What We Do, "Cracking The Energy Retrofit Finance Code", http://www.livingcityblock.org/what-we-do/

Environmental Impact

Living City Block's goal for the district is to have two Net Zero buildings by 2016. Both buildings will be historic retrofits, so there is an extra level of challenge. LCB considered using Geoexchange for their district heating and cooling source. They partnered with Colorado Geo Energy Heat Pump Association in proving a business case for operating buildings and districts with geothermal energy sources. [96] Unfortunately, according to Llewellyn Wells, what they discovered is that the cost of installing geothermal doesn't make it a viable option when compared to the current costs of energy. Colorado has plentiful resources of coal which dramatically reduces energy costs. [97]

Overall, Living City Block understands that creating a mini Eco District is not just about the efficiency of the buildings or whether streets accommodate just pedestrians and bikes. Ultimately any project in real estate is about the people that will live there and use the space. One of the major aims of LCB is "placemaking". They want to create spaces that are well used, comfortable and promote social well being. Part of this is the creation of "third spaces" where people can gather socially. Gardens, outdoor cafes, amphitheatres, parks are all examples of places that create identities of a particular place and make it an enjoyable place to be.

Energy

The map below shows geothermal resources in the United States. Among the various climates we have in this country, Colorado is in one of the best places for geothermal energy installations. When LCB representatives first met with other professionals in the architect and urban design world, all the goals of the LCB were laid out. After the new team members went round and round on how to achieve the goals, two NetZero

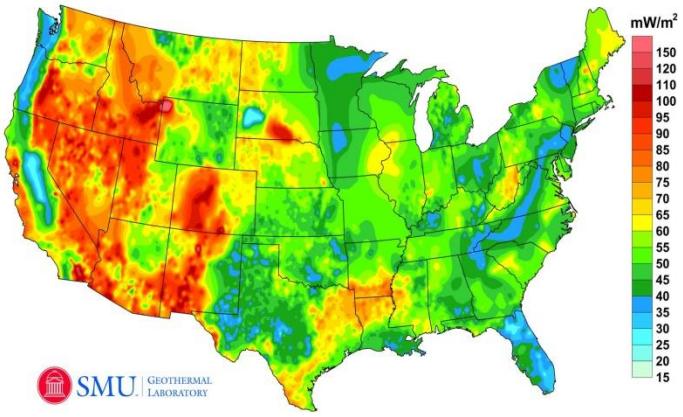


Photo SMU Geothermal Laboratory 2011

buildings, retrofit all buildings to efficient energy standards…they came upon a novel idea. Everyone agreed that a district heating was a priority, but the general thought was that you had to do retrofitting first in order to determine your energy needs. The problems with that are 1) retrofitting takes a tremondous amount of time and money, stalling other projects and 2) the

[96] http://gogoenow.org/Resources/Documents/goGeoNewsLtr_2.pc
[97] Llewellyn Wells, interview by the author, New Orleans, LA, March 2012

one item that would immediately make a big energy difference, a district heating system, would be put last. It was important to LCB board members to show an energy difference sooner rather than later because they needed to show people early on that a LCB is feasible. They hoped that by doing that, they would win over the remaining 20% of building owners and jumpstart other LCB projects. It would also increase the value on buildings connected and people will want to invest more in them. Also, it was agreed that its easier to get funding for one project rather than sixteen individual ones. In the end, the consensus was to install the district heating system first, show that it works efficently and then retrofit buildings as the fiancing came on line.[98] Even though they ended up not using geo-thermal or installing district heating as mentioned before, the process of making these decisions is important to other Eco Districts needing to show immediate and obvious success in energy retro-fits. As other Eco Districts are formed, and many of them will take the same form of working with historic buildings with multiple owners as in LCB Denver, they will look for previous examples of success or failure to understand what will work best for them.

Monitoring and Maintaining

Living City Block has been monitoring their retrofit projects for energy savings since 2010. As mentioned earlier, the goal is that by 2014 full measurement and verification of energy savings will be in place.

Cautionary Tale in LCB-Denver

Living City Block in Denver has had some successes, but also critical failures. Hard lessons have been learned that are valuable to other Eco Districts. For example: climate makes a big difference when considering green options. Unlike the other Eco Districts examined in this paper, Denver's climate is arid, receiving very little precipation. Water management strategies that work well in other climates don't necessairly apply here.

Another lesson learned is that an abundance of natural resources in your district makes a difference when you're trying to convince homeowners to make the switch to more environmentally friendly energy sources. Denver has an abundance of coal and that makes energy costs in Denver lower than in other parts of the world. Therefore, why would anyone invest money in switching to something new? The lesson learned here is that until or unless

[98] http://www.archfoundation.org/2011/10/the-whole-is-greater-than-the-sum-of-its-parts/

homeowners/building owners are affected in the pocketbook by energy costs, they aren't going to change.

Another lesson is that it is much easier working with smaller groups of owners. When working with a large number of building owners, it is important to get as many owners on board as possible. Working as a consortium is much more powerful than working as individual owners as we have seen in our other Eco District models. For example, in Portland, each Eco District has its own board which represents the interests of the community by organizing events such as farmer's markets, park clean-ups and community gardents. In Southeast False Creek the community board there helps new residents understand the environmental goals of the building and how it works. Organizing and working as a group accomplishes more and is important in Eco Districts.

Existing Conditions and Plans for the Walter Reed Hospital Site

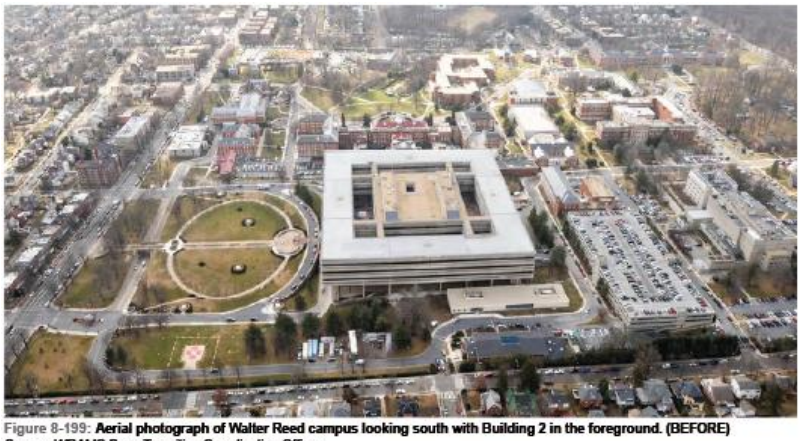
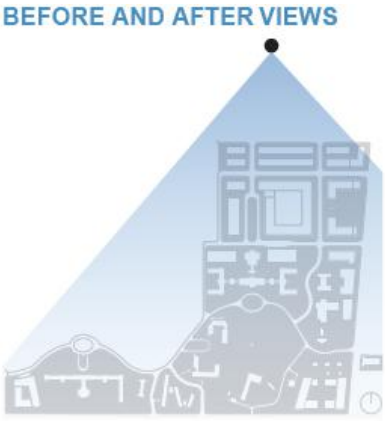


Figure 8-199: **Aerial photograph of Walter Reed campus looking south with Building 2 in the foreground. (BEFORE)** *Source: WRAMC Base Transition Coordination Office*

Figure 8-200: **Aerial rendering of the same view as Figure 8-199 with northeast corner in the foreground [and Building 2 demolished]. (AFTER)** *Source: Perkins+Will*



99

Above are images of Walter Reed as it exists today and how it is projected to appear. In the second rendering there is demolition of existing buildings and construction of new buildings. The Director of the site for the District of Columbia, Martine Combol, stated that the Army, in turning over this site to the District of Columbia, wants to create value.[100] There are many ways

[99] District of Columbia Deputy Mayor's Office, Walter Reed Local Redevelopment Authority, Reuse Plan Final Draft, pg. 143 March 15, 2012, http://dmped.dc.gov/DC/DMPED/Programs+and+Initiatives/Neighborhood+Revitalization/Ward+Four+-+Walter+Reed

[100] Martine Combal, interview by the author, New Orleans, March 2012

to create "value" but listed below are the goals for the site that the Walter Reed Local Redevelopment Authority has written:[101]

Integrate the Site with the Community
• Open the site to local neighborhoods
• Support redevelopment of Georgia Avenue corridor
• Provide community amenities

Provide a Mix of Uses
• Quality retail
• Residential with diverse housing options
• Cultural and community uses

Activate the Site
• Maximize market viability
• Minimize site vacancy
• Competitively attract high quality development partners
• Address environmental issues

Create Jobs and Revenue for DC
• New employment potential
• Increase city revenue from property and sales taxes
• Generate revenue to help support neighborhood

To accomplish this, the LRA has determined that several buildings will be demolished and approximately 26 buildings will be new construction. The plan also calls for new sewer and water infrastructure, new transit in the form of a new streetcar line, new and improved roads, bike lanes and sidewalks and a new district heating/cooling plant.

[101] District of Columbia Deputy Mayor's Office, Walter Reed Local Redevelopment Authority, Reuse Plan Final Draft, pg. 143 March 15, 2012, http://dmped.dc.gov/DC/DMPED/Programs+and+Initiatives/Neighborhood+Revitalization/Ward+Four+-+Walter+Reed

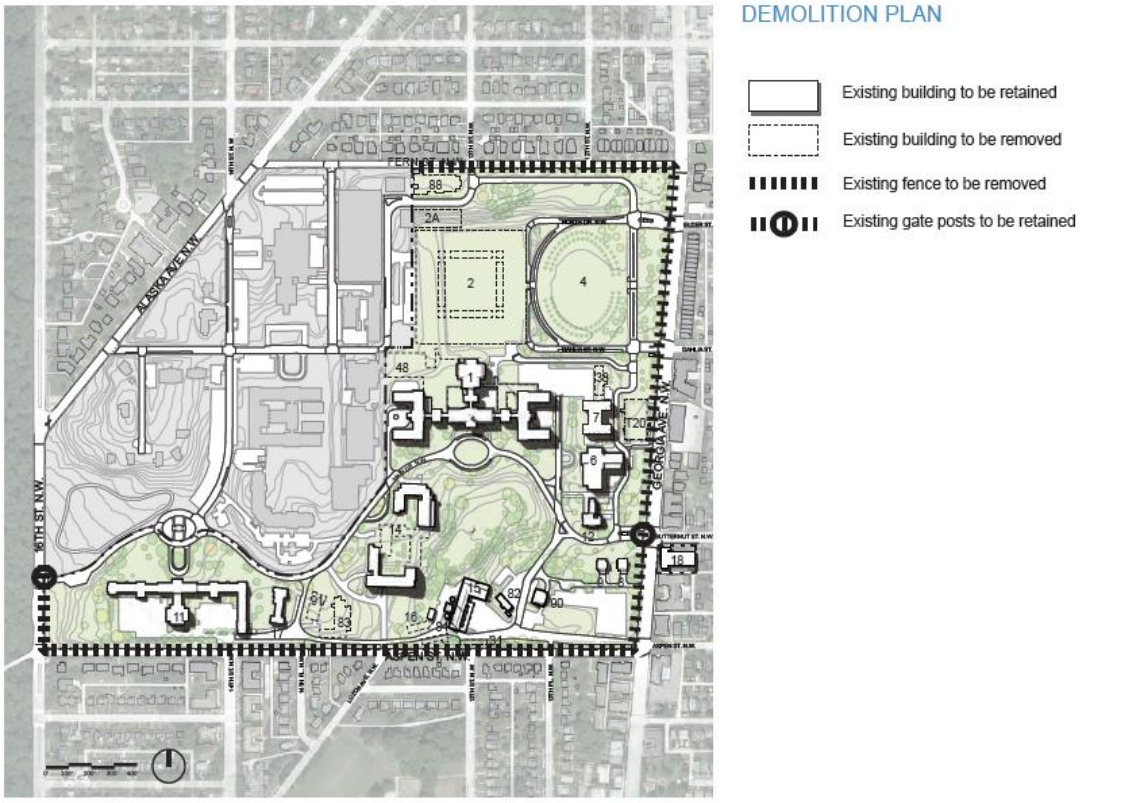


Exhibit 8-201: **Demolition Plan** *Source: Perkins+Will.*

102

This rendering shows the plan for demolition of existing buildings and fences as well as buildings and gates that are to remain. As you can see the site is currently blocked off from the rest of the existing community by a high fence. One of the challenges of this site is to open it up and integrate back into the surrounding area.

[102] District of Columbia Deputy Mayor's Office, Walter Reed Local Redevelopment Authority, Reuse Plan Final Draft, pg. 141 March 15, 2012, http://dmped.dc.gov/DC/DMPED/Programs+and+Initiatives/Neighborhood+Revitalization/Ward+Four+-+Walter+Reed

This next illustration shows the density of development on the site. Most of the site will be used for residential purposes. Therefore, many of the changes to this site will need to cater to residential needs.

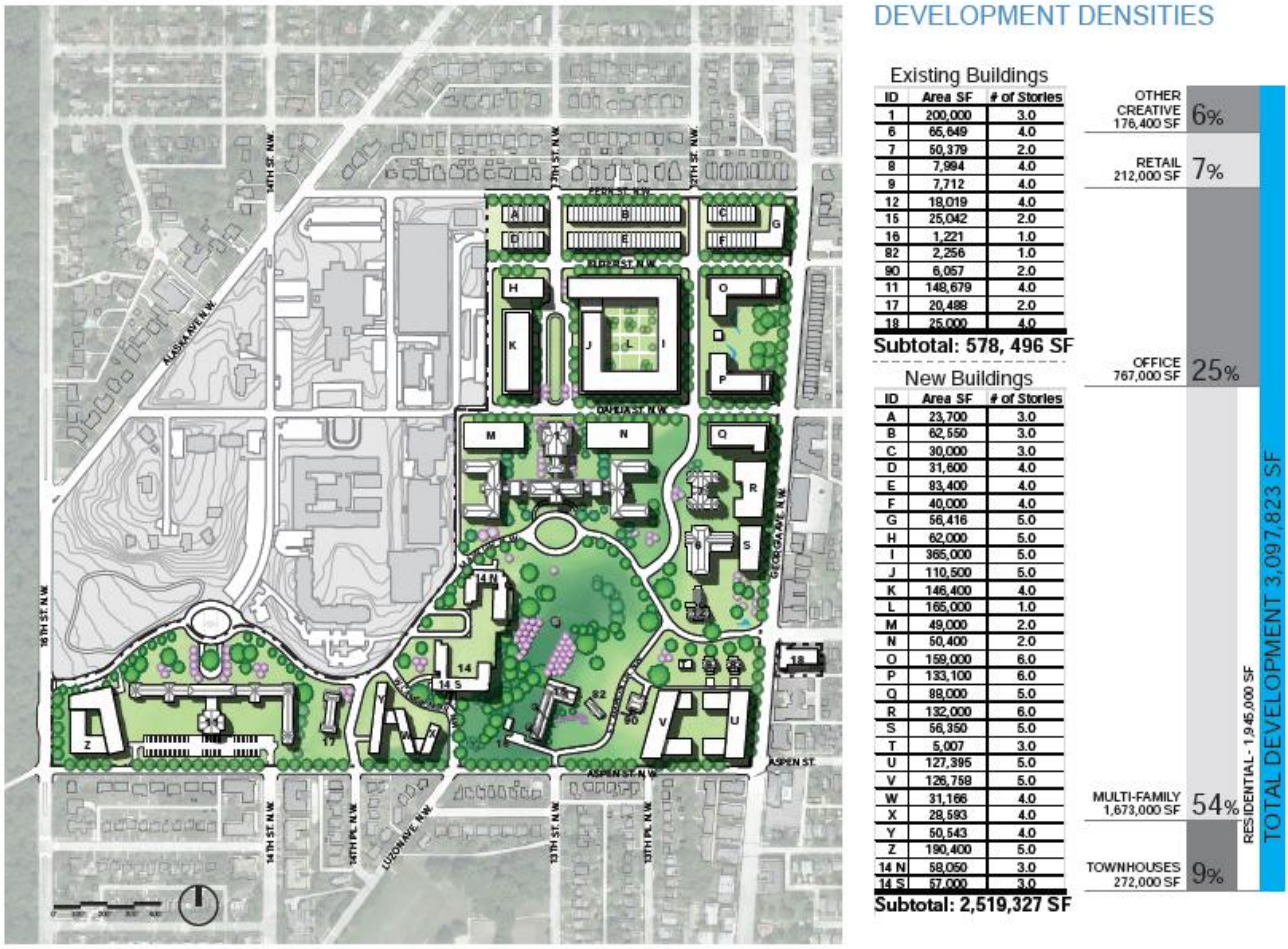


Exhibit 8-205: **Development Densities** *Source: Perkins+Will*

103

[103] [103] District of Columbia Deputy Mayor's Office, Walter Reed Local Redevelopment Authority, Reuse Plan Final Draft, pg. 146 March 15, 2012, http://dmped.dc.gov/DC/DMPED/Programs+and+Initiatives/Neighborhood+Revitalization/Ward+Four+-+Walter+Reed

This is the final plan for the Walter Reed Hospital site showing each building's proposed use.

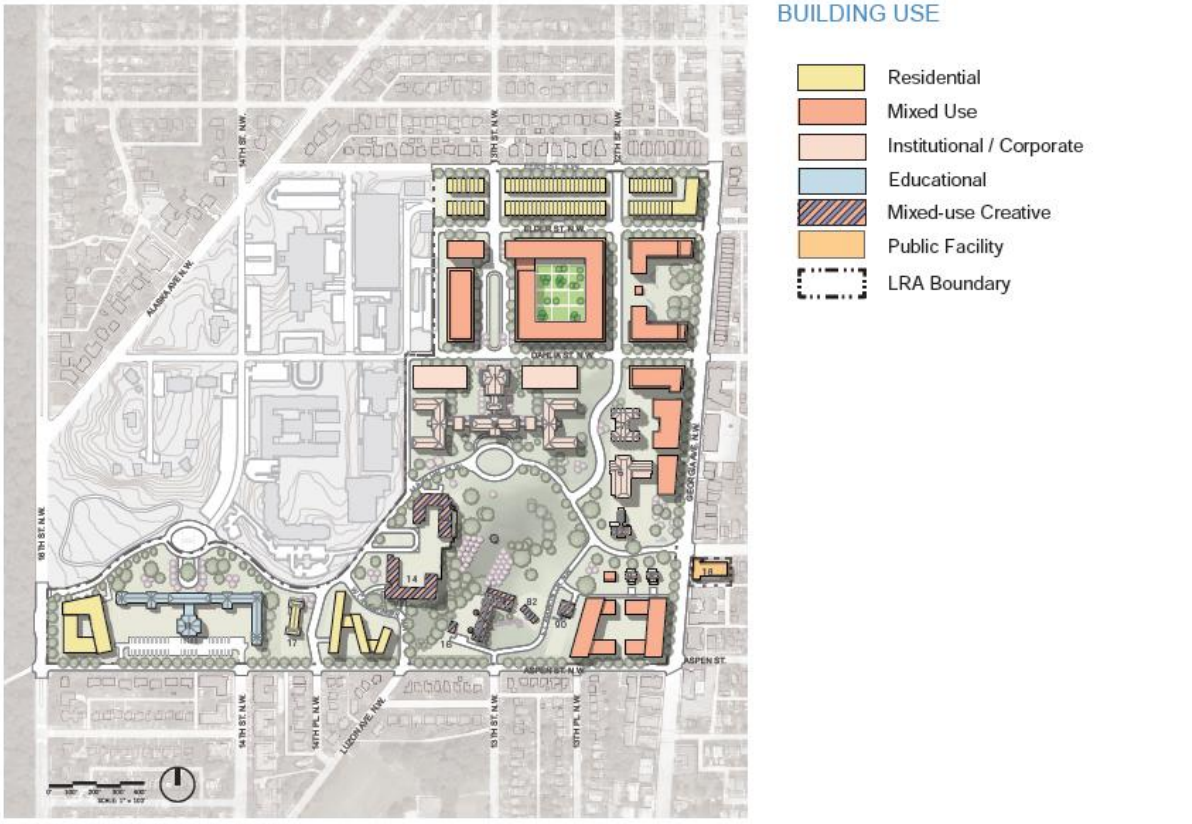


Exhibit 8-202: **Building Use** *Source: Perkins+Will*

104

As you can see there is a wide variety of building usage. Most of the buildings will be mixed use with retail on the lower floors and residential on the upper floors. But the question remains as to how to make this a place where people will want to live, work, go to school, as well as enjoy themselves while keeping in mind environmental goals.

[104] District of Columbia Deputy Mayor's Office, Walter Reed Local Redevelopment Authority, Reuse Plan Final http://dmped.dc.gov/DC/DMPED/Programs+and+Initiatives/Neighborhood+Revitalization/Ward+Four+-+Walter+Reed

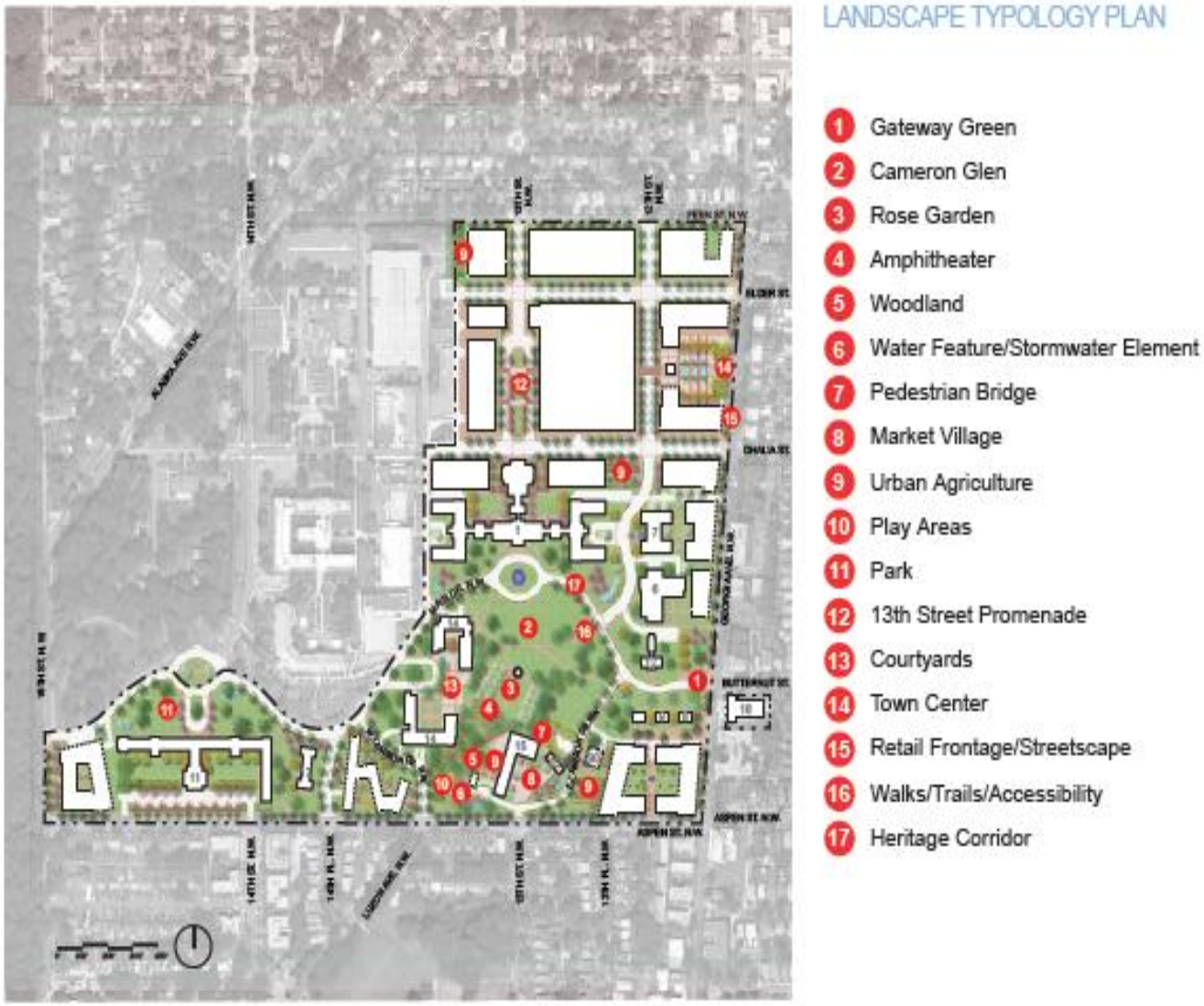


Exhibit 8-240: **Landscape Typology Plan.** Source: Lee & Associates, Inc.

This map shows the proposed landscaping plans for the site. Notice that most of the current open spaces remain. An amphitheatre, town center, market center, three different urban agriculture areas and a heritage corridor are all added features. Cameron Creek is buried under numbers 4,5 and 6. Point six is the lowest point at the site, the top of the site is the highest point.

Recommendations for the Walter Reed Hospital Site

While considering recommendations for the Walter Reed Site, much thought was given to what works, and doesn't, in other Eco Districts. Furthermore, consideration was given to the existing plan and how to supplement it rather than replace it.

1. Re-use demolition material from buildings in the aggregate base for all new roads and sidewalks within the campus. Building 2, the largest building on the Walter Reed campus is scheduled for demolition. It is over two million square feet in area and constructed of concrete. The reuse of demolition material could be a big cost savings in road construction plus save room in a landfill.

2. Currently the plan calls for total reconstruction of the sewer and water system on all 67 acres of the site. The plan is to use PVC piping throughout. The recommendation is to use ABS piping instead. PVC is highly toxic in its manufacture. Its entire life cycle from production through use and disposal has a negative impact on human health and the environment. When PVC is burned, it gives off toxic hydrogen chloride gas which turns into hydrochloric acid on contact with moisture in our lungs.[105] PVC piping can encourage leaching of heavy metals-including lead-into a home's drinking water. This occurs more frequently in homes using a public water source that incorporates chloramine to kill dangerous bacteria in its central water supply. [106] A better alternative to PVC is ABS piping. ABS is easier to install, requiring just one step instead of two. ABS is also more flexible. But the big difference is that ABS does not have the toxic properties that PVC does.

3. The transit plan calls for a proposed streetcar line to operate up Georgia Avenue. It is currently planned to start operation in 2020. The recommendation is to move up the scheduled date to 2015. There are several reasons for this. First, the proposed conversion and construction of housing on the site requires a dependable source of public transportation. The nearest metro station is ¾ of a mile away. Considering the population the site hopes to house, seniors and homeless persons, who's health can be precarious, that is too far away. While there are bus lines near the site, the need for an

[105] The Alliance For A Clean Environment, "PVC: The Poison Plastic", http://www.acereport.org/pvc2.html

[106] EHow Home, "What Are the Dangers of PVC Pipe for Plumbing?", http://www.ehow.com/info_12171269_dangers-pvc-pipe-plumbing.html

alternative dependable source of transit is needed. Furthermore, the investment of a new streetcar line on Georgia Avenue will signal the rebirth of the Walter Reed site and allow new residents a form of transportation that won't require them to have a car or resort to bus only transit. It will also accelerate the number of people able to move into the site earlier.

4. Restoring Cameron Creek to its original stream bed is recommended for several reasons. First, since the creek bed is the lowest point on the site, water from the site naturally flows toward it. Covering it up for decades, whatever the reason, alters the natural flow of stormwater on the site. Uncovering it will allow an opportunity to not only let a natural creek flow again, but it can also give engineers an opportunity to develop bioswales and other stormwater management tactics.

5. Install solar panels on all bus and streetcar shelter stops as well as on enclosed bicycle storage structures. Energy acquired from the panels can be used to light the shelter at night or could be used to alert riders when the next bus or streetcar will arrive.

6. Construction of all new buildings on campus should aim for LEED Gold or higher. In addition, at least one new building on campus should be built to the "Living Building" guidelines. Details of what the "Living Building" guidelines are can be found at http://cascadiagbc.org/ . "Living Building" criteria are beyond LEED standards. However, if the District is serious about becoming a "green" city, progressive criteria such as found in the Living Building Challenge, should be considered.

7. In the construction of the senior residence building, there should be a mid-sized grocery store on the first level. Currently, the closest grocery store is about a mile away, too far for most seniors and disabled persons to travel on a frequent basis if they are using public transportation. A grocery store on the main floor would help not only the residents in the building, but it would also attract current residents living in the surrounding areas.

8. As exemplified in the senior building in the Southeast False Creek development in Vancouver, an integrated heat exchange system should be utilized in the senior resident building on Walter Reed. As seen from the diagram earlier in this paper, heat is captured from the grocery store's refridgeration system and used for space heating and roof-top solar arrays are used to heat water. Excess energy is sold back to the city's utility company. The building achieves a net zero energy rating.

9. Bioremediation, and more specifically, phytoremediation should be considered in the removal of toxins from areas in Walter Reed that are determined to be contaminated. Phytormediation can be used on sites that are polluted with heavy metals as well as organic chemicals. Plants used in the process have evolved the capacity to take up and accumulate selected metals in their shoots at levels that are toxic to regular plants. They have a method of breaking down contaminants to where they are no longer harmful. Phytoremediation can be used on site and can also be used to cleanup water systems as well. It is much cheaper than removing top soil and disposing it in landfills. [107]

10. Incorporate more historical elements into the design of the campus. For example, in Southeast False Creek they formed an art council whose sole purpose was to use art to tell the story of False Creek. They incorporated medallions into the three different sections of False Creek to illustrate what each section was traditionally. They used artistic sculptures like the ship ribs to showcase the shipbuilding past of the area. They imprinted figures of trout into the concrete seats in the amphitheatre. And, they created the giant sparrow sculptures to illustrate that False Creek was and is a natural habitat for sparrows and other birds. Walter Reed should incorporate more art installations to tell the story of the hospital and the thousands of men and women who came there for help. While art is mentioned in the re-use plan, it could be incorporated more thoroughly and subtly so that it creates an atmosphere of caring and healing.

11. Create a Walter Reed neighborhood association. Each of the Eco Districts examined in this paper had community participation. Strong community support can help garner funds for Eco District projects and events. Involving residents in making decisions for the district can also help create a sense of unity and belonging making it a desireable place to live.

[107] Dzantor, Kudjo E., Assistant Professor, Department of Natural Resources, Maryland Cooperative Extension, Fact Sheet 757, "Bioremediation of Contaminated Soils, What It Is and How To Do It", http//extension.umd.edu/publications/pdfs/fs757.pdf

Conclusion

More and more Americans are moving to cities every day. Many American cities, especially in the "rust belt" of the Midwest, are in need of rejuvantion, renovation, and recreation. This situation creates an opportunity like we haven't seen before to reinvent American cities on a district or neighborhood scale to be self sustaining, highly energy efficient districts, or Eco Districts. While this paper focused particularly on the formation of the Walter Reed Army Hospital Site as an Eco District, this paper also demonstrated that the concept can be duplicated in a variety of cities with a variety of climates, governments, and people.

This paper has examined the best practices of four different Eco Districts around the world: Bo01 in Malmo, Sweden, South Waterfront in Portland, Oregon, Southeast False Creek in Vancouver, British Columbia, Canada and The Living City Block in Denver, Colorado. Ten different subgroups of each district were determined to be critical components of what make up an Eco District. Through analyzing the different subgroups and seeing how each contriubutes to the success of each district is important for other potential Eco Districts to see. Learning from others' mistakes is cheap, making them yourself is not.

The transformation of Walter Reed from an active military site to a residential Eco District is a momentus undertaking. The number of buildings on the site, currently and proposed, make this project formidable and exciting at the same time. There are also issues of historical importance with Walter Reed. With this project, however, the District of Colombia has an opportunity to show the nation how environmentally sensitive re-adaptive use can be on a grand scale. The case studies in this paper are meant to be examples of Eco Districts that have achieved success albeit with varying degrees.

One thing that planners, city administrators, politicans and residents have in common is how do we reinvent aging cities into energy efficient, clean, safe and healthy places to live. The takeaway from this paper should be what are three critical characteristics that make an Eco District special and how can they be applied to Walter Reed. First, seeing as Walter Reed is somewhat sequestered from the surrounding neighborhood makes it ideal for developing an Eco District. Each Eco District we looked at had its own boundary whether it was on the water or separated from the city by its character as in The Living City Block in LoDo in Denver. It's important to note that this fact does not "cut it off" from the rest of the city, but that it has it's own identity. This is sometimes referred to as "placemaking" and it is very important in creating Eco Districts. Second, residents must be participating in District decisions. Whether it is helping to organize Farmer's Markets on certain days or overseeing art programs in the district, residents need to have some form of "buy-in" for them to want to live there specifically. Third, an Eco District must be very focused on sustainable living practices. More than recycling, this tenant focuses on district energy sources, careful water management

practices, and having a board or company that oversees and maintains the energy saving systems. Eco Districts need to be sustainable in the long term to continue to be replicable. Having oversight to maintain that efficiency is critical.

Perhaps the most important point though about Eco Districts, is that they are created not on an individual basis. There just isn't one house, or one building that decides to "go green". Eco Districts can be a catalytic change in cities. They can set examples and lend encouragement. And, they can be tailored and modified for the area in which they are located. But the signal they send can not be mistaken. By taking this leap and making a commitment to do it on a community scale, governments, officials, politicans, business leaders and residents have decided that the time for environmentally responsible living is now.