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Abstract

Objective

This project for the Portland Urban Architecture Research Laboratory will be presented at “Patterns, Pattern Language and Sustainability”, a symposium at the University of Oregon at Portland on November 13th-14th, 2009. We are creating a pattern language of “EcoPatterns” that can be used to study and create the model for an EcoDistrict.

What is an EcoDistrict?

“An EcoDistrict is a neighborhood that generates all its energy from on-site renewables, collects and recycles rainwater and waste, and prioritizes pedestrian, bike, and transit access. It combines mixed use, mixed income development; neighborhood scale parks, schools, community centers; and services, and enhanced IT infrastructure...The objective of the program is to test, accelerate and eventually codify the next generation of best practices in green development and civic infrastructure that can be scaled to create neighborhoods with the lowest environmental impact and highest economic and social resiliency in the United States.” (Bennett, 2009)

This definition builds the framework for a comprehensive strategy to build communities with the lowest possible environmental impact and highest long-term economic and community returns. We have chosen Rob Bennett’s model of an ecologically sustainable district as a point of departure for our studies for two primary reasons:

1) His definition provides conceptual modalities that, though explicitly actionable, are broad enough in scope to be adapted to diverse urban and suburban morphologies without prejudicing one in favor over another.

2) His goals provide for a balanced approach, utilizing ecological, economic, and social solutions for sustainability instead of simply focusing on one. Also, since the intention of the EcoDistricts project is the eventual execution and codification of some of these solutions in Oregon, we are uniquely prepared by being acquainted with the cultural and social norms that must be reconciled for this framework to actually produce a sustainable community people will actually desire to live within.

We believe this blend of ecological, economic and social sustainability to be imperative in the creation and success of healthy and responsible districts in urban and suburban areas. Through the identification and extraction of patterns from related case studies and literature we are creating a library of strategies (many of them interrelated) that can be applied to a new or existing district to increase its sustainable attributes.
Research Methodology

The city of Portland, via Rob Bennet of the Oregon & Portland Sustainability Institute, has proposed the creation of EcoDistricts in Portland (Bennet, 2008), defined here as communities that are socially, economically, and ecological whole. However, thus far this proposal is largely abstract, identifying goals and values, but without concrete applicable solutions. Our purpose and goal here is to create a framework pattern language for the analysis of potential EcoDistrict sites in order to facilitate their creation in real terms. To do this we have adopted the following methodology, listed here and defined thereafter:

1) Analyze the EcoDistrict proposal and identify core values to be achieved by the creation of this district.

2) Identify case studies and precedents and analyze these in relation to the values established.

3) Identify recurring or universal patterns from these case studies that achieve or manifest the established EcoDistrict values.

4) Tabulate and develop a general pattern language for measuring and evaluating potential EcoDistrict sites.

5) Analyze and evaluate potential EcoDistrict sites in light of the pattern language to identify advantages, potentials, and disabilities of a district in becoming an EcoDistrict.

1) Analyze the EcoDistrict proposal and identify core values to be achieved by the creation of this district.

The first step in this process is the analysis of the published EcoDistrict proposal itself to identify the core values and goals to be achieved. This document must be analyzed thoroughly and comprehensively in order to distill a finite set of actionable goals. This list will be developed to best represent the primary intentions inherent in the pursuit of the concept of an EcoDistrict. This list will then be utilized as the base measure for considering patterns and establishing a pattern language. All patterns will be tested for validity by identifying their agency towards the established goals.

2) Identify case studies and precedents and analyze these in relation to the values established.

Once the primary goals of the EcoDistrict proposal are established, case studies and precedents will be identified, both from theory and practice, in order to understand what makes a district or neighborhood whole. Studies of contemporary communities and historic community theory will be made to find the underlying foundations for their success. Existing and proposed projects from throughout the world will be studied. These will include
projects and places at all scales, from building-scale to urban-scale, although neighborhood and community scaled places will be regarded as a priority for their relevance to all three primary agendas: social, economic, and ecological. Studies will also include urban and community thought and theory to ensure academic robustness and to give equal weight to historic precedent and knowledge of whole communities in addition to modern developments of the built environment.

3) Identify recurring or universal patterns from these case studies that achieve or manifest the recognized EcoDistrict values.

Case studies and precedents will be analyzed and compared to identify recurring themes or patterns. Where overlap occurs, investigation will be undertaken to understand the root causes or conditions that enable these situations to prosper. Conditions or causes that habitually reoccur in various projects that aid a community’s success in such a way as to inform the language of an EcoDistrict will be tabulated and recorded. From these conditions a list of potential patterns or situations that contribute to whole communities will be developed.

4) Tabulate and extract a general pattern language for measuring and evaluating potential EcoDistrict sites.

Once a list of recognized solutions has been established, it shall be analyzed in order to extract primary patterns contributive to the creation of an EcoDistrict. Tactic-level solutions will be culled from this list or incorporated into higher-level strategies because they tend to be problem-specific and therefore fail to be broad enough to be patterns that can be implemented universally. This list will be distilled to include the greatest density of high-level generative strategies, patterns that can be applied flexibly to a wide array of situations and sites. Once compiled, the list will be organized into a web of interdependent families that have the potential to catalyze and augment each other, the sum of which could inform the understanding of a whole community and used as a tool for the evaluation and implementation of EcoDistricts. This general EcoPattern Language is the primary product of our research.

5) Analyze and evaluate potential EcoDistrict sites in light of the EcoPattern Language to identify advantages, potentials, and disabilities of a district in becoming an EcoDistrict.

Once this general EcoPattern Language has been established, it can be used as a tool for evaluating potential EcoDistrict sites. Also, once a site has been chosen, a site-specific EcoPattern Language can be developed and, incorporated into a broader strategy of intervention, be utilized as a design tool to aid responsible development. This process, outlined here, will be explained in more detail in the examples at the end.

If the EcoPattern Language is to be used to evaluate potential EcoDistrict sites, the following procedure is recommended:
a) Compare the Language to the potential site, and identify which patterns are present and which are not. The patterns present represent inherent advantages in the establishment of EcoDistricts. Communities that already possess the greatest number and widest array of these patterns should be priority options for EcoDistrict projects. The list of patterns not present represent an EcoDeficit, the gap between what a community is and a healthy and successful EcoDistrict. By assessing and evaluating this list in relation to a community, a general strategy of application can be gleaned and analyzed for feasibility.

b) Compare various sites for natural advantages and disadvantages catalogued in these two lists and evaluate in which districts the fulfillment of the EcoPattern Language is most feasible and constructive to the community.

Once a site has been chosen, the following outlined procedure is recommended to develop a site-specific EcoPattern Language:

a) If the two EcoPattern lists discussed above have not been produced, they should be now. These lists are the foundation for this procedure.

b) The list of patterns not present should be analyzed in relation to the inherent culture and character of the site. All patterns should be tested for veracity in relation to a specific site. In order to be viable, they should satisfy all three core agendas: they should be viable socially, economically, and ecologically. If they are deemed inappropriate or unviable on a particular site, they should be ignored. Additional non-present patterns that are deemed especially applicable to a site should also be added to this list.

c) With the list of missing patterns formed to the needs of the site, preliminary design exercises can begin to establish actionable strategies in a district. Strategies and tactics that manifest multiple patterns should be implemented first, followed by secondary actions that round out a district.
Core Goals & Values

From Rob Bennett’s EcoDistricts proposal, we have identified six core values by which we will evaluate case studies and to which we will apply patterns (Bennett, 2008). Listed here:

1) On-site Renewable Resources
2) Rainwater & Waste Collection & Recycling
3) Pedestrian, Bicycle, & Transit Access
4) Mixed-Use & Mixed-Income Development
5) Neighborhood-scale Parks
6) Schools, Community Centers, & Services

Following is an analysis of these values and methods by which they might be achieved.

On-Site Renewable Resources

Integrate Your Systems

By combining several traditional methods of conserving energy together to produce efficient buildings, the amount of energy production necessary for the district to function is drastically reduced.

“The interesting thing is that the technologies we propose are not that new but instead we have combined them in a unique integrated system… the first strategy we use is all the best techniques of energy conservation – insulation, passive solar, natural ventilation, daylighting, efficient appliances etc and that can reduce the load by as much as 40-50% so then we’re only asking renewables to do the remaining 50%. We’ve integrated 3 renewable sources – so none have to be oversized to do whole job.” (Fraker, 2008)

Lloyd Crossing proposes the creation of an annual solar budget for the district and using additional methods of energy production to help meet that number. The graphic below shows how non-renewable energy sources will be phased out by the year 2050 in this project, leaving a mix of solar energy, thermal systems, renewable electric, local natural gas and local wind farm power to pick up the load. (Mithun, 2004)

Buildings as Energy Infrastructure

Integrate the necessary infrastructure for on-site energy into the architecture of the district. Raise wind turbines up to heights where the wind speeds are higher and more consistent by placing them on top of the taller buildings. Utilize unused wall
area (roof area on shorter buildings) to support photovoltaic cells that double as sunshades for the conditioned spaces behind and below them.

“We have wind turbines on the tops of the tall buildings, that meets about 40-50% of the electricity demand. Then we have photovoltaics on the roofs of lower buildings that also act as shading devices for the units – these take care of another 40%.”

(Fraker, 2008)

Lloyd Crossing proposes the use of a solar sail composed of photovoltaic panels that cover the south-facing façade of the upper building shown below.

The lower building is oriented to capitalize on the direction of the prevailing winds to provide natural ventilation.

**Rainwater and Waste Collection and Recycling**

*Collect the Rain*

Reduce the use of municipal water by collecting and storing rainwater for non-potable uses like flushing toilets.

Lloyd Crossing collects rainwater through its green roofs and planters and stores it in underground storage tanks. This rainwater, along with treated blackwater is used to flush toilets in the buildings. The used toilet water goes to the on-site blackwater treatment plant, after which it is recycled and used to flush more toilets.

*Reuse Waste*

At the Qingdao EcoBlock Project, so much of the energy load is reduced or eliminated by conservation and the use of renewable energy that the remaining load is picked up by turning waste back into energy. “The remainder is then done by this very old principle, which is to convert the sewage sludge, kitchen waste and yard waste into gas that then runs the backup generators. Simultaneously because the sludge is taken out of the sewage system, we can process the water by using constructed wetlands on site. We’re also collecting rainwater to top off that supply so we only need a tiny amount of municipal water.” (Fraker, 2008)

“On-site wastewater treatment facilities which use biological systems to reclaim water should be used whenever possible. The reclaimed water should be used for on-site irrigation or for nearby farming. Biomass can also be harvested for fertilizer.” (Calthorpe, 1993)

“Existing drainageways and wetlands should be maintained or enhanced in a natural state. In lower-density areas, drainage systems should recharge on-site groundwater by using swales and surface systems, rather than storm drains. All urban runoff must be treated on site with biological retention and filtration areas.” (Calthorpe, 1993)

“Our current ways of getting rid of sewage poison the great bodies of natural water, and rob the land around our buildings of the nutrients they need. Arrange all toilets
over a dry composting chamber. Lead organic garbage chutes to the same chamber, and use the combined products for fertilizer. (Alexander, 1977)

**Pedestrian, Bicycle and Transit Access**

*A Safe Journey*

People need to feel safe and secure when they are walking, riding a bike or using public transit. If they don’t, they will elect to use an automobile to get to their destination instead. By having retail, commercial or residential buildings that front a pedestrian path or right of way, this will increase activity along the path, creating “eyes on the street” at the very least.

“Pedestrian routes should be located along or visible from all streets. Primary pedestrian routes and bikeways should be bordered by residential fronts, public parks, plazas, or commercial uses. Routes through parking lots or at the rear of residential developments should be avoided.” (Calthorpe, 1993)

*An Easy Journey*

People like to quickly and efficiently get to where they are going. Create straight paths that offer direct access to commercial areas and transit stops. Otherwise, they will use an automobile if it will save them a considerable amount of time.

“Place commercial, housing, jobs, parks, and civic uses within walking distance of transit stops. Create pedestrian-friendly street networks which directly connect local destinations” (Calthorpe, 1993)

“A coordinated system of bikeways should be provided in conjunction with transit-oriented developments or a series of transit-oriented developments. Important destinations, such as core commercial areas, transit stops, employment centers, parks, open spaces, schools, and other community facilities, should be linked by these bike routes.” (Calthorpe, 1993)

*An interesting Journey*

People like to be entertained as they move from one destination to the next. They like to watch other people and witness various activities that are going on around them. They want to see and be seen. By lining a street with a wide variety of building types that contain a wide variety of different programs, a rich and diverse environment is created for the pedestrian, cyclist or transit rider.

“Walking needs to be interesting, and there is nothing more interesting than people or stores. Mixed-use planning is necessary not only to bring activities closer together but also to line our paths with ‘on the way’ activities and chance meetings or rendezvous.” (Calthorpe, 1986)

“The simple social intercourse created when people rub shoulders in public is one of the most essential kinds of social ‘glue’ in society. Arrange buildings so that they form pedestrian streets with many entrances and open stairs directly from the upper
stories to the street, so that even movement between rooms is outdoors, not just movement between buildings.” (Alexander, 1977)

**Mixed Use and Mixed Income Development**

*Design Housing for People of All Incomes*

Create a wide variety of housing sizes, types and costs every demographic of citizen can live in the community. We can create diverse and vibrant communities by enabling and encouraging people of different ages, cultures, races and socioeconomic statuses to live within them.

In the 1980s, California Governor Jerry Brown’s administration created a plan to correct the past mistakes that were made in the development of Sacramento’s downtown area. Their goal was to “conserve the older qualities of the city: the mix of housing, local stores and workplaces, the 24-hour community, and the scale and diversity of old Sacramento neighborhoods. The mix of unit plans, from three-bedroom family townhouses through two-bedroom apartments designed for co-ownership to one-bedroom units for elderly or single people, represents a cross section of the population combined in one neighborhood. This mix of different age groups and households is a reversal of our current segregated housing patterns: subdivisions for families, retirement villages or high-rises for the elderly, and condominiums for swinging singles. Such mixes were once the norm of cities and contributed to the synergy and wisdom of the social fabric. The costs of the dwellings make them available to several income groups. One-third of the project is subsidized for low-income groups, one-third is priced for first-time buyers, and one-third is priced at the standard market rate. The income mix reaffirms a basic philosophical commitment to equality of opportunity and a rejection of the kind of economic segregation that breeds discrimination.” (Calthorpe, 1986)

*Integrate Home and the Workplace*

Scatter workplaces throughout the district, rather than concentrating them in areas that only contain other workplaces. They must be separated from other workplaces and integrated into residential areas to encourage interaction between workers and their families. By making the proximity of work and home closer, we also eliminate the need for workers to use automobiles to travel between home and work. If workers have the opportunity to live near their job, they will spend less time, energy and money commuting and be closer to their spouses and children. It will also encourage them to spend more time outside getting exercise by walking or bike to and from their workplaces.

“Once the segregation of work and home is broken and the freeway link reduced, the form and criteria of the workplace will become a part of a neighborhood again, rather than floating as the focus of many dispersed and incomplete bedroom communities.” (Calthorpe, 1986)
Neighborhood Scale Parks

Give Everyone a Park

People like to relax and exercise in neighborhood parks. A person will frequently use a park as long as it is close enough to their home or workplace. Place neighborhood green areas within two blocks or a three minute walk from any residence or workplace.

“Build one open public green within three minutes’ walk—about 750 feet—of every house and workplace. This means that the greens need to be uniformly scattered at 1500-foot intervals, throughout the city.” (Alexander, 1977)

“One- to four-acre village parks should be placed within two blocks of any residence. Total park acreage should be based on the quantity of residential development and/or equivalent to roughly 5 to 10% of the site area. Village greens should be placed at the juncture between the core commercial area and surrounding residential or office uses.” (Calthorpe, 1993)

Human Scale Parks

Parks must be an appropriate scale to accommodate the activities for which they will be used. If they are too small, people cannot play games and exercise in them. If they are too large, they feel empty, vacant and unsafe.

“Make the greens at least 10 feet across, and at least 60,000 square feet in area.” (Alexander, 1977)

“Village greens should be between 1 and 3 acres in size. Public parks should be designed for both active and passive uses. They should reflect and reinforce the character of the surrounding area and accommodate the anticipated intensity of use.” (Calthorpe, 1993)

Lloyd Crossing uses the design of a 200’ x 200’ neighborhood park with an open space connection down 8th Avenue to Sullivan’s Gulch.

Schools, Community Centers and Services

Connect Children and their Schools to the Rest of the District

In the modern age, it is commonplace to develop schools away from the busy areas of the city because it seems like children would be safer in isolation than they would be if they were exposed to all of the activity of the adult world. However, they must be allowed to experience the real world as they grow older and socially mature, in order to become a part of it. If enough watchful eyes are on the paths along which they travel, they will be in a safe environment.

“If children are not able to explore the whole of the adult world round about them, they cannot become adults. But modern cities are so dangerous that children cannot be allowed to explore them freely. As part of the network of bike paths, develop one system of paths that is extra safe—entirely separate from automobiles, with lights
and bridges at the crossings, with homes and shops along it, so that there are always many eyes on the path. Let this path go through every neighborhood, so that children can get onto it without crossing a main road. And run the path all through the city, down pedestrian streets, through workshops, assembly plants, warehouses, interchanges, print houses, bakeries, all the interesting “invisible” life of a town—so that the children can roam freely on their bikes and trikes.” (Alexander, 1977)

“Strong pedestrian and bike links should connect school sites and community parks with the commercial and transit core.” (Calthorpe, 1993)

Keep Community Services Visible, Small, and Easily Accessible

Community services are a positive amenity to a district only so long as they are effective. As soon as they stop working properly and efficiently, they become a burden on society. People use community services as supplemental means of help with their daily lives, so they must work well, easily identified and easily accessed.

“Civic services, such as community buildings, government offices, recreation centers, post offices, libraries, and daycare, should be placed in central location as highly visible focal points. Where feasible, they should be close to the transit stop.” (Calthorpe, 1993)

“Departments and public services don’t work if they are too large. When they are large, their human qualities vanish; they become bureaucratic; red tape takes over. In any institution whose departments provide public service:

1. Make each service or department autonomous as far as possible.
2. Allow no one service more than 12 staff members total.
3. House each one in an identifiable piece of the building.
4. Give each one direct access to a public thoroughfare.” (Alexander, 1977)
Case Studies

Lloyd Crossing

Overview:

Lloyd Crossing was a conceptual design proposal for a sustainable, financially feasible, mixed-use development project by Mithun in 2004. The major goal of Lloyd Crossing was to identify “green” infrastructure opportunities and synergies that can be realized at the neighborhood scale that will catalyze future private development in the district. The project focused on a dynamic mix of uses, enhancement of identity and linkages, and optimization of shared systems. The end product was to be an achievable, high-density development.

Strategies:

Use of Potential Build-Out

To maximize the density and efficiency of the district, Mithun proposes the utilization of all available FAR. Unused FAR should be transferred to other sites with added zoning height.

![Project Area Development Potentials](image-url)

Solar Budget

Lloyd Crossing proposes the creation of an annual solar budget for the district and the use of additional methods of energy production to help meet that number. The graphic below shows how non-renewable energy sources will be phased out by the
year 2050 in this project, leaving a mix of solar energy, thermal systems, renewable electric, local natural gas and local wind farm power to pick up the load. (Mithun, 2004)

Water Neutral

Water conservation shall be achieved through fixture efficiency, non-potable through rainwater harvesting & blackwater reuse. Lloyd Crossing collects rainwater through its green roofs and planters and stores it in underground storage tanks. This rainwater, along with treated blackwater is used to flush toilets in the buildings. The used toilet water goes to the on-site blackwater treatment plant, after which it is recycled and used to flush more toilets.
Carbon Neutral

Building efficiency, wind power & carbon offsets, improved solar use, wind power integrated building and infrastructure will help Lloyd Crossing to achieve its goal of carbon neutrality. Mithun proposes the use of a solar sail composed of photovoltaic panels that cover the south-facing façade of the upper building shown below.

The lower building is oriented to capitalize on the direction of the prevailing winds to provide natural ventilation.

Habitat

Mithun is committed to preserving and rejuvenating the natural habitat of the district through the use of bioswales, green streets, open space connections. Lloyd Crossing uses the design of a 200’ x 200’ neighborhood park with an open space connection down 8th Avenue to Sullivan’s Gulch.
Implementation:

By introducing the capital investment of a resource management association, overall energy costs can be reduced while property owner savings will increase.
Qindao EcoBlock Project

Overview:

In recent years, China has been developing “superblocks”, which are roughly 1 square kilometer areas that contain 2,000-10,000 residential units within them. The city provides the arterial streets and the developer buys the rights to build everything inside the blocks. The Chinese are able to build 10-15 of these superblocks each day. Harrison Fraker and a team of students at UC Berkeley have designed the Qindao EcoBlock Project, an alternative to the superblock system. The EcoBlock prototype can be mass replicated, but is completely off the grid, generates its own electricity and processes its own water and waste. If the Chinese government adopted the EcoBlock, it could save $35 billion in infrastructure costs and $200 billion in environmental costs each year.

Strategies:

Integrated System

The Qindao EcoBlock Project uses the best techniques of energy conservation: insulation, passive solar, natural ventilation, daylighting, and efficient appliances. These are old techniques that have been tested with time and proven efficient. However, when integrated into one system, they reduce the energy load by 40-50%.
3 methods of renewable resources pick up the other half of the load:

1. Wind turbines are installed on top of the tall buildings to generate 40-50% of the electricity demand.

2. Photovoltaic units are installed on top of the lower buildings (which also work as sunshades), picking up another 40%.

3. The remainder of the energy load is covered by converting waste from sewage sludge, kitchens, and yards into gas. This gas then runs backup generators.
Onsite Water Treatment

Water is processed in constructed onsite wetlands and rainwater is collected.
Implementation:

Sound Economics

Instead of the developer plugging into the centralized infrastructure (this is the case now), he or she can be the property manager. They can collect utility fees that would normally be paid to the government. The property manager can charge the homeowners the same fees that they are used to paying and still make money. This process is in the financial interest of the developer to replicate the EcoBlock model.

Pilot Project

A pilot project is already under construction in Qingdao to test the feasibility of the EcoBlock concept in the real world and improve its efficiency.

The project consists of 600 residential units within 5-7 story townhouses. In addition the townhouses, there are also six 12-story tower blocks and four 2 story tower blocks. They are arranged around public and semi-private courtyards. Parking is minimized and on-street or underground. The layout encourages walking, cycling and public transit, but residents are also encouraged to use electric cars through a car share scheme that is available to the residents of the EcoBlock.
EcoPattern Districts

- Dedicated off-street paths
- Primary sidewalks + bike routes
- Secondary sidewalks + bike routes

High-level of pedestrian + bike accessibility and connectivity
Linked Hybrid

Overview:

Steven Holl has designed a mixed-use pedestrian oriented development for 2,500 residents and workers in Beijing. Its 2 million square feet of conditioned space flows in and out of the public space that surrounds it and is heated and cooled with geothermal technology, making it one of the largest green (LEED Gold) residential projects in the world.

Strategies:

Mixed-Use

Linked Hybrid contains 750 apartments in 8 towers. The residential component is integrated with public functions at the ground level of the development, including a restaurant, hotel, Montessori school, kindergarten school, drugstore and cinema. At the upper levels of the project, additional multi-use amenities are connected with skybridges, including a swimming pool, fitness room, café, gallery, auditorium and salon.
Open Space

There are a variety of sizes of opens spaces and the programs within them vary greatly from commercial, residential, educational and recreational. The overall goal of these spaces is to promote interaction and encourage encounters between the users of the space. Retail shops activate the space around the reflecting pond at the ground level. On the roofs of the intermediate levels, there are large public roof gardens, and at the tops of the residential towers, there are smaller private roof gardens connected to the penthouses. All of these offer green space to the inhabitants at different scales.

Geothermal Energy

Holl has designed the project to be heated and cooled with a system of 660 geothermal wells that reach down 330 feet below the surface of the earth.
Urban Farming Food Chain

Overview:

Urban Farming has created a project where edible plants are grown and harvested on vertical walls in poor urban areas. Each wall is 24 to 30 feet long and 6 feet high and composed of recycled stainless steel panels that are mounted to existing urban structures that can support them, but are not harmed by them. Each panel is 24 inches wide by 24 inches high by 4 inches deep and is part of an interconnected network of panels, as well as an automated irrigation system.

Strategies:

Food Production

The plants grown during the first season include bell peppers, hot peppers, tomatoes, cucumbers, tomatillos, strawberries, spinach, parsley, leeks, edible lavender and a variety of herbs. Locations for these urban gardens are selected on the scarcity of food and abundance of hunger among the residents. Once ready to harvest, the fresh produce is immediately accessible to the entire community.

Teamwork and Training

Residents that take advantage of the opportunity learn a useful set of gardening skills under the guidance of a master gardener as well as a feeling of empowerment and gratification from working together as a team with other members of the community. Those who tend the gardens also donate a portion of the harvested food to people and organizations in need.
Climate Improvement

In addition to providing much needed food and skills to hungry people in dilapidated urban areas, they also help soften the harsh environments of concrete and steel that surround them. The lush greenery of urban farms helps reduce the heat index and combat the effects of global warming.

Implementation:

Pilot Project

There are four locations within Los Angeles where organizations have hosted these living walls and harvested their crops. Each location is assigned a master gardener who is available as an advisor and consultant to local community members. The individual locations of the wall systems are designed to be “links” that work together as part of a greater network or “chain” that connects across the city.
EcoPattern Language

After the analysis and comparison of case studies and literature, the EcoPattern Language has been developed to best represent the aspiration that is an EcoDistrict. Again, all patterns were tested against the core goals and values established by the EcoDistrict proposal. The following table first lists the six identified core goals and values and thereafter the patterns chosen and the goals to which they have agency.

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<td>Manageable Scale</td>
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<td>X-Community of 7000</td>
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<tr>
<td>Life Cycle</td>
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<td>Accessible Green</td>
<td>X</td>
<td>X</td>
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<td>X</td>
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<tr>
<td>Small Public Squares</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
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<tr>
<td>Neighborhood Boundary</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Main Gateway</td>
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<td></td>
<td>X</td>
<td></td>
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</tr>
</tbody>
</table>

* - New patterns developed from studies
** - Patterns adapted from A Pattern Language
*** - Patterns from A Pattern Language
Walkable Community

People use automobiles to move through their communities because the communities have been designed primarily (and in many cases only) for the automobile. Locate amenities that are necessary for everyday life such as grocery stores, banks, schools, pharmacies, hardware stores, restaurants and parks within walking distance from one another. Encourage walking as a primary mode of transportation by creating an environment that is not only safe, but also easy and interesting for pedestrians to use. Line pedestrian right-of-ways with buildings that front the path and bring activity to it, providing interesting scenery for entertainment and “eyes on the street” for safety. Keep the diameter of the community smaller than 1 mile to ensure that a pedestrian can reach any destination within 20 minutes or less.

Pedestrian Density

“Many of our modern public squares, though intended as lively plazas, are in fact deserted and dead. For public squares, courts, pedestrian streets, any place where crowds are drawn together, estimate the mean number of people in the place at any given moment (P), and make the area of the place between 150P and 300P square feet.” (Alexander, 1977)

Web of Public Transportation

“The system of public transportation—the entire web of airplanes, helicopters, hovercraft, trains, boats, ferries, busses, taxis, mini-trains, carts, ski-lifts, moving sidewalks—can only work if all the parts are well connected. But they usually aren’t, because the different agencies in charge of various forms of public transportation have no incentives to connect to one another. Treat interchanges as primary and transportation lines as secondary. Create incentives so that all the different modes of public transportation—airplanes, helicopters, ferries, boats, trains, rapid transit, buses, mini-buses, ski-lifts, escalators, travelators, elevators—plan their lines to connect the interchanges, with the hope that gradually many different lines, of many different types, will meet at every interchange. Give the local communities control over their interchanges so that they can implement the pattern by giving contracts only to those transportation companies which are willing to serve these interchanges.” (Alexander, 1977)

Activity Nodes

“Community facilities scattered individually through the city do nothing for the life of the city. Create nodes of activity throughout the community, spread about 300 yards apart. First identify those existing spots in the community where action seems to concentrate itself. Then modify the layout of the paths in the community to bring as many of them through these spots as possible. This makes each spot function as a “node” in the path network. Then, at the center of each node, make a small public square, and surround it with a combination of community facilities and shops which are mutually supportive.” (Alexander, 1977)
Green Streets

“There is too much hot hard asphalt in the world. A local road, which only gives access to buildings, needs a few stones for the wheels of the cars; nothing more. Most of it can still be green. On local roads, closed to through traffic, plant grass all over the road and set occasional paving stones into the grass to form a surface for the wheels of those cars that need access to the street. Make no distinction between street and sidewalk. Where houses open off the street, put in more paving stones or gravel to let cars turn onto their own land.” (Alexander, 1977)

Corner Grocery

“It has lately been assumed that people no longer want to walk to local stores. This assumption is mistaken. Give every neighborhood at least one corner grocery, somewhere near its heart. Place these corner groceries every 200 to 800 yards, according to the density, so that each one serves about 1000 people. Place them on corners, where large numbers of people are going past. And combine them with houses, so that the people who run them can live over them or next to them.” (Alexander, 1977)

Parallel Roads

“The net-like pattern of streets is obsolete. Congestion is choking cities. Cars can average 60 miles per hour on freeways, but trips across town have an average speed of only 10 to 15 miles per hour. Within a local transport area build no intersecting major roads at all; instead, build a system of parallel and alternating one-way roads to carry traffic to the ring roads. In existing towns, create this structure piecemeal, by gradually making major streets one-way and closing cross streets. Keep parallel roads at least 100 yards apart (to make room for neighborhoods between them) and no more than 300 or 400 yards apart.” (Alexander, 1977)

Tangent Auto Roads (adapted from Ring Roads)

“It is not possible to avoid the need for high speed roads in modern society; but it is essential to place them and build them in such a way that they do not destroy communities or countryside. Place high speed roads (freeways and other major arteries) so that:

1. At least one highspeed road lies tangent to each local transport area.
2. each local transport area has at least one side not bounded by a high speed road, but directly open to the countryside.
3. The road is always sunken, or shielded along its length by berms, or earth, or industrial buildings, to protect the nearby neighborhoods from noise.” (Alexander, 1977)

Self-Sufficiency

A self-sufficient community is a sustainable one. If a district can meet all of its needs through onsite processes, then it eliminates dependency on goods and services that must be transported to it from other areas of the world. Encourage a balanced mix of land uses that can accommodate industry, commerce, farming and housing by providing a diverse and integrated network of zoning laws.
Scattered Work

“The artificial separation of houses and work creates intolerable rifts in people’s inner lives. Use zoning laws, neighborhood planning, tax incentives, and any other means available to scatter workplaces throughout the city. Prohibit large concentrations of work, without family life around them. Prohibit large concentrations of family life, without workplaces around them.” (Alexander, 1977)

Zero Waste

Conventional methods of waste treatment require excessive energy for transportation and pollute isolated areas of land to the point that natural processes cannot be used to filter out toxins. Treat all waste onsite with biological systems. Reclaim as much water as possible for non-potable uses and harvest biomass for use as fertilizer on local farms. Collect sewage sludge, kitchen waste and yard waste and convert it into gas to be used in tandem with energy from onsite renewable resources.

Energy Independence

Minimize dependence on a greater municipal grid for the energy needs of the community. Take advantage of onsite renewable resources such as solar, hydro, geothermal and wind power to generate the energy required to make the district operate. Place windmills on top of tall buildings or in open fields. Attach photovoltaic panels to window sunshades and place them on the roofs of shorter buildings. As long as you do not interfere or destroy existing natural processes and ecosystems, utilize the constant temperature of the earth and harness tidal energy with underwater mills.

Water Neutral

Minimize dependence on a greater municipal grid for the water needs of the community. Collect rainwater on rooftops and store it for non-potable uses such as flushing toilets, onsite irrigation or for local farming. Greenroofs and planters at street level can also be used to collect and store rainwater. Treat blackwater onsite using biological systems and recycle it so that it can be reused as non-potable water. Use bioswales and surface systems instead of storm drains whenever possible.

Urban Food

Much of the food we consume is transported from great distances to get to us. This process is expensive, wasteful of energy, and yields food of diminished nutritional value. Raise livestock and grow crops on organic onsite farms without the use of pesticides and growth hormones. Educate the public on the health and sustainability benefits of eating organic and locally grown food. Encourage the community to support local farmers and grocers by providing them with tax credits so that their prices are competitive.

Identifiable Neighborhood

“People need an identifiable spatial unit to belong to. Help people to define the neighborhoods they live in, not more than 300 yards across, with no more than 400 or 500 inhabitants. In existing cities, encourage local groups to organize themselves
to form such neighborhoods. Give the neighborhoods some degree of autonomy as far as taxes and land controls are concerned. Keep major roads outside these neighborhoods.” (Alexander, 1977)

**Diverse Neighborhood (adapted from Mosaic of Subcultures)**

“The homogeneous and undifferentiated character of modern cities kills all variety of life styles and arrests the growth of individual character. Do everything possible to enrich the cultures and subcultures of the city, by breaking the city, as far as possible, into a vast mosaic of small and different subcultures, each with its own spatial territory, and each with the power to create its own distinct life style. Make sure that they subcultures are small enough, so that each person has access to the full variety of life styles in the subcultures near his own.” (Alexander, 1977)

**Manageable Scale (adapted from Community of 7000)**

“Individuals have no effective voice in any community of more than 5,000-10,000 persons. Decentralize city governments in a way that gives local control to communities of 5,000 to 10,000 persons. As nearly as possible, use natural geographic and historical boundaries to mark these communities. Give each community the power to initiate, decide, and execute the affairs that concern it closely: land use, housing, maintenance, streets, parks, police, schooling, welfare, neighborhood services.” (Alexander, 1977)

**Life Cycle**

“Make certain that the full cycle of life is represented and balanced in each community. Set the ideal of a balanced life cycle as a principal guide for the evolution of communities. This means that each community include a balance of people at every stage of the life cycle, from infants to the very old; and include the full slate of settings needed for all these stages of life. It also means that the community contain the full slate of settings which best mark the ritual crossing of life from one stage to the next.” (Alexander, 1977)

**Building Fronts**

“Building set-backs from the street, originally invented to protect the public welfare by giving every building light and air, have actually helped greatly to destroy the street as a social space. On no account allow set-backs between streets or paths or public open land and the buildings which front on them. The set-backs do nothing valuable and almost always destroy the value of the open areas between the buildings. Build right up to the paths; change the laws in all communities where obsolete by-laws make this impossible. And let the building fronts take on slightly uneven angles as they accommodate to the shape of the street.” (Alexander, 1977)

**Individually Owned Shops**

“When shops are too large, or controlled by absentee owners, they become plastic, bland, and abstract. Do what you can to encourage the development of individually owned shops. Approve applications for business licenses only if the business is owned by those people who actually work and manage the store. Approve new
commercial building permits only if the proposed structure includes many very very small rental spaces.” (Alexander, 1977)

Accessible Green

“People need green open places to go to; when they are close they use them. But if the greens are more than three minutes away, the distance overwhelms the need. Build one open public green within three minutes’ walk—about 750 feet—of every house and workplace. This means that the greens need to be uniformly scattered at 1500-foot intervals, throughout the city. Make the greens at least 150 feet across, and at least 60,000 square feet in area.” (Alexander, 1977)

Small Public Squares

“A town needs public squares; they are the largest, most public rooms, that they town has. But when they are too large, they look and feel deserted. Make a public square much smaller than you would at first imagine; usually no more than 45 to 60 feet across, never more than 70 feet across. This applies only to its width in the short direction. In the long direction it can certainly be longer.” (Alexander, 1977)

Neighborhood Boundary

“The strength of the boundary is essential to a neighborhood. If the boundary is too weak the neighborhood will not be able to maintain its own identifiable character. Encourage the formation of a boundary around each neighborhood, to separate it from the next door neighborhoods. Form this boundary by closing down streets and limiting access to the neighborhood—cut the normal number of streets at least in half. Place gateways at these points where the restricted access paths cross the boundary; and make the boundary zone wide enough to contain meeting places for the common functions shared by several neighborhoods.” (Alexander, 1977)

Main Gateways

“Any part of a town—large or small—which is to be identified by its inhabitants as a precinct of some kind, will be reinforced, helped in its distinctness, marked, ad made more vivid, if the paths which enter it are marked by gateways where they cross the boundary. Mark every boundary in the city which has important human meaning—the boundary of a building cluster, a neighborhood, a precinct—by great gateways where the major entering paths cross the boundary.” (Alexander, 1977)
Example Applications

Example Purpose

In order to verify our findings and test our EcoPattern Language, it is necessary to evaluate its process and application on a subject site. When considering potential sites for this study, we first drew a large pool from the Portland Metro region. We considered several sites, but in the end we chose two sites for this evaluation: the Rose Quarter and Old Town/Chinatown. These districts were chosen for three primary reasons:

1) Both are relatively small in size, neither occupying more than a square mile.
2) Both exhibit a relative homogeneity in their character and urban fabric.
3) Both are districts we had personal familiarity with studying.

These factors were primary because they simplified the process of evaluation. In any planned intervention of an outside entity into a community, no effort will be effective without a thorough understanding of the problems, aspirations, and local character of a district. These cannot be comprehended without extensive study and critical analysis. For this exercise, such a complex and comprehensive process was not possible, so we are forced to choose districts that create more straightforward design problems. These two districts both have characteristics that make them favorable in this light. Our familiarity with both and their relative size and consistency of urban form made them ultimately our best opportunities.
Example 1: Old Town/Chinatown

1) To evaluate the district by the EcoPattern Language, compare the Language to the potential site, and identify which patterns are present and which are not. The patterns present represent inherent advantages in the establishment of EcoDistricts. Communities that already possess the greatest number and widest array of these patterns should be priority options for EcoDistrict projects. The list of patterns not present represent an EcoDeficit, the gap between what a community is and a healthy and successful EcoDistrict. By assessing and evaluating this list in relation to a community, a general strategy of application can be gleaned and analyzed for feasibility.

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Y</th>
<th>N</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walkable Community</td>
<td>X</td>
<td></td>
<td>Highly walkable; frequent, organized street network; fine-grained morphology;</td>
</tr>
<tr>
<td>Pedestrian Density</td>
<td></td>
<td>X</td>
<td>Activity-sparse district with intermittent intensive activity focused in small areas;</td>
</tr>
<tr>
<td>Web of Public Transportation</td>
<td>X</td>
<td></td>
<td>Transit Mall on 5th &amp; 6th Avenues carrying buses &amp; MAX and 1st Ave MAX lines cradle district;</td>
</tr>
<tr>
<td>Activity Nodes</td>
<td>X</td>
<td></td>
<td>Waterfront, Chinese Gardens, Festival Streets are potential activity nodes that need to be intensified;</td>
</tr>
<tr>
<td>Green Streets</td>
<td>X</td>
<td></td>
<td>Festival Streets and 3rd &amp; 4th Ave streetscape improvements are foundations that can be exploited;</td>
</tr>
<tr>
<td>Corner Grocery</td>
<td>X</td>
<td></td>
<td>Small shops and grocers are the districts only internal retail commerce</td>
</tr>
<tr>
<td>Parallel Roads</td>
<td>X</td>
<td></td>
<td>Road system ideally orthogonal and fine-grained</td>
</tr>
<tr>
<td>Tangent Auto Roads</td>
<td>X</td>
<td></td>
<td>Ringed by major auto roads Glisan, Burnside, Broadway, &amp; Naito</td>
</tr>
<tr>
<td>Self-Sufficiency</td>
<td></td>
<td>X</td>
<td>Dependent on external visitors and entities to survive; very little internal self-sufficiency</td>
</tr>
<tr>
<td>Scattered Work</td>
<td>X</td>
<td></td>
<td>Does have mix of residential, commercial, and retail; needs to be greatly intensified</td>
</tr>
<tr>
<td>Zero Waste</td>
<td>X</td>
<td></td>
<td>No district-wide waste strategy</td>
</tr>
<tr>
<td>Energy Independence</td>
<td>X</td>
<td></td>
<td>No district-wide energy strategy</td>
</tr>
<tr>
<td>Water Neutral</td>
<td>X</td>
<td></td>
<td>No district-wide water strategy</td>
</tr>
<tr>
<td>Urban Agriculture</td>
<td>X</td>
<td></td>
<td>Despite high population in need of regular food, no internal food production</td>
</tr>
<tr>
<td>Neighborhood Identity</td>
<td></td>
<td>X</td>
<td>Strong neighborhood identity, historic and cultural</td>
</tr>
<tr>
<td>Diverse Neighborhood</td>
<td>X</td>
<td></td>
<td>Diverse community in need of density</td>
</tr>
<tr>
<td>Manageable Scale</td>
<td>X</td>
<td></td>
<td>Small community with many voices, strong internal involvement</td>
</tr>
<tr>
<td>Life Cycle</td>
<td>X</td>
<td></td>
<td>Boasts wide array of facilities for the life cycle: universities, businesses, schools, &amp; eldercare</td>
</tr>
<tr>
<td>Building Fronts</td>
<td>X</td>
<td></td>
<td>Despite prevalent vacant lots, building frontages produce strong streetwall</td>
</tr>
<tr>
<td>Individually Owned Shops</td>
<td>X</td>
<td></td>
<td>Small retail shops are foundation of district’s economic livelihood</td>
</tr>
<tr>
<td>Accessible Green</td>
<td>X</td>
<td></td>
<td>District sandwiched between park blocks &amp; waterfront</td>
</tr>
<tr>
<td>Small Public Squares</td>
<td>X</td>
<td></td>
<td>Festival Streets and Saturday Market form foundation for public social space</td>
</tr>
<tr>
<td>Neighborhood Boundary</td>
<td>X</td>
<td></td>
<td>Automotive thoroughfares and Chinatown gate create strong perceptual boundary</td>
</tr>
<tr>
<td>Main Gateway</td>
<td>X</td>
<td></td>
<td>Chinatown Gate is primary</td>
</tr>
</tbody>
</table>
2) The list of patterns not present should be analyzed in relation to the inherent culture and character of the site. All patterns should be tested for veracity in relation to a specific site. In order to be viable, they should satisfy all three core agendas: they should be viable socially, economically, and ecologically. If they are deemed inappropriate or unviable on a particular site, they should be ignored. Additional non-present patterns that are deemed especially applicable to a site should also be added to this list.

None of the patterns seem fundamentally at odds with the three motivating agendas for Old Town/Chinatown. Therefore the patterns that should be pursued in the enhancement of the district are:

- Pedestrian Density
- Self-Sufficiency
- Zero Waste
- Energy Independence
- Water Neutral
- Urban Agriculture

3) With the list of missing patterns formed to the needs of the site, preliminary design exercises can begin to establish actionable strategies in a district. Strategies and tactics that manifest multiple patterns should be implemented first, followed by secondary actions that round out a district.

Analyzing possible interrelationships among missing patterns, there are many possible strategies that could be employed that address them holistically. Some possible actions could include using vacant lots as ecological engines, i.e. living machines, community gardens, bioswales, or parks, potentially addressing many patterns at once.
Example 2: the Rose Quarter

1) To evaluate the district by the EcoPattern Language, compare the Language to the potential site, and identify which patterns are present and which are not. The patterns present represent inherent advantages in the establishment of EcoDistricts. Communities that already possess the greatest number and widest array of these patterns should be priority options for EcoDistrict projects. The list of patterns not present represent an EcoDeficit, the gap between what a community is and a healthy and successful EcoDistrict. By assessing and evaluating this list in relation to a community, a general strategy of application can be gleaned and analyzed for feasibility.

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<tr>
<th>Pattern</th>
<th>Y</th>
<th>N</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walkable Community</td>
<td></td>
<td>X</td>
<td>Small, easily walkable but no activity to support it</td>
</tr>
<tr>
<td>Pedestrian Density</td>
<td></td>
<td>X</td>
<td>Intensive activities from arenas contrast utter dormancy at other times</td>
</tr>
<tr>
<td>Web of Public Transportation</td>
<td></td>
<td>X</td>
<td>Bus, MAX, and bike access are plentiful</td>
</tr>
<tr>
<td>Activity Nodes</td>
<td></td>
<td>X</td>
<td>Arenas and waterfront are attractions, but should be intensified</td>
</tr>
<tr>
<td>Green Streets</td>
<td></td>
<td>X</td>
<td>Green streets or spaces are not present</td>
</tr>
<tr>
<td>Corner Grocery</td>
<td></td>
<td>X</td>
<td>No grocers or basic services are present</td>
</tr>
<tr>
<td>Parallel Roads</td>
<td></td>
<td>X</td>
<td>Roads are haphazard, but arenas make alteration unlikely and prohibitively expensive</td>
</tr>
<tr>
<td>Tangent Auto Roads</td>
<td></td>
<td>X</td>
<td>I-5, N Interstate, and Broadway ring district</td>
</tr>
<tr>
<td>Self-Sufficiency</td>
<td></td>
<td>X</td>
<td>Dependent on outside stimulus to function</td>
</tr>
<tr>
<td>Scattered Work</td>
<td></td>
<td>X</td>
<td>No residents or internal economic foundation</td>
</tr>
<tr>
<td>Zero Waste</td>
<td></td>
<td>X</td>
<td>No district-wide waste strategy</td>
</tr>
<tr>
<td>Energy Independence</td>
<td></td>
<td>X</td>
<td>No district-wide energy strategy</td>
</tr>
<tr>
<td>Water Neutral</td>
<td></td>
<td>X</td>
<td>No district-wide water strategy</td>
</tr>
<tr>
<td>Urban Agriculture</td>
<td></td>
<td>X</td>
<td>No internal food production</td>
</tr>
<tr>
<td>Neighborhood Identity</td>
<td></td>
<td>X</td>
<td>Strong identity as entertainment district</td>
</tr>
<tr>
<td>Diverse Neighborhood</td>
<td></td>
<td>X</td>
<td>In need of diversity of users and activities</td>
</tr>
<tr>
<td>Manageable Scale</td>
<td></td>
<td>X</td>
<td>Arena scale contrasts with empty zones, with no connecting tissue or gradient</td>
</tr>
<tr>
<td>Life Cycle</td>
<td></td>
<td>X</td>
<td>No accommodation for many groups</td>
</tr>
<tr>
<td>Building Fronts</td>
<td></td>
<td>X</td>
<td>Arenas are setback, with empty voids in between</td>
</tr>
<tr>
<td>Individually Owned Shops</td>
<td></td>
<td>X</td>
<td>Sparse activity and lack of 24-hour community prevent small businesses</td>
</tr>
<tr>
<td>Accessible Green</td>
<td></td>
<td>X</td>
<td>Green spaces on waterfront are remote and cut off</td>
</tr>
<tr>
<td>Small Public Squares</td>
<td></td>
<td>X</td>
<td>Spaces between and in front of arenas could be excellent public spaces with more activity to support them</td>
</tr>
<tr>
<td>Neighborhood Boundary</td>
<td></td>
<td>X</td>
<td>I-5, N Interstate, &amp; Broadway form strong boundary</td>
</tr>
<tr>
<td>Main Gateway</td>
<td></td>
<td>X</td>
<td>Because of limited access, Broadway &amp; Steel bridges and Interstate form major gateways</td>
</tr>
</tbody>
</table>

2) The list of patterns not present should be analyzed in relation to the inherent culture and character of the site. All patterns should be tested for veracity in relation to a specific site. In order to be viable, they should satisfy all three core agendas: they should be viable socially, economically, and ecologically. If they are deemed inappropriate or unviable on a particular site, they should be ignored.
Additional non-present patterns that are deemed especially applicable to a site should also be added to this list.

**Because of its configuration and lower-density surroundings, individually-owned shops & corner grocery would most likely not be economically viable. Likewise, its physical configuration makes parallel roads equally inviable. Therefore, the patterns that should be pursued in the enhancement of the district are:**

- Walkable Community
- Pedestrian Density
- Green Streets
- Self-Sufficiency
- Scattered Work
- Zero Waste
- Energy Independence
- Water Neutral
- Urban Agriculture
- Diverse Neighborhood
- Manageable Scale
- Life Cycle
- Building Fronts
- Accessible Green

3) With the list of missing patterns formed to the needs of the site, preliminary design exercises can begin to establish actionable strategies in a district. Strategies and tactics that manifest multiple patterns should be implemented first, followed by secondary actions that round out a district.

**Analyzing possible interrelationships among missing patterns, there are many possible strategies that could be employed that address them holistically. Because of the district’s lack of any internal viability, this must be addressed as a first priority. Efforts to bring in mixed-use and mixed-income infill development could attend to many of these. Also, the large roof surfaces of the two existing arenas could certainly be used for water management or energy production. The large open spaces, currently vacuums, could be used for public space or urban agriculture.**
Bibliography


