

# LLOYD ECODISTRICT ROADMAP PROJECT PLAYBOOK

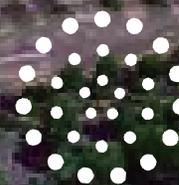
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portland  
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# Existing Building Efficiency Program

A Building Efficiency Program provides property owners and commercial tenants with resources and tools to improve the performance of facilities. Energy and water efficiency are important, as are waste removal and proximity to transportation infrastructure. Existing building retrofits include upgrades to building HVAC systems and lighting to save energy and water.

There are two primary types of commercial building retrofits: conventional and deep.

Conventional energy retrofits focus on individual system upgrades with a short payback of three years or less, such as lighting systems and retro commissioning. Deep energy retrofits achieve much greater energy efficiency by taking a whole-building approach to address many systems at once.

A deep energy retrofit combines measures such as energy-efficiency equipment, air sealing, moisture management, controlled ventilation and insulation so that energy savings are achieved alongside optimal building performance.

## Opportunities in the Lloyd District

In the Lloyd District, a comprehensive building retrofit program would increase the value of the existing building stock and conserve energy, water and potentially waste. The collaborative nature of the EcoDistrict creates the potential to aggregate assessment and retrofit work, producing economies of scale that save time and money. According to the recently published Lloyd EcoDistrict Roadmap, by 2035, existing buildings in the Lloyd District will consume 36% of total annual energy. These buildings are primarily commercial. Aggressive, yet proven, building retrofit strategies could be utilized to reduce existing building energy demands by 20-40%.

### EXAMPLE PROJECTS

- Seattle 2030 District: Over thirty building owners and managers in downtown are collectively approaching retrofits for their commercial buildings <http://www.2030district.org/seattle/>
- Living City Block: Aggregate approach to financing multiple building retrofits <http://www.livingcityblock.org/>

### ECONOMICS

- Retrofitting existing buildings to reduce energy demand would cost approximately \$46,600,000, and would

result in reduced energy costs of \$6.2M for an ROI of 8 years (per Lloyd EcoDistrict Roadmap, October 2012)

- Investment by private sector property owners or third party Energy Services Company (ESCO); private delivery program would reduce retrofitting costs to property owners up to 100%

### PERFORMANCE IMPACT

- Existing building retrofits are expected to achieve an overall 10% energy savings in Lloyd, an important step to meeting the Lloyd EcoDistrict goal of 60% energy reduction by 2035
- Existing building retrofits are expected to achieve an overall 14% water savings in Lloyd, an important step to meeting the Lloyd EcoDistrict goal of 58% water reduction by 2035

### IMPLEMENTATION PARTNERS

- Lloyd EcoDistrict Board
- Northwest Energy Efficiency Alliance
- Energy Trust of Oregon
- Pacific Power
- City of Portland's Sustainability at Work program



## IMPLEMENTATION

# High Performance New Buildings

High performing new buildings are an essential part of any EcoDistrict performance strategy. New buildings provide an opportunity to innovate and set new standards for energy, water and waste performance and may achieve goals like net zero energy much more easily than existing buildings. Some cities or neighborhoods institute a LEED Gold minimum or potentially a more customized and site specific standard regarding energy and water performance in Northwest buildings or connections to district utilities in the area.

## Opportunities in the Lloyd District

As an EcoDistrict, Lloyd will encourage high performance standards for all new construction projects. New development suggests a need to create clear performance guidelines to ensure that new projects fulfill the EcoDistrict vision. Such guidelines demonstrate a collective commitment to sustainability. By creating a new business as usual for new development, Lloyd creates a more desirable building portfolio to attract strong tenants and sets a model for other districts in the City and region.

According to the recently published Lloyd EcoDistrict Roadmap, sixty four percent of energy demand by 2035 will come from new buildings. Should new buildings achieve LEED certification, energy reduction benefits would range from 15-55%. Assuming all new buildings achieve LEED Gold, the overall energy reduction benefit would be around 30%.

## EXAMPLE PROJECTS

- Seattle 2030 District: Provides performance standards for over thirty buildings in downtown Seattle in areas of energy, water and carbon <http://www.2030district.org/seattle/>

## ECONOMICS

- No net anticipated cost (current Portland building marketing assumes no cost premium for LEED Silver and many developers are finding no cost premium for LEED Gold)
- Investment by private sector district stakeholders

## PERFORMANCE IMPACT

- New building performance is expected to achieve an overall 30% energy savings in Lloyd, an important step to meeting the Lloyd EcoDistrict goal of 60% energy reduction by 2035
- New building performance is expected to achieve an overall 30% water savings in Lloyd, an important step to meeting the Lloyd EcoDistrict goal of 58% water reduction by 2035

## IMPLEMENTATION PARTNERS

- Developers and private property owners
- City of Portland Green Building Program

*timeline-* Achievable within five years

# Aggregate Renewable Energy Program

Interest in bulk solar energy programs soared in the past few years. The most common model is direct ownership in which multiple homeowners agree to purchase solar for their homes with the incentive that the more people who signed up, the lower the cost. This is known in many parts of the country as “Solarize.” An organizing entity releases an RFP to solar providers and installers and the winning bid goes to the company that offers the lowest cost. Fundamental to the aggregate solar model is the notion of competitive contractor selection. The model has expanded to include solar leases in which third party solar investors own and operate a system while a homeowner provides a rooftop and receives discounted electricity costs. The model now includes commercial buildings, primarily through a third party model in which an investor owns and operates a system on the roof of a commercial building owner.

## Opportunities in the Lloyd District

Early conversations with the Lloyd EcoDistrict working group identified interest in a bulk solar renewable energy contract in which a third party owners would install and maintain solar arrays on the rooftops of major buildings in the district. The large scale of roofs, such as the Memorial Coliseum and Oregon Convention Center, provide an attractive opportunity to third party solar investors and this aggregated approach means more demand and roof space. This approach is the most cost effective renewable energy solution for Lloyd building owners and creates the most appeal for third party investors.

A recent solar energy analysis of the Lloyd EcoDistrict, completed by the National Renewable Energy Lab, estimated that 2% of annual energy demand could be satisfied through on-site solar PV installations. Future roof top area will be around 250 acres, given a typical coverage of 50% and an adoption rate of 75%, 4,000,000 SF of roof top would be available for solar PV. This would generate approximately 62,000,000 kW annually, providing 5% of annual energy needs.

### EXAMPLE PROJECTS

- Solarize Portland: Bulk solar installation program with a model that has expanded to cities and states around the

country - [www.solarizeportland.org](http://www.solarizeportland.org)

- Solarize Harvard: Residential and commercial loan program for Cambridge area bulk solar program - [newenglandcleanenergy.com/solarizeharvard/](http://newenglandcleanenergy.com/solarizeharvard/)
- Solar Roadmap: Platform for aggregate solar delivery to municipalities and large commercial areas - [solarroadmap.com](http://solarroadmap.com)

### ECONOMICS

- Maximizing solar installation on building rooftops would cost approximately \$238M, reducing electricity costs by \$4.2M annually, for a return on investment of 56 years
- To reduce solar costs and drive adoption, consider a private solar energy provider to create a district scale solar program to finance, deliver, own and maintain a system across multiple rooftops

### PERFORMANCE IMPACT

Renewable energy is expected to achieve an overall 5% energy savings in Lloyd, an important step to meeting the Lloyd EcoDistrict goal of 60% energy reduction by 2035

### IMPLEMENTATION PARTNERS

- Lloyd EcoDistrict to lead procurement
- Private third party solar provider to deliver



# District Energy Utility

District energy systems provide an energy-efficient and cost-effective option for heating and cooling multiple buildings from a central plant using a network of underground pipes to pump steam, hot water, and/or chilled water to buildings in a given area such as a downtown district, college or hospital campus or airport. Providing localized heating and cooling requires less fuel and avoids the need to install separate heating and cooling and hot water systems in each building. District energy systems use a variety of conventional fuels such as coal, oil and natural gas. Because of the system's size, the district energy plant can also transition to use renewable fuels, such as various forms of biomass including wood and food processing waste, geothermal heat, and combined heat and power. Often, district energy systems are connected to combined heat and power (CHP) plants.

## Opportunities in the Lloyd District

The density and proximity of buildings in the Lloyd District create an excellent economic and environmental case for district energy. A new system is in development at the Rose Quarter. The first phase will connect Veterans Memorial Coliseum (VMC) and the Rose Garden Arena. The second phase will connect the Oregon Convention Center to the district. The third phase will expand the system to include a second node near the Lloyd Mall and central district. Expansion of this system has the greatest potential to dramatically improve energy performance across the entire district and save operating costs. Analysis from the first phase of work found that in addition to fulfilling the City's 2012 Climate Plan goal for new district energy, the District Energy system could provide multiple benefits specific to the VMC renovation project. Most notably, over \$1.3 million (preliminary) from the project's capital budget would become available as new heating and cooling mechanical systems would be replaced by the system – all while meeting VMC's aggressive construction schedule. Additional benefits would include much needed LEED points to help VMC achieve its city-mandated LEED goal. Similar benefits would accrue to other buildings in the district that connect to the district energy system.

### EXAMPLE PROJECTS

- Seattle Steam District Energy System: Privately-owned utility that provides reliable and sustainable heat to approximately 200 buildings in downtown Seattle - [seattlesteam.com](http://seattlesteam.com)

- SE False Creek Neighborhood Energy Utility: Provides space heating and hot water to new buildings at the Vancouver Olympic Village neighborhood through sewer heat recover - [vancouver.ca/home-propertydevelopment/neighbourhood-energy-utility.aspx](http://vancouver.ca/home-propertydevelopment/neighbourhood-energy-utility.aspx)
- Nashville District Energy System: The Nashville District Energy System is natural gas fired system serving downtown Nashville. The idea of a district system dates back to the early 1970s, while the current facility was opened in 2004. [http://www.nashville.gov/des/history\\_of\\_metro.asp](http://www.nashville.gov/des/history_of_metro.asp)

### ECONOMICS

- Overall cost of district energy in Lloyd would be about \$45M, generating over \$2.25M in annual energy savings for a return on investment of twenty years.
- Investment led by private, third party district utility provider

### PERFORMANCE IMPACT

- Converting building thermal systems to district thermal systems could reduce district energy demand by 10-30%. The overall energy reduction benefit of implementing a district energy system for Lloyd would be 25%.

### IMPLEMENTATION PARTNERS

- Lloyd building owners
- City of Portland
- Third party district utility provider

*timeline* - Achievable within two years

## IMPLEMENTATION

# District Water Utility

District water management systems collect, treat and disperse or reuse wastewater or stormwater from individual buildings and streets. These systems may treat sewage and stormwater onsite through natural and/or mechanical processes, or may use a more distributed approach to collect and treat water at a neighborhood, district, or small community scale. Examples of decentralized approaches range from passive systems such as composting toilets, gravity fed grey water wetland treatment systems and living machines, to more energy-intensive bio filters and membrane bioreactors. Studies indicate that more distributed methods of collection, which rely mostly on gravity-fed pipes, will have fewer negative environmental impacts than systems that expend large amounts of energy for conveyance.

## Opportunities in the Lloyd District

A district water utility in Lloyd would provide a reclaimed water supply that collects, treats and distributes treated wastewater and stormwater in order to achieve a water balance within the district that reduces consumption and saves costs. A district water utility should be established for the Lloyd EcoDistrict to provide a reclaimed water supply. Reclaimed water should be supplied to all new buildings development within the district. At least one third of the district will meet reduction goals through the use of treated wastewater. The Lloyd EcoDistrict should engage with a private 3rd party water company to develop the system. Further study will be needed.

### EXAMPLE PROJECTS

- Anita B. Gorman Conservation Discovery Center: Treats wastewater through a Living Machine - [sustainablesky-lineskc.org/projects/waterwise-workshopregistration.asp](https://sustainablesky-lineskc.org/projects/waterwise-workshopregistration.asp)

- Oregon Health + Science University Membrane Bioreactor: Treats wastewater from high building in basement treatment system - [portlandoregon.gov/bps/42606](http://portlandoregon.gov/bps/42606)

### ECONOMICS:

- Investment by private, third party district utility provider

### PERFORMANCE IMPACT

- District water is anticipated to contribute to an overall water savings of 14%, significantly contributing towards the Lloyd District's 58% water reduction goal

### IMPLEMENTATION PARTNERS

- Lloyd property owners
- City of Portland
- Private energy utility (likely Corix Utilities)



*timeline* - Achievable within next two years



IMPLEMENTATION

# Green Sites

Green sites refer largely to a concept called, “the green factor,” a ratio of vegetative to non-vegetated area within a property boundary. It is a landscape measure designed to increase the quantity and quality of planted areas. Vegetation includes features like stormwater management, native vegetation, green roofs, vegetated walls and overall percentage of vegetated area. As a standard, and sometimes code requirement, it may provide a required minimum percentage of site area that is vegetated. It is designed for flexible use with a range of landscape measures that meet the requirement.

## Opportunities in the Lloyd District

Green sites, or a green factor minimum, would enable property owners to support overall district green infrastructure goals within their own property lines and complement the public investments in the right of way improvements. An adopted green factor would provide baseline standards for all buildings sites in the district. Lloyd specific standards would include flexibility for property owners and designers to meet the standard through the most appropriate site-specific means.

### EXAMPLE PROJECTS

- Seattle Green Factor: currently applies to new development in commercial and neighborhood commercial zones outside of downtown, and is proposed for multifamily residential zones - [seattle.gov/dpd/permits/greenfactor/](http://seattle.gov/dpd/permits/greenfactor/)
- Sustainable Sites Initiative: a voluntary national guide-

lines and performance benchmarks for sustainable land design, construction and maintenance practices - [sustainable-sites.org/](http://sustainable-sites.org/)

### ECONOMICS

- No additional cost assuming all development meets Portland’s Stormwater Management Manual standards

### PERFORMANCE IMPACT

- This goal requires 142 of the 177 acres in the district to be managed with green infrastructure
- A green sites, or green factor, strategy is expected to achieve an overall 80% green infrastructure management goal for the district

### IMPLEMENTATION PARTNERS

- Developers and private property owners
- Portland Bureau of Environmental Services



*timeline-* Achievable in five years



Pre-Settlement Conditions

Historical Urban Development

Urban Greening

## IMPLEMENTATION

# Green Infrastructure Corridors

Green infrastructure corridors connect a series of greenstreets through a hierarchy that manages stormwater, provides ecosystem services and connects habitat in a continuous manner allowing native flora and fauna to thrive at a larger scale than one green street planter. Such corridors fully maximize and integrate green infrastructure into a street environment, creating a pedestrian scale while increasing natural habitat.

## Opportunities in the Lloyd District

The greatest opportunity for green infrastructure corridors in Lloyd is to build them into the streets plan of the N/NE Quadrant Plan. Every new street retrofit and design should be part of a broader stormwater management plan that contributes ecosystem services. Priority streets include Holladay (work underway) as well as Clackamas, Interstate, Lloyd, 2nd, 6th, and 15th.

### EXAMPLE PROJECTS

Grey to Green: City of Portland program prioritizing green infrastructure over grey infrastructure, organized by watersheds within the City <http://www.portlandonline.com/bes/index.cfm?c=47203&a=321331>

Community Green Stormwater Infrastructure Programs: Philadelphia Water Department program designed to connect Philadelphians with the natural water environ-

ment [http://www.phillywatersheds.org/what\\_were\\_doing/green\\_infrastructure](http://www.phillywatersheds.org/what_were_doing/green_infrastructure)

### ECONOMICS

- Anticipated cost of the Greenstreet Corridors is approximately \$38M
- Primary investment by public sector, particularly Portland Bureau of Environmental Services

### PERFORMANCE IMPACT

- Supports EcoDistrict goals for 100% of streets to be green streets

### IMPLEMENTATION PARTNERS

- Lloyd EcoDistrict Board
- Portland Bureau of Environmental Services
- Portland Bureau of Transportation



*timeline* - Achievable in next ten years





IMPLEMENTATION

## Green Streets

Green streets are an important part of a green infrastructure strategy and provide a means for managing stormwater while also introducing native habitat and creating a sense of place. Through the use of nature-based stormwater facilities (rain gardens, stormwater planters, eco-roofs) and landscaping (trees, street trees, native vegetation), green streets recreate lost hydrologic function. Urban stormwater is typically managed through underground pipes, or “grey” infrastructure. Green streets emphasize the hydrological cycle and the interception, infiltration, detention, and evapotranspiration of as much rainfall as possible rather than conveying surface runoff into pipes and streams.

### Opportunities in the Lloyd District

A green streets strategy in Lloyd starts with a green streets master plan, which will ensure a coordinated and connected approach to managing stormwater and bringing nature into the neighborhood. Achieving this strategy would include installation of approximately 900 green street stormwater planters. All streets in the Lloyd District should be green streets with connections between them that support cohesive and connected vegetation.

#### EXAMPLE PROJECTS

- White Oak Neighborhood Stormwater Retrofit: low impact development green street retrofit in Montgomery, MD - [montgomerycountymd.gov/dectmpl.asp?url=/Content/dep/water/whiteoak.asp](http://montgomerycountymd.gov/dectmpl.asp?url=/Content/dep/water/whiteoak.asp)
- Tabor to the River: Portland strategy to replace aging pipes with surface level green streets to manage

stormwater - <http://www.portlandonline.com/bes/index.cfm?c=47591>

#### ECONOMICS

- The anticipated cost for district wide green streets is \$9M
- Primary investment would be led by the public sector, particularly Portland Bureau of Environmental Services

#### PERFORMANCE IMPACT

- Supports 80% green infrastructure management goal of Lloyd the district

#### IMPLEMENTATION PARTNERS

- Lloyd EcoDistrict Board
- City of Portland Bureau of Environmental Services



*timeline* - Achievable within next two years

## IMPLEMENTATION

# Car Sharing

Car sharing, a form of collaborative consumption, is a means to increasing access and mobility without requiring personal automobile ownership. It is car renting for short periods of time, often by the hour. Such access is appealing to users who only need occasional access to a vehicle or who need access to a particular type of vehicle (such as a van or truck). Companies like Zipcar provide easy access to a huge fleet of vehicles parked at strategic locations through a city. With the swipe of a card, users can unlock a vehicle and use it for daily needs. Programs like this reduce the burden of ownership saving operating costs and material waste while reducing cars on the street.

## Opportunities in the Lloyd District

As a pioneer in transportation management, expanded car sharing options present a natural next step for the Lloyd District. The EcoDistrict might work with residential and commercial building owners to develop programs and incentives to use car sharing programs in an effort to further reduce mode split in the district. Car sharing increases transportation options while saving costs and reducing congestion and related carbon emissions.

### EXAMPLES

- Car2Go: car sharing program that manages a fleet of vehicles and allows members to pick up and drop off a car at any legal parking spot within a defined boundary - car2go.com
- Getaround: Peer to peer car sharing program that allows owners to put their personal vehicle on a car sharing

network - getaround.com

### ECONOMICS

- No anticipated cost for Lloyd stakeholders if partnering with existing program; cost per use for those who participate in program

### PERFORMANCE IMPACT

- Increases mode split and reduces vehicle miles traveled and associated GHG emissions

### IMPLEMENTATION PARTNERS

- Lloyd EcoDistrict Board
- Lloyd Transportation Management Association
- Portland Bureau of Transportation
- Car sharing Companies (such as Getaround, Car2Go and Zipcar)

The screenshot shows the Getaround website interface. At the top, there's a navigation bar with 'GETAROUND' logo, 'Join', 'Tour', 'Sign In', and 'List Your Car' buttons. The main content area features a large banner with the text 'Rent a car from someone nearby. Convenient hourly rentals. Full Insurance included.' and a 'Join Now' button. Below the banner, there's a grid of car listings. A yellow banner is overlaid on the grid with the text 'timeline - Achievable within next two years'. The listings include:

Company	Vehicle	Location	Rate
Buick	Nissan Xterra	San Francisco, California	\$5 / hour
constantx	BMW 328i	San Francisco, California	\$15 / hour
tesla	Tesla Roadster	San Francisco, California	\$50 / hour
MissionP	Toyota Prius	San Francisco	\$7.25 / hour

# Bike Sharing

A bike-sharing system is a public active transportation program composed of interconnected stations that exchange bicycles for free (first 30 minutes) or at an affordable rate for short distance trips in urban areas. These programs have been developed as an alternative to motorized transportation to prevent its negative externalities, and also as a response to the increasing need for urban sustainable development. It presents a way to resolve health problems associated with sedentary lifestyles, such as obesity.

## Opportunities in the Lloyd District

In the spring of 2012, the City of Portland released an RFP to hire a firm to design, build and operate a public/private bike sharing system for the central city. Construction is expected to begin in 2013. As a pioneer in transportation management, this new system is a natural fit and benefit for the Lloyd District and will provide improved access within the district and to other parts of the city. The EcoDistrict should work with the City, and the private operating partner to ensure the district is well served and help provide incentives for residents and employees to use it.

### PRECEDENT PROJECTS

- B-cycle: Community and public bike sharing system now

functioning in multiple US cities: [bcycle.com](http://bcycle.com)

- The VÉLO'v Program, Lyon, France: [velov.grandlyon.com](http://velov.grandlyon.com)

### ECONOMICS

- No anticipated cost for Lloyd stakeholders if partnership with existing program
- Performance Impact
- Increases mode split and reduces vehicle miles traveled and associated GHG emissions

### IMPLEMENTATION PARTNERS

- Lloyd EcoDistrict Board
- Lloyd Transportation Management Association
- Portland Bureau of Transportation



*timeline*- Achievable within next two years



## IMPLEMENTATION

# District Dashboard

A district dashboard is a technology designed to increase awareness of energy consumption and track district, and building level, performance. Most systems and software display real time performance data including energy and water consumption across the district and at the building level. The dashboard could be made accessible at the property (accessible to employees by desktop computers) and district (kiosks in public space) scale. This kind of dashboard technology creates heightened awareness about resource consumption and would support a district-wide resource conservation challenge between buildings, or floors of buildings, to further drive resource reduction efforts by creating competitions between tenants in the district.

## Opportunities in the Lloyd District

This approach would build awareness of the overall impacts of the Lloyd district and trigger changes in the behavior and routines of residents and workers in order to increase resource efficiency of the district.

### EXAMPLE PROJECTS

Seattle 2030 District: A partnership with Lucid resulted in a customized district dashboard to track energy, water and carbon performance of over thirty commercial buildings in a district - [buildingdashboard.net/seattle2030district/](http://buildingdashboard.net/seattle2030district/)

### ECONOMICS

- Anticipated cost of \$100k for system including building

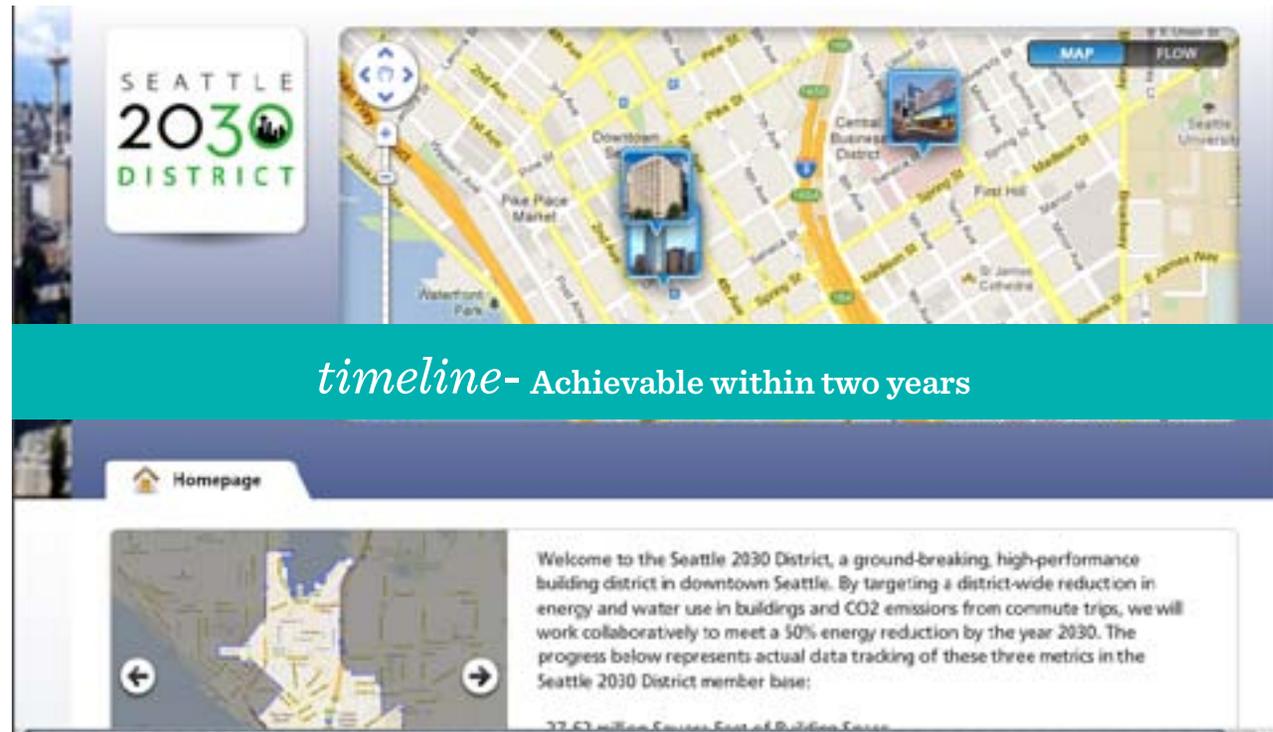
- level monitors and centralized software system
- Investment by private stakeholders in Lloyd District

### PERFORMANCE IMPACT

- Directly supports efficient district goals to reduce energy, water and waste consumption

### IMPLEMENTATION PARTNERS

- Lloyd EcoDistrict Board
- Lloyd Property Owners
- Technology partner to develop dashboard





# Zero Waste Program

A zero waste program integrates many strategies to manage waste streams produced by a community. Strategies may include a Zero-Waste Program Committee; program scoping and goal setting; waste stream mapping, implementation plan, and monitoring. Working as a district to address waste can lower fees, uncover market opportunities and expand access to services for all of the participants.

## Opportunities in the Lloyd District

Achieving the ambitious waste reduction goals of the Lloyd District will require a significant focus on commercial development, which is projected to account for 98%. Lloyd should establish a waste reduction working group to drive the effort and to make collaborative, binding decisions about priorities, investments, engagements and outreach. Once committed to taking on the large and complex tasks of aggressive waste reduction at a district scale, it is important to first and foremost develop a very clear understanding of priority goals, waste stream and resources. Like any major project, a waste reduction initiative should be developed through and follow a thoughtful and managed process. The approach should include: 1) Project Scope and Initial Goal Setting; 2) Waste Stream Mapping; 3) Review Project Scope and Goals; 4) Implementation Plan with Benchmarks; 5) Project Implementation; 6) Benchmark and Implementation Plan Review; 7) Project Implementation; 8) Project Evaluation and Reporting.

As part of the District Zero-Waste Program, Lloyd may consider: 1) District Rate Negotiation - The District should considering leveraging its large number of properties to potentially reduce hauler collection rates. 2) Recycled Resource Monetization - Based on the development of the

District Zero-Waste Program, district scale collection of recycled resources (plastics, glass, paper, organics) could provide a revenue stream to the district. This revenue could be used to offset program delivery costs in addition to providing participating properties added revenue.

### EXAMPLE PROJECTS

- Roadmap to Zero Waste Protocol - <http://www.zerowaste.org/our-work.html>
- Zero Waste Palo Alto - <http://www.city.paloalto.ca.us/gov/depts/pwd/zerowaste/default.asp>

### ECONOMICS

- Overall, the creation of a district zero-waste program for Lloyd should create a self-funding and self-sustaining program that generates value back to the district

### PERFORMANCE IMPACT

- Achieve 93% waste reduction

### IMPLEMENTATION PARTNERS:

- Lloyd EcoDistrict Board
- Zero Waste Alliance
- Waste haulers

