portland sustainability institute

The EcoDistricts Toolkit: **Assessment**

Prioritizing Projects in an EcoDistrict

rendering: ZGF Architects and Portland Sustainability Institute

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EcoDistricts Assessment Overview

Introduction

Background

Global challenges like climate change, resource scarcity and urbanization threaten the stability of life in metropolitan regions. For the first time in history, the majority of the world's population lives in cities, and these urban regions anticipate even greater growth. This concentration of people and resources means that cities are increasingly critical in addressing these challenges, compelling the search for and adoption of urban sustainability solutions. As cities grapple with these pressing issues, the question of scale becomes increasingly important — scale of change, scale of impact and scale of risk. International precedents show that districts and neighborhoods provide the appropriate scale to test integrated sustainability strategies because they concentrate resources and make size and risk more manageable.

An EcoDistrict is a neighborhood committed to sustainability with empowered people, green buildings and smart infrastructure. EcoDistricts are a comprehensive strategy to accelerate sustainable development at the neighborhood scale by integrating building and infrastructure projects with community and individual action. They are an important scale to accelerate sustainability — small enough to innovate quickly and big enough to have a meaningful impact. They offer a meaningful way to test and integrate the neighborhood-based solutions that cities urgently need.

The approach is simple: use EcoDistricts as "public-private innovation zones" where the latest in business practice, technology and supportive public policy comes together to drive ambitious sustainability outcomes.

The EcoDistrict approach begins with District Organization, or engagement and governance to provide the district with the leadership, capacity and structure to implement an EcoDistrict. This process includes defining a vision for the EcoDistrict with broad support and buy in. This process is captured in the Portland Sustainability Institute's *EcoDistrict Organization* toolkit. The vision developed in this phase guides EcoDistrict Assessment.

With a governance structure and vision in place, the first question asked is, "What projects should we take on?" or "How do we pick projects?"

The Assessment Toolkit

The EcoDistrict Assessment toolkit is a performance standard and process for prioritizing district-scale projects based on eight performance areas. It is designed to be a rigorous, yet user-friendly, framework for creating a performance baseline, setting goals and identifying projects to meet those goals. It requires both data collection and stakeholder involvement. This toolkit provides resources for every step of the process.

By taking this broad and integrated approach across multiple strategies and performance areas, it is possible to identify the most appropriate high impact projects for a particular EcoDistrict.

The strategies and projects identified in this toolkit, specifically in the Project Palette, have significant district-scale impacts. They are not an exhaustive list but represent a range of highly effective and recommended neighborhood sustainability strategies. The strategies and projects are most effectively deployed at the district scale.

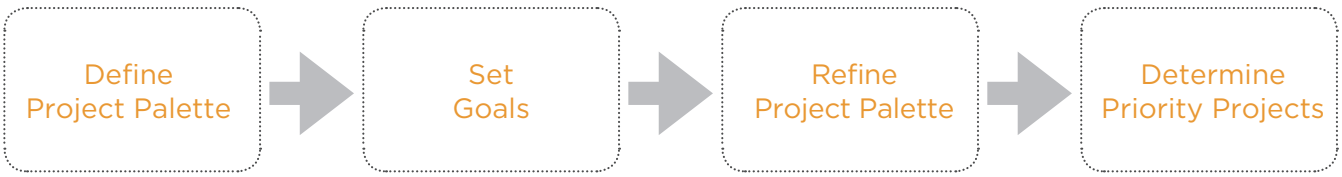
Assessment Process

The Portland Sustainability Institute developed this EcoDistrict Assessment Process in response to a lack of industry tools that effectively assess neighborhood sustainability and inform project priorities. It captures the major components of a sustainability master plan and distills them into a series of targeted steps and tools for a more time and cost effective process. It is designed to guide users through the process of working with a district to understand neighborhood interests, apply EcoDistrict performance areas and determine project priorities.

The assessment process provides a tool for cities and neighborhoods to understand existing neighborhood performance, set targets and develop strategy recommendations to achieve EcoDistrict goals. The outcome is a clear set of project priorities to meet established performance goals.

Assessment implementation may be led a city, by community members with some data collection support, or by a consultant team.

The process includes four main steps:



1. Define the Project Palette for the EcoDistrict

Key question: What are the most promising projects that would help meet the EcoDistrict vision adopted in the District Organization phase?

How: Identify a set of promising of projects (buildings, infrastructure and programs) that support the vision and EcoDistrict performance areas

Tool: Project Palette (to be customized by district)

2. Gather Baseline Data and Set Targets that Support Performance Area Goals

Key question: How well is the neighborhood performing and what targets will achieve EcoDistrict goals?

How: Determine baseline for each performance area using available metrics that provide the most useful indicators for the performance area. Determine timeline to achieve EcoDistrict goals and set district-specific targets based on the performance baseline. Related tasks include:

- Define the EcoDistrict's working boundary
- Use growth projections and/or zoning capacity studies to estimate future demand
- Gather data based on recommended metrics per performance area
- Using EcoDistrict goals, match baseline data to long-term goals
- Define targets with specific dates to measure progress toward long-term goals
- Consider evaluating existing local policies so that EcoDistrict targets meet or exceed established goals

Tool: EcoDistrict performance areas with goals, strategies and metrics

3. Refine the Project Palette

Key question: Which of the potential projects will most effectively help achieve the eight performance area goals?

How: Narrow the original project palette based on Step 2 to identify the strategies that most effectively meet long-term goals.

Tool: Project Palette

Notes: Consider "stacking" projects within each performance area to understand cumulative effects of multiple projects towards long-term performance goals (i.e., strategies that reuce, produce and offset energy)

4. Select High Impact Project Priorities

Key question: What are the highest impact projects that meet multiple goals? Which of those high impact project priorities are most feasible to implement?

How: Filter all projects in refined project palette through the Performance Matrix to determine strategies that meet most goals. Filter projects through Feasibility Matrix to determine ease of implementation and create short-term action plan.

Tool: Performance + Feasibility Matrix

Notes: Matrix can be customized by district.

The outcome of this four-step process are project priorities (as many as the EcoDistrict is prepared to take on) selected through a rigorous screening process.

rendering: ZGF Architects and Portland Sustainability Institute

Tools

This toolkit provides the following tools to support completion of an EcoDistrict Assessment. There is a tool for each step.

EcoDistrict Performance Areas

The EcoDistrict performance areas address eight major categories important to neighborhood sustainability:

- Equitable Development
- Health + Well Being
- Community Identity
- Access + Mobility
- Energy
- Water
- Habitat + Ecosystem Function
- Materials Management

Each performance area includes the following structure and content:

- Goal: Long-term aspiration for performance
- Objectives: The means to achieve the goal
- Measures of Success: Indicators by which the performance area may be measured. These are suggested metrics based on those broadly collected by cities, but must be evaluated based on available data sets in a particular city. This data is most effectively collected and managed by a city. Appendix C indicates where a measure aligns with Portland plans.

Project Palette

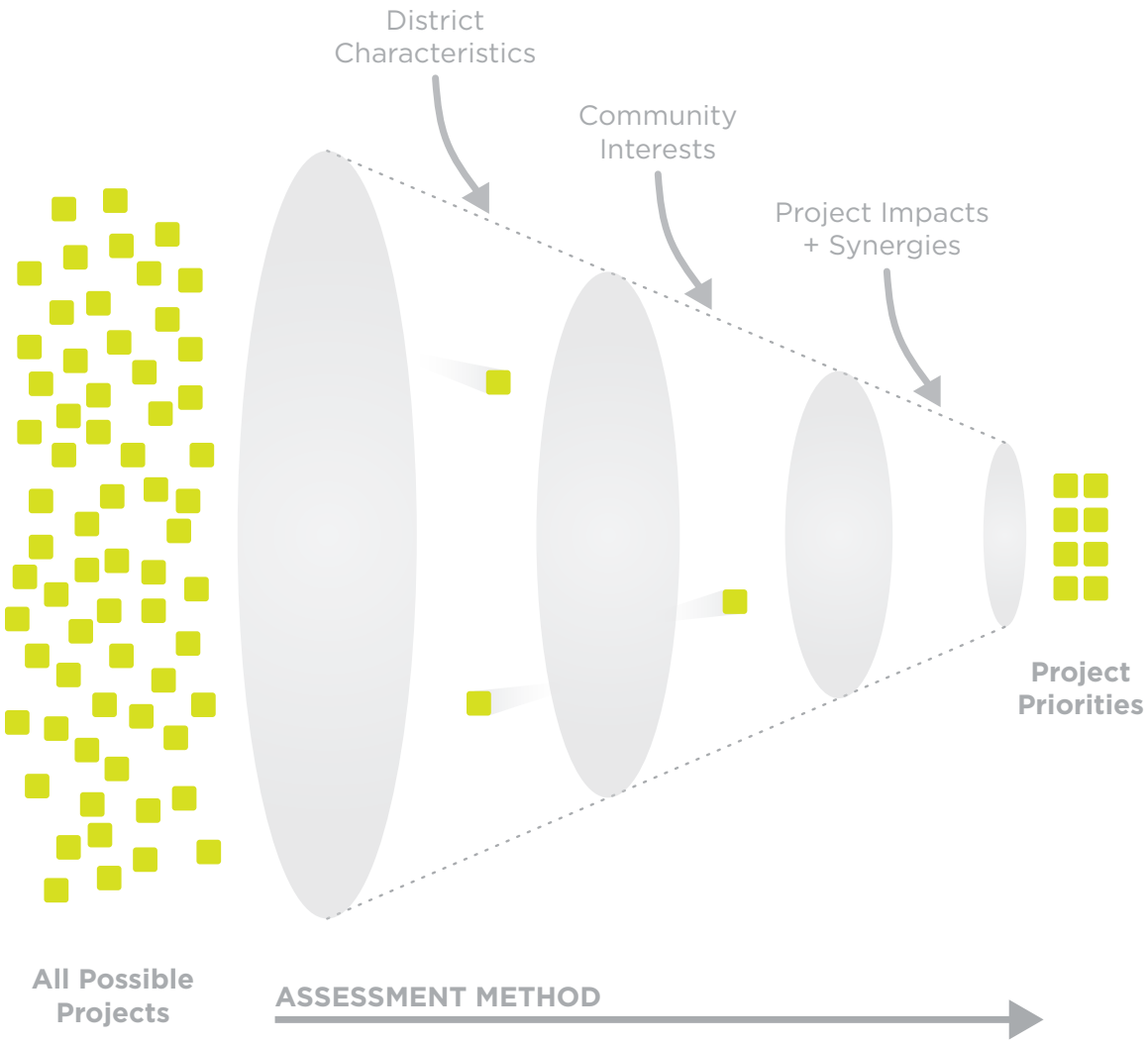
The EcoDistrict Project Palette provides a menu of proven projects that help achieve EcoDistrict performance areas and may be effectively deployed at a neighborhood scale. It is organized by the eight performance areas. EcoDistricts can customize this Project Palette to include the strategies and projects that are most interesting and effective for their neighborhood. EcoDistricts will refine and narrow the Project Palette after the goal setting phase.

Performance + Feasibility Matrix

The Performance + Feasibility Matrix is a screening tool for weighting the overall performance impacts and feasibility of potential projects. It has two sections, one for performance areas, where projects are evaluated based on how many performance areas are met, and one for feasibility, where projects are evaluated based on ease of implementation.

Next Steps

Upon completion of an EcoDistrict Assessment, the next step is feasibility and project development for the priorities identified through the Assessment. Feasibility will likely include additional data collection with measures specific to the project being pursued.



Tool 1: EcoDistrict Performance Areas

Background Context

These performance areas are the critical performance considerations for an EcoDistrict. They provide a framework for the interrelated issues that must be addressed by all EcoDistricts and fundamentally support healthy, livable neighborhoods. They cover the great challenges faced by urban areas and the opportunities neighborhoods have to meaningfully address those challenges. The performance areas heavily weight environmental and social outcomes, recognizing that economic outcomes already drive decisions.

In developing these goals, strategies and metrics, the EcoDistricts Technical Advisory Committee (TAC) reviewed related existing and emergent assessment tools and rating systems including: The Living Building Challenge, Sustainable Sites Initiative, LEED for Neighborhood Development, One Planet Living and STAR Community Index. The TAC also reviewed policy precedents with requirements related to the performance areas.

Performance Area 1:
Equitable Development

Intent[1]

This performance area intends to leverage EcoDistrict projects to bring greater equity and opportunity through their development. It addresses the related equity opportunities and benefits of environmental investments in a neighborhood. These projects are a means for job creation and training, local investment, improved neighborhood vitality and access to decision making. EcoDistrict project development must be done in an equitable and just way that brings direct benefit to those currently living and working in a neighborhood. This performance area recognizes the inherent equity opportunity of EcoDistrict projects and process.

Goal

Promote equity and opportunity and ensure fair distribution of benefits and burdens of investment and development.

Objectives

1. Ensure neighborhood investments provide direct community benefit through job creation and investment opportunities
2. Provide quality and consistent local job opportunities through EcoDistrict projects
3. Mitigate the forced displacement of existing residents and businesses
4. Ensure diverse stakeholder involvement in all EcoDistrict activities and decision making

Potential Measures of Success[2]

- Diversity Index: Reports the percentage of time two randomly selected people differ by race/ethnicity
- Income Distribution: Measures distribution across five income brackets in a geographic area
- Dissimilarity Index: Measures whether a particular group is distributed across census tracts in the city in the same way as another group
- Percentage of Community Members that are Self-Sufficient: Measures whether an income is sufficient to meet the basic needs of most adults including the cost of housing, childcare, food, healthcare and transportation
- Displacement: Measures whether residents or businesses will be relocated or displaced as a result of new project development

1 This area was included with the recognition that its metrics will be challenging to collect. An EcoDistrict priority is to collect data that provides more effective indicators for this performance area.

2 Where appropriate, disparity by income, race/ethnicity, geography, age ability or gender will be considered for specific metrics.

Performance Area 2:
Health + Well Being


Image: flickr user theoellot

Intent

This performance area intends to advance the health and wellbeing of all people in an EcoDistrict. The creation of great places is, first and foremost, about people. Healthy neighborhoods support healthy, happy people. They achieve better health outcomes and human well being through walkable communities, uncontaminated natural environments and access to basic services and amenities. In modern society, many health inequities result from unequal access to basic services and community benefits. This performance area recognizes that all community members must have access to opportunities to advance their well-being and achieve their full potential.

Goal

Promote human health and community well being.

Objectives

1. Provide access to safe and functional local recreation and natural areas
2. Provide access to healthy, local and affordable food
3. Ensure safe and connected streets
4. Expand economic opportunities to support a socially and economically diverse population
5. Improve indoor and outdoor air quality

Potential Measures of Success[3]

- Percentage of Residents with Access to Neighborhood Parks, Trails and Natural Areas: Measures percentage of residents who live within a half mile of parks and open spaces
- Percentage of Residents With Access to Full-Service Grocery Stores, Farmers' Markets and Community Gardens: Measures percentage of residents who live within a half mile of a location that sells healthy food
- Crimes per Person (Property and Residential): Measures level of comfort and safety felt by individuals walking in their own neighborhoods
- Percentage of Community Members that are Self-Sufficient: Measures whether an income is sufficient to meet the basic needs of most adults, including the cost of housing, childcare, food, healthcare and transportation
- Resident Satisfaction: Measures resident satisfaction with basic city services and their quality of life
- Percentage of Population that Lives within One Quarter Mile of Healthy Food: Measures access to a location that sells healthy food
- Healthy Weight: Measures the percentage of population at a healthy weight
- Exposure to Toxic Chemicals: Measures the impact of industry on human health in a geographic area
- Outdoor Concentrations of NO_x and particulate matter ($PM_{2.5}$): Measures air quality and provides indicator for related human health impacts

3 Where appropriate, disparity by income, race/ethnicity, geography, age, ability or gender will be considered for specific metrics.

Performance Area 3:
Community Identity


Image: flickr user throgers

Intent[4]

This performance area intends to create community and physical place with a unique neighborhood identity. The strategies to create an EcoDistrict will inherently impact the quality of place and the identity of a neighborhood. They provide an opportunity to align projects with identified community values. Community Identity blends social cohesion and placemaking. The relationships between people as well as the urban design are equally essential to creating a community identity. This performance area recognizes the opportunity for an EcoDistrict to provide significant branding and placemaking value to a neighborhood.

Goal

Create cohesive neighborhood identity through the built environment and a culture of community.

Objectives

1. Create beautiful, accessible and safe places that promote interaction and access
2. Foster social networks that are inclusive, flexible and cohesive
3. Develop local governance with the leadership and capacity to act on behalf of the neighborhood

Potential Measures of Success[5]

- Percent Satisfied with Neighborhood: Measures resident satisfaction with quality of their community
- Walking Distance from Cultural Institutions: Measures number of residents within a half mile walking distance to a cultural institution
- Quality and Appearance of Building Stock: Measures the variety of building stock for a more pleasing pedestrian experience
- Quality of Parks and Public Spaces: Measures the quality of public spaces as a value to the neighborhood identity
- Quality of Pedestrian-Scaled Streetscape: Measures how well the streetscape enhances or detracts from the pedestrian experience
- Mix of Desirable Land Uses: Measures the integration of different, compatible land uses
- Commercial Lease/Vacancy Rates: Measure vitality of neighborhood businesses
- Walkability Access: Measures the percentage of residents who live within a half mile of sidewalk-accessible complete neighborhoods
- Accountability in Decision Making: Measures the opportunity for community input in the decision making process
- Diversity of Stakeholder Engagement: Measures the type of outreach and the populations reached out to for stakeholder involvement

4 This area was included with the recognition that its metrics will be challenging to collect. An EcoDistrict priority is to collect data that provides more effective indicators for the performance area.

5 Where appropriate, disparity by income, race/ethnicity, geography, age ability or gender will be considered for specific metrics.

Performance Area 4:
Access + Mobility


Image: flickr user Steven Vance

Intent

This performance area intends to meet mobility needs in an environmentally sensitive way. Transportation is fundamentally about providing access to jobs, housing, education, grocery stores and community amenities. Access + Mobility connects modes of transit (walking, biking, taking the bus or MAX, driving in a carpool or alone) with their related impacts (energy use, emissions and cost). This performance area recognizes that walkability and clean transportation is essential for accessing basic services.

Goal

Provide access to clean and affordable transportation options.

Objectives

1. Provide accessible services through mixed-uses and improved street access
2. Prioritize active transportation[6]
3. Reduce vehicle miles traveled
4. Use low and zero emission vehicles

Potential Measures of Success

- Walkability and Access Rating: Measures the extent to which the built environment is friendly to non-motorized means of transportation
- Walk Score: Measures walking distance to food, schools, parks, entertainment, etc., from designated addresses
- Frequency of Transit Service: Measures how often a bus stop or train station is served
- Access to Transit Services: Measures the distance from housing to bus stop or train station
- Transit Affordability: Measures cost of transit relative to personal income
- Work Commute Mode Split: Measures number of commuters using different modes of transportation (personal car, transit, walking, biking, telecommuting, etc) during commute
- Daily Vehicle Miles Traveled: Measures the total amount of miles traveled in a given area
- Annual Diesel Emissions: Measures impact of diesel emitting vehicles on the environment, typically in micrograms per cubic meter per year
- Annual Carbon Emission: Measures carbon emissions from vehicles, typically as tons of carbon dioxide per year

6 Active transportation refers to human powered modes of transportation including biking, walking, running, etc

Performance Area 5:
Energy

Image: flickr user Orbmiser

Intent

This performance area intends to change the consumption and production of energy resources in order to minimize the carbon emissions of an EcoDistrict. It assumes that it is possible to provide the energy resources necessary for a fully functional neighborhood while eliminating all negative impacts associated with energy consumption. There are many proven strategies that start with conservation and then alternative production to achieve net zero energy through an integrated neighborhood strategy. This performance area recognizes that people must significantly change the way we perceive energy resources.

Goal

Achieve net zero energy usage annually.

Objectives[7]

1. Conserve energy use by minimizing demand and maximizing conservation
2. Optimize infrastructure performance at all scales
3. Use renewable energy

Potential Measures of Success

- Annual Energy Demand: Measures the energy demand of buildings, typically in kBtu/SF/year
- Individual Energy Demand: Measures annual energy demand per capita
- Building Energy Demand: Measures the energy demand of buildings, typically in kBtu/SF/year
- Solar Potential: Measures solar energy potential to take advantage of solar production opportunities[8]
- Annual Carbon Emissions: Measures carbon emissions from vehicles, buildings and industry, typically as tons of carbon dioxide per year

7 The performance goals, listed in order of priority, intend to set an iterative approach to a restorative result.

8 http://www.nrel.gov/gis/solar.html

Performance Area 6:
Water

Intent

This performance area intends to value water as a limited natural resource by redefining its purpose in urban areas. It is both necessary for basic human life and for a healthy ecosystem. In an EcoDistrict, water must meet basic human needs as well as the needs of the local watershed. Meeting this goal requires minimizing the water consumed by people and reusing it multiple times (as rainwater, greywater and blackwater) before treating it and releasing it back into the environment. Only this approach will preserve watershed health, a critical indicator of the health of our natural environment. This performance area recognizes that an EcoDistrict can significantly reduce its potable water demand.

Goal

Meet both human and natural needs through reliable and affordable water management.

Objectives

1. Reduce water consumption through conservation
2. Reuse and recycle water resources wherever possible, using potable water only for potable needs
3. Manage stormwater and building water discharge within the district

Potential Measures of Success

- Stormwater Management: Measures amount and quality of stormwater being managed in the district
- Pervious Area: Measures ratio of impervious to pervious area that accommodates stormwater infiltration
- Potable Water Consumption: Measures demand and consumption of potable water
- Wastewater Treatment: Measures amount of wastewater being treated in the district
- Annual Hydrologic Balance (Baseline and Predevelopment): Measures rainfall, infiltration, evapotranspiration, runoff and/or groundwater as indicators
- Existing Temperature of Creek Runoff: Measures water quality
- Pollution Generating Surfaces: Measures water quality

Performance Area 7:
Habitat + Ecosystem Function

Intent

This performance area intends to restore habitat and ecosystem function to optimal performance in an urban environment. It assumes that there is an appropriate balance between natural and human needs that does not compromise the health of flora and fauna nor of soils, air or watersheds. Because EcoDistricts focus on existing neighborhoods, it is necessary to understand the ecology of the area, as well as the conditions of the built environment, to determine optimum performance. This performance area recognizes that it is possible to support functional habitat and ecosystems within urban areas.

Goal

Achieve healthy urban ecosystems that protect and regenerate habitat and ecosystem function.

Objectives

1. Protect and enhance local watersheds
2. Prioritize native and structurally diverse vegetation
3. Create habitat connectivity within and beyond the district
4. Avoid human-made hazards to wildlife and promote nature-friendly urban design

Potential Measures of Success

- Pervious Area: Measures ratio of impervious to pervious area that accommodates stormwater infiltration
- Percentage of Area Under Tree Canopy: Measures the amount of land covered by the existing tree canopy
- Land Cover: Measures the type and percentage of the various physical materials covering the earth
- Carbon Sequestration: Measures CO_2 sequestered by vegetation (canopy and shrubs)
- Bird Counts: Measures the amount and diversity of birds in area
- Invasive Species: Measures the amount and diversity of invasive species in area
- Invertebrate and Vertebrate Species Diversity: Measures the amount and diversity of invertebrate and vertebrate species in area
- Plant Diversity (Native and Non-Native): Measures the amount and diversity of native and non-native plants in area
- Vegetated Coverage: Measures the percentage and overall acreage of area covered by vegetation
- Soil Quality: Identifies the soil types of the EcoDistrict as determined by the USDA's Soil Capability Classification System

Performance Area 8:
Materials Management

Intent

This performance area intends to eliminate the negative impacts of material flows through a district. Most material products have poor human and environmental health throughout their life. The goal is to reduce material consumption at every opportunity and to change the way products move in and out of neighborhoods, capturing as much value from each material as possible. This is a particularly challenging area due to a vast number of chemicals in a vast range of products that will enter and leave an EcoDistrict. This performance area recognizes that there are opportunities to rethink the definition of "waste" and create more intentional material flows.

Objectives

1. Eliminate practices that produce waste wherever possible
2. Minimize use of virgin materials and minimize toxic chemicals in new products
3. Optimize material reuse and salvage and encourage use of regionally manufactured products or parts
4. Where opportunities for waste prevention are limited, maximize use of products made with recycled content
5. Capture greatest residual value of organic wastes (including food) through energy recovery and/or composting

Goal

Zero waste and optimized materials management.[9]

Potential Measures of Success

- Materials Recovery Rates: Measures the amount of building material that is recovered or salvaged for later use[10]
- Compostables/Organics Recovery Rates: Measures the amount and percentage of waste stream that was composted or otherwise recovered
- High Impact Purchases: Tracks all significant purchases (over $1,000) in the district for material impacts
- Salvaged Products: Tracks all salvaged products used for district projects
- Procurement Policies: Measures number of businesses that have waste prevention procurement policies in place
- Pesticide Impacts: Measures number of properties that have pesticide-free or Integrated Pest Management plans to reduce toxicity
- Carbon Emissions from Waste Disposal: Measures carbon emissions from district waste trucked to landfills that serve a city

9 Materials management is based on an EPA definition that refers to how we make choices about products as they flow through the economy, from extraction or harvest of materials and food, production and transport of goods, provision of services, reuse of materials, and, if necessary, disposal

10 LEED-NC MR Credit 2: Construction Waste Management

Tool 2: Project Palette

The EcoDistrict Project Palette provides a menu of proven projects that help achieve EcoDistrict performance areas and may be effectively deployed at a neighborhood scale.

Performance Area	Strategy	Buildings and Infrastructure (hardware)	People and Behavior (software)
Equitable Development	access	affordable housing	green business start-up loans
		multi-modal transit options	EcoDistrict jobs center
		information centers (library, schools, etc)	enhance local job demand through project agreements
		20-minute neighborhoods	community benefit agreements
		access to parks and open space	
	represent		sustainability management association
Health + Well Being	access	parks and open space	job opportunities
		healthy food sources	training and learning opportunities
	feel	safe streets and pedestrian zones	air quality improvement challenge
			trash clean ups
Community Identity	identify	signature landmark, park or building	district brand campaign
		district brand improvements	district safety campaign
		foster local businesses and products	create “third places”
		green infrastructure	
	interact	parks and open space	public events
		pedestrian encounter zone	
		urban agriculture	regular community connections
		create “third places”	
	lead		community events
			neighborhood governance
			collaborative decision making
			strong neighborhood networks
Access + Mobility	shift	bicycle facilities	bike challenge
		bicycle parking	non-SOV
		pedestrian facilities (side/cross walks)	district dashboard
		transit facilities (bus, lightrail, streetcar)	education campaign
		20-minute neighborhoods	
	share	car share facilities	car share program
		bike share facilities	bike share program
		pedestrian-oriented development	district dashboard
			education campaign
	manage	transportation demand management (parking)	district dashboard
		transportation demand management (zone pricing)	

Performance Area	Strategy	Buildings and Infrastructure (hardware)	People and Behavior (software)
Energy	reduce	new construction performance standard	energy conservation challenge
		energy conservation retrofits (building)	district dashboard
		energy conservation retrofits (right of way)	education campaign
		smart grid	
	produce	district energy	renewables challenge
		district renewables	district dashboard
		property renewables	education campaign
	offset		green energy offsets
			education campaign
			carbon credits
Water	reduce	new construction performance standard	water conservation challenge
		water conservation retrofits (building)	stormwater challenge
		water conservation retrofits (right of way)	district dashboard
		stormwater retrofits (building)	education campaign
		greenstreet retrofits (right of way)	
	reuse	property rainwater harvesting	water reuse challenge
		district rainwater harvesting	district dashboard
		property wastewater reuse	education campaign
		district wastewater reuse	
	reconnect	stormwater retrofits (building)	stormwater challenge
		greenstreet retrofits (right of way)	district dashboard
		district stormwater	education campaign
	offset		water credits
			education campaign
Habitat + Ecosystem Function	enhance	tree canopy/vegetation enhancement	tree planting challenge
		green infrastructure	district dashboard
		urban agriculture	education campaign
	connect	tree canopy/vegetation enhancement	tree planting challenge
		green infrastructure	district dashboard
			education campaign
	restore	protect existing natural areas	district dashboard
		restore existing natural areas	education campaign
Materials Management	reduce		district dashboard
			education campaign
	reuse	materials exchange center	district dashboard
		waste to energy facility	education campaign
	recycle	district recycling	district dashboard
		district composting	education campaign

Tool 3: Performance + Feasibility Matrix

The Performance + Feasibility Matrix is a screening tool for weighting the overall performance impacts and feasibility of potential projects. It has two sections, one for performance areas, where projects are evaluated based on how many performance areas are met, and one for feasibility, where projects are evaluated based on ease of implementation. The two sections may be used for one overall evaluation or may be separated into phases in which projects are first evaluated by performance area. Then those high-performing projects are evaluated by the feasibility criteria.

Projects	Equitable Development	Health + Well Being	Community Identity	Access + Mobility	Energy	Water	Habitat + Ecosystem Function	Materials Management	Other	Performance Total	Technical Feasibility	Financial Feasibility	Cost Effectiveness	Management Capacity	Commitment of Leaders	Commitment of Stakeholders	Other	Feasibility Total	Overall Ranking	Notes

Appendix A: Glossary of Projects

Buildings + Infrastructure (Hardware)

Construction Performance Standards

Construction performance standards such as the U.S. Green Building Council's LEED rating systems or the Green Building Initiative's Green Globes rating system require increased energy/water efficiency and decreased resource consumption over conventional building practices up to or exceeding some set point. Performance standards are important because buildings account for 41 percent of U.S. CO_2 emissions.[1] As EcoDistricts adopt ambitious sustainability goals, setting standards for building performance, particularly for new construction and redevelopment, will be an important area to consider.

Example: On August 4, 2008, Mayor Newsom signed the San Francisco Green Building Ordinance, requiring proof of green building practices and LEED certification for all residential and commercial buildings in the city.

Energy Conservation Retrofits

Energy conservation retrofits address the energy inefficiencies of the existing stock of commercial, residential and public buildings. These buildings often feature outdated and inefficient HVAC or lighting systems and poorly insulated building envelopes. As a result, energy use in the U.S. commercial building sector accounts for 20 percent of U.S. GHG emissions and costs building operators over $100 billion a year.[2] Energy retrofits present a large sustainability opportunity to save money for building operators, create construction jobs and reduce the greenhouse gases that are produced operating these buildings.

Example: The U.S. EPA's Energy Star program provides tools and resources for commercial building owners and operators looking to improve their building's energy efficiency: http://www.energystar.gov/index.cfm?c=business.bus_index

Energy Conservation Retrofits (Right of Way)

Energy Energy conservation retrofits in the public right of way seek to address the large energy consumption of infrastructure such as streetlights and traffic signals. The replacement of existing systems with more efficient technologies, such as LED streetlights and traffic signals, can reduce energy load and save cities money. Reduced energy consumption results in reduced CO2 emissions associated with energy production.

Example: In 2006, Ann Arbor, Michigan used a $630,000 grant from the Ann Arbor Downtown Development Authority to convert over 1,000 conventional streetlights to LED streetlights, resulting in energy savings greater than $100,000 a year. By 2007-2008, the entire downtown was converted, for a total estimated savings of $375,000 per a year.

Smart Grid

Smart grid refers to the integration of computer-based sensing and automation into the electricity network, giving both utilities and customers a better understanding of energy demands and more choices on how to manage that demand. By allowing information to be shared in real-time, utilities can better utilize distributed energy production and consumers can more actively participate in energy conservation and take greater advantage of variable pricing. Piloting a smart grid on the district scale allows utilities, consumer and policy makers to test the technology prior to regional adoption. Smart grid IT can measure a district's progress toward sustainability goals and visually disseminate energy usage via a District Dashboard.

1 2011 Greenhouse Gas Inventory Report, EPA

2 http://yosemite.epa.gov/opa/admpress.nsf/d0cf6618525a9efb85257359003fb69d/db40ab7277269d15852578530052c495!OpenDocument

Example: Austin Texas is piloting smart grids with Pecan Street Inc., a project integrating renewable energy, energy storage, residential housing, and businesses at a district scale to test the efficiency gains from full deployment of smart grid technology.[3]

District Energy

District energy refers to neighborhood scale heating, cooling, domestic hot water, electricity or some combination of the above within a defined service area. District energy delivers significant energy performance benefits by balancing the diverse energy demands of different buildings at different times of day, using economy of scale to improve the efficiency of heating and cooling by up to 20 percent.

Example: In New York City, Con Edison operates the largest district steam system in the United States. The system contains 105 miles of mains and service pipes, providing steam for heating, hot water and air conditioning to approximately 1,800 customers in Manhattan.[4]

Property Renewables

Individual property owners can explore installing renewable energy generators on their property. Solar energy is the most likely candidate as urban rooftops and south facing building facades are often ideal places to install photovoltaic solar panels and solar hot water systems. One option to maximize solar energy production while minimizing costs is by taking advantage of solarizing models.[5] One such model is bulk solar installation, which reduces transaction costs through information sharing among district building owners and reduces capital costs through bulk purchasing price breaks. Individual property geothermal and wind power are also potential options. However, geothermal is typically cost-prohibitive for an individual property owner and small-scale wind power has been shown to not be cost effective in urban areas due to variable wind patterns.

Example: Solarize Portland is a solar panel volume-purchasing program being led by Portland area neighborhood associations. Interested neighbors come together to choose a contractor, purchase and install solar as a community, and save significant costs as a result of bulk purchasing of solar electric panels. This program, coupled with state tax credits and cash incentives, can bring the cost of solar electricity down by 90 percent for the individual property owner.

3 www.smartgrid.gov
4 www.coned.com/history/steam.asp
5 www.portlandonline.com/bps/index.cfm?c=51902

Water Conservation Retrofits (Building)

Water conservation retrofits address the inefficient plumbing systems of the existing stock of commercial, residential and public buildings. These buildings use water features requiring more water than needed, resulting in considerable waste. Possible retrofits include low flow toilets that use less water to flush, dual flush toilets that give the user a choice of how much water is needed to flush, waterless urinals, faucets outfitted with low flow aerators and shower heads outfitted with low flow fixtures. These simple low cost measures can result in water savings of 20 to 40 percent[6] and significant reductions in the energy use needed to pump and treat potable water and wastewater.

Example: The Bronx Zoo retrofitted a large visitor restroom with composting toilets to save water because the location made bringing in sewer lines cost prohibitive.[7]

Water Conservation Retrofits (Right of Way)

Aging water distribution and sewage collection infrastructure in many cities results in potable water loss as well as potential health risks and environmental damage. As an EcoDistrict redevelops infrastructure, steps should be taken to modernize pipes to ensure no loss of potable water due to leaks as well as proper handling of wastewater. Sensors could also be installed so that potential problems are detected and repaired early.

Stormwater Retrofits (Buildings)

Stormwater retrofits at the building level are intended to reduce runoff from impervious surfaces like parking lots, roofs, and roads which increase pollution loads and degrade stream banks. Stormwater retrofits include green roofs, rain gardens, permeable pavement and bio-swales (specially designed gardens that absorb and filter stormwater).

Example: The Ecotrust building in downtown Portland, OR includes green roofs, permeable pavement, and bio-swales as part of a LEED gold certified redesign of historic building.[8]

6 www.nwfwmd.state.fl.us/pubs/RetroFit/RetroFit.htm
7 www.treehugger.com/files/2007/03/clivus_multrum_at_the_bronx_zoo.php
8 www.ecotrust.org/ncc

Green Street Retrofit (Right of Way)

Green street retrofits are being adopted by cities to abate the pollution associated with stormwater runoff. The runoff from streets is laden with motor oil, break dust, trash and other pollutants that are most often not filtered before discharging to a stream or river. Green streets make use of bio-swales, specially designed gardens that absorb and filter stormwater, to address pollution and flooding concerns.

Example: The City of Portland's Tabor to the River program integrates hundreds of sewer, green stormwater management, tree planting and other watershed projects to improve sewer system reliability, stop sewer backups in basements and street flooding, control combined sewer overflows (CSOs) to the Willamette River, and restore watershed health. [9]

Individual Property Rainwater Harvesting

Property rainwater harvesting is a technique of storing rain on an individual property for future reuse, reducing the need for potable water and minimizing stormwater runoff. The water can then be used for a variety of purposes: watering landscape plants, flushing toilets, for use in a public fountain or for charging a sprinkler system. When done on the scale of an individual building, rainwater is most often collected from a roof and stored in a rain barrel.

Example: In Washington, DC, H.D. Woodson Senior High School harvests rainwater from the portions of the roof not covered by a green roof for storage in large underground cisterns and use in flushing toilets.[10]

District Rainwater Harvesting

Rainwater harvesting can occur at the district scale when a group of buildings, streets and public spaces are engineered to capture rainwater for later use. The stored rainwater can flush toilets, charge sprinkler systems, water landscape features or be used in water features.

Example: In Berlin, Germany, Potsdamer Platz is a mixed-use community that incorporated district wide rainwater harvesting and stormwater management. The buildings collect stormwater and use it for watering landscape features, flushing toilets, fire suppression and in an innovative outdoor waterscape that enhances the plaza with pools, canals and constructed wetlands.[11]

Individual Property Wastewater Reuse

Individual properties can reuse greywater for flushing toilets or watering landscapes. Greywater is water used in showers and sinks that is not heavily contaminated and requires little treatment before reuse. Blackwater is the water used in flushing toilets and must be treated before reuse. Blackwater systems are typically more complicated than greywater systems but both have been found to be more efficient at filtering wastewater than large centralized wastewater treatment facilities.

Example: The Oregon Health and Science University's Center for Health and Healing in Portland, OR uses a membrane bioreactor to treat blackwater and reuse it for flushing toilets.[12]

District Water Reuse

District wastewater reuse is similar to individual property wastewater reuse and uses many of the same methods. A membrane bioreactor or constructed wetland filtration system can be scaled up to serve multiple buildings on a district scale.

Example: Orange County, California treats wastewater in a groundwater replenishment system designed to reuse treated wastewater for potable uses.[13]

District Recycling

Most major municipalities mandate residential and commercial recycling. At a district scale businesses can work together to improve individual recycling programs and reduce costs. In places where there is no recycling program, district residents can work to establish a central collection point for periodic recycling.

Example: In Greenville, South Carolina the South Carolina Recycling Council established a program called "Share the Load." The concept, implemented in an industrial district, is to share the responsibility of recycling among several companies in an effort to defray costs and logistical headaches. The industrial businesses use a "milk run" model where they share the cost for a hauler to run a weekly rout picking up small-volume recyclable materials.[14]

District Composting

District composting applies economies of scale to the process of managing the decomposition process of organic materials. Large-scale composting facilities

9 www.portlandonline.com/bes/index.cfm?c=47591&a=358466
10 www.theadagency.com/opefm/woodson.html
11 web.mit.edu/fmr/www/11.308/project_cases_platz.html
12 www.gerdingedlen.com/project.php?id=62
13 www.csmonitor.com/USA/2011/0822/More-Western-towns-adopt-toilet-to-tap-strategy-to-water-conservation
14 waste360.com/waste-generators/volume-discount

are cost effective and environmentally beneficial for an entire city. While many cities have composting programs for yard debris, few US cities have kitchen scrap composting programs. At the district scale residents can take matters into their own hands by creating a composting facility in a local community garden or vacant lot.

Example: In Brooklyn, NY, the community organization Compost For Brooklyn created a neighborhood garden and composting facility for the Ditmas Park neighborhood. Residents drop off kitchen scraps and volunteers manage the process and provide compost for use in the garden.

Bicycle Facilities

Bicycle facilities seek to increase the number of cyclists by providing a safe and convenient space for cyclists to share the road with cars and pedestrians. EcoDistrict bicycle facilities should include a networked system of car free bike paths, slow traffic roads marked with sharrows and striped bike lanes. Other bicycle facilities include pressure pads that trigger cross signals for bikes at tricky intersections and bike racks on public transit.

Example: In Portland, OR, there is a well mapped network of neighborhood greenways, streets with low traffic pressure that are marked with sharrows and are safe for a variety of cycling and pedestrian uses.

Bicycle Parking

Bicycle parking is an important an important component of bicycle infrastructure, providing cyclists with secure and convenient places to leave their bicycles both on the street and inside buildings. Recognizing that increasing the number of cyclists has corresponding health and environmental benefits, the U.S. Green Building Council offers developers points under the LEED rating systems for including bicycle parking in their building design.

Example: Portland, OR has begun installing "bicycle corals" as an option for adding bike parking. The coral replaces two on-street car parking spots, but adds eighteen secure bicycle parking spaces. The corals are very popular with local business, allowing for customers to comfortably store their bikes while shopping.[15]

Pedestrian Facilities

Pedestrian facilities include sidewalks, crosswalks, walkways, curb ramps and traffic calming measures such as curb bump-outs and roundabouts. They should be designed to accommodate all potential users, but especially the elderly, children and visually and physically disabled persons. By designing streets that prioritize pedestrian uses, planners ensure that the transportation system works in totality. Within an EcoDistrict, pedestrian use should be prioritized over other forms of transit.

Transit Facilities

Transit facilities include stops and stations for buses, streetcars, light rail and other forms of public transit. Ideally transit facilities will also orient commuters and provide real time information on when the next bus or train will arrive. Centrally located multi-modal transit centers (e.g. transit hubs) are integral to EcoDistricts by offering safe and convenient service to and from the district and can be a focal point for (re)development.

Example: In Charlotte, North Carolina bus shelters display when the next bus will arrive and the transit agency has developed smart phone applications that provide all bus and train routes, schedules and arrivals of the next trip from any bus stop or train station.[16]

Bike Share Facilities

A bicycle sharing system is a service in which bicycles are made available for shared use to individuals who do not own them. Bicycle sharing systems can be divided into two general categories: "Community Bike programs" organized mostly by local community groups or non-profit organizations; and "Smart Bike programs" implemented by government agencies, sometimes in a public-private partnership. The central concept of these systems is to provide free or affordable access to bicycles for short-distance trips in an urban area as an alternative to motorized public transportation or private vehicles, thereby reducing traffic congestion, noise, and air pollution.[17]

Example: Capital Bikeshare is a bike sharing system serving Washington, DC and Arlington County, VA. The stations and bicycles are owned by the participating local governments and operated in a public-private partnership. With more than 1,100 bicycles operating from 116 stations, the system is one of the largest bike sharing services in the United States.[18]

15 bikeportland.org/2011/04/13/behind-portlands-bike-corral-backlog-51332

16 charmeck.org/city/charlotte/cats/Bus/Pages/mobileapp.aspx
17 en.wikipedia.org/wiki/Bicycle_sharing_system
18 www.capitalbikeshare.com/

Green Infrastructure

Green infrastructure refers to a network of strategically planned and managed natural lands, working landscape and other open spaces that conserve ecosystem values and functions, and provide associated benefits to human populations.[19] Natural lands can include forests, grasslands, wetlands, rivers and streams, parks and open spaces. Working landscapes can include bio-retention gardens, green roofs, urban agricultural areas and the urban tree canopy.

Example: In the Portland metropolitan region, the Intertwine is an effort to link and protect existing natural areas, trails and parks while also increasing access to these areas and active transit mobility throughout the region.[20]

Tree Canopy/Vegetation Enhancement

Tree canopy, in the urban context, refers to the total area covered by the spreading branches and leaves of all area trees and includes trees in parks, forested areas, private land and in the public right of way. Together with vegetated landscapes, tree canopy makes up an essential part of a city's green infrastructure and provides numerous environmental benefits: improved air quality, reduced urban heat-island effect, increased wildlife habitat, and reduced stormwater runoff and improved water quality. Tree planting and landscape restoration can serve as neighborhood revitalization projects within an EcoDistrict.

Urban Agriculture

Urban agriculture integrates food production systems into the urban environment. Urban agriculture takes place at a variety of scales, from complex commercial operations to small community gardens run by volunteers. Space where city dwellers can connect with food production can provide a valuable outlet for many people while also addressing issues of nutrition, access to open space and food security. Community gardens have been avenues for urban renewal that provide a constructive neighborhood project that can be leveraged to catalyze further change.

Example: In New York City, the GreenThumb program, run out of the City's parks department, provides programming and material support to over 500 community gardens in the city. Some gardens are green spaces meant for relaxation and a community meeting space, others are full–fledged farms, and many are a mix of the types. All are volunteer supported.[21]

19 www.greeninfrastructure.net/
20 theintertwine.org/index.html
21 www.greenthumbnyc.org/

20-Minute Neighborhood

A 20-minute neighborhood is a place with convenient, safe, and pedestrian-oriented access to the places people need to go to and the services people use nearly every day: transit, shopping, quality food, school, parks, and social activities, that is located within a 20 minute walk of housing. 20-minute neighborhoods have the following characteristics: a walkable environment, destinations that support a range of needs, and residential density and generally include pedestrian-scaled buildings, mixed-use and dense development near neighborhood services and transit, a variety of connected transportation options, and a street grid or other frequently connected network of local streets.[22] While twenty minutes by foot is ideal, twenty minutes by bicycle or transit is a reasonable planning goal.

Complete Streets

Complete streets refer to streets that are designed and operated to enable safe access for all users. They give pedestrians, bicyclists, motorists and transit riders of all ages and abilities equal access to the street. A complete street may include: sidewalks, bike lanes (or wide paved shoulders), special bus lanes, comfortable and accessible public transportation stops, frequent and safe crossing opportunities, median islands, accessible pedestrian signals, curb extensions, narrower travel lanes or roundabouts.[23] EcoDistricts should look to retrofit existing streets into complete streets to create a greater sense of community.

Example: In Columbus, OH, the regional body that allocates federal transportation dollars has directed all projects provide for people on foot, bicycle, and public transportation.[24]

The Third Place

The third place refers to places that are neither home nor work that serve as anchors of community life and facilitate and foster broader, more creative interaction. They serve as public gathering spaces outside the home and provide space for planned and unplanned encounters. A third place can be a local coffee shop or restaurant, a park, a library or even a community garden.

22 www.portlandonline.com/portlandplan/index.cfm?a=246917&c=46822
23 completestreets.org/
24 www.morpc.org/transportation/complete_streets/completeStreets.asp

People + Behavior (Software)

Sustainability Management Association (SMA)

An SMA is a neighborhood-based organization dedicated to improving sustainability performance over time. It builds on the successful model of a Transportation Management Association (TMA), which relies on neighborhood staff to help meet transportation demand management goals and to increase mode split. As a neighborhood-based organization, an SMA may more effectively deliver sustainability projects and services because staff has easy access to the local market.

District Dashboard

A district dashboard displays real-time energy and water use data for the district to help residents be more aware of how they are consuming utilities. District dashboards work by gathering real-time and historical utility data for the district and converting it into metrics meaningful to the audience. For instance, data can be customized to show the total GHG emissions released within the past hour or how many trees have been saved through energy consumption.

Example: The Oberlin Environmental Dashboard is a combined effort of Oberlin College, the City of Oberlin, the Great Lakes Protection Fund and others to provide citizens with real-time feedback on water and electricity flows through residences, businesses and through the entire City of Oberlin. The goal is to present this information in a social and environmental context that engages, educates, motivates and empowers community members to conserve resources.[25]

Public Education + Engagement

Organizations use public education and engagement in a variety of ways to try to influence the public and to change behaviors. In each case, an organization identifies an issue to bring to light and develops a campaign that will engage the public and, through that engagement, educate them on the issue and ways to address it.

Example: The WWF organized Earth Hour[26] as a way of bringing attention to the issue of climate change and to send the message that everyone can take personal responsibility for ensuring the future of the planet by asking people to turn off their lights from 8:30 to 9:30 pm on the last Saturday of March each year. As the event has grown, organizers have created a new program—Beyond the Hour—asking people to think about what more they can do to address climate change.

Conservation Challenge (energy, active transit, water, carbon)

Conservation challenges seek to mobilize people around the goal of reduced or increased use of an identified resource: energy, active transit, water, carbon, etc. Challenges are held for a limited period of time, typically a month, and participants are asked to track how much of the resource they are consuming, in line with either an individual limit or program-wide goal. As part of the challenge, participants are provided with strategies that will help them to reach their goal.

Example: The San Diego County Water Authority launched the 20-Gallon Challenge to increase voluntary water conservation. The goal of the Challenge was to reduce average water use in the region by 20 gallons per person per day. The program has provided conservation information, water saving tips, links to rebates, and recognition of water savers throughout the region.[27]

Example: The Bicycle Transportation Alliance organizes the Bike Commute Challenge in Oregon every year to encourage more people to commute by bike. Participants record the number of times they commute by bicycle during the month of September and offices with the greatest percentage of workers commuting by bicycle win. BTA provides resources for new bicycle commuters and participants are eligible for discounts at local bike shops.[28]

Green Energy Offset

Green energy offsets, also known as renewable energy offsets or Green Tags, are used in conjunction with carbon emission reduction strategies to achieve the goal of becoming carbon neutral by offsetting carbon emissions that cannot be reduced. By purchasing

25 oberlindashboard.org/index.php

26 www.earthhour.org/
27 www.20gallonchallenge.com/
28 bikecommutechallenge.com

Green Energy offsets, a consumer is choosing to purchase renewable energy, often at a slight mark-up. Renewable energy includes wind power, solar power, hydroelectric power and biofuel. Through the purchase of green energy offsets, the consumer is financing the construction and operation of renewable energy, energy efficiency and reforestation projects both domestically and internationally.

Example: Portland General Electric's Green Source program allows residents and small business owners to make the decision to have all electricity use offset by renewable energy. In 2010, the mix for this product came from approximately 44% low-impact hydro, 35% new wind, 14% new biomass (wood waste) and 7% new geothermal energy.[29]

Renewables Challenge

Renewables challenges seek to incentivize residential or commercial building owners to produce renewable energy, making onsite renewable production more mainstream. Like a conservation challenge, a renewables challenge mobilizes people to change a behavior to meet a neighborhood's overall energy goal. Programs typically run for a limited period of time with a targeted number of onsite renewable energy systems installed. The challenge is for as many owners as possible to install renewable systems to get added benefits like reduced costs and efficiency of installation through bulk installations, which stimulates competition. This challenge works well when incentives offset some of the cost of a renewable system, making local governments and utilities excellent partners.

Example: Solarize Portland is a solar panel volume-purchasing program led by Portland area neighborhood associations. The more homeowners that sign up within a set period of time, the lower the cost of each system. This provides incentive for participating homeowners to encourage their neighbors to sign up creating a district-wide renewables challenge.

Water Credits

Water credits are a way for a utility district or other local government to limit the amount of water being used by residents. For each house, the water-permitting department conducts an initial survey of the number of water fixtures in the house, which is known as the water credits for the house. The total number of credits for a property is not based on size but rather the number of original water fixtures when it was constructed. The total amount of credits can be used for whatever fixtures a homeowner wishes, as long as the total number assigned to the property is not exceeded. Residents can switch to low-flow appliances as a way of freeing up fixture credits to be used elsewhere on the property.

Carbon Credits

A carbon credit is a generic term for any tradable certificate or permit representing the right to emit one ton of carbon dioxide or the mass of another greenhouse gas with a carbon dioxide equivalent (tCO_{2e}) equivalent to one ton of carbon dioxide. Carbon credits and carbon markets are a component of national and international attempts to mitigate the growth in concentrations of GHGs. The goal is to allow market mechanisms to drive industrial and commercial processes in the direction of low emissions or less carbon intensive approaches than those used when there is no cost to emitting carbon dioxide and other GHGs into the atmosphere. Since GHG mitigation projects generate credits, this approach can be used to finance carbon reduction schemes between trading partners and around the world.[30]

Resource Sharing

Resource sharing is a community-based program that allows for a group of people to share a common resource, rather than having to individually purchase the resource for their personal use. It works on the principle of a library whereby residents of the community become members and have the ability to check out the resource for a set amount of time.

Example: In Portland, tool libraries have been established in North and Northeast Portland. In both cases, the tool library is seen as a community resource dedicated to building community and fostering sustainability by providing residents with tools free of charge.[31]

29 www.portlandgeneral.com/residential/renewable_energy/green_source.aspx

30 en.wikipedia.org/wiki/Carbon_credit

31 www.neptl.org/

Appendix B: Correlation Matrix

		Equitable Development (Eq D)	Health + Well Being (H+WB)	Community Identity (C Id)	Access + Mobility (A+M)	Energy (En)	Water (Wa)	Habitat + Ecosystem Function (H+EF)	Materials Management (MM)	Referenced Example
Buildings + Infrastructure	district renewables			■		■			■	Southeast False Creek, St. Paul District Energy, FortZed, Tangerine Solar
	smart grid					■				Hydro One (Ontario)
	district energy					■			■	Columbia Biogas, Hammarby Sjostad (Stockholm, Sweden), Syvant Waste Plan (Copenhagen, Denmark), Waste to Energy Plant (Gothenburg, Sweden)
	energy conservation retrofit (building)	■				■				Clean Energy Works, Sustainable Skylines—Urban Heat Island (Dallas, TX), Community Environmental Center (NYC), LEED-EB, NYSERDA
	energy conservation retrofit (right of way)	■				■				Street light retrofits in Mexico City
	district water						■	■		Potsdamer Platz Water Management System, Palo Alto Reclaimed Water District
	property renewables									Solarize Portland, Mt. Pleasant Solar Coop
	water conservation retrofits (building)					■	■			Alliance for Water Efficiency
	stormwater retrofits (building)						■			Kroon Hall (Yale School of Forestry, New Haven, CT), Portland's Gray to Green Initiative
	district composting								■	Compost for Brooklyn
	district recycling					■			■	Pneumatic waste collection system
	district rainwater harvesting			■		■	■	■		Potsdamer Platz (Berlin, Germany), Olympic Village (Vancouver, BC), South Bronx Greenway Project (New York, NY)
	greenstreet retrofit (right of way)			■		■	■	■		Portland BES, Nature in Neighborhoods (Portland, OR), Seattle SEA Streets, Chicago Green Alley
	tree canopy enhancement	■		■	■	■	■	■		Chicago Trees Initiative, Million Trees NYC
	district wastewater reuse					■	■			Bullitt Building, National Rainwater and Greywater Initiative (Australia), Sidwell Friends School (Washington, DC)
	property rainwater harvest					■	■			Bullitt Building
	water conservation retrofits (right of way)					■	■			

		Eq D	H+WB	C Id	A+M	En	Wa	H+EF	MM	
Buildings + Infrastructure	transit facilities (bus, lightrail, streetcar)					■	■			Bus Rapid Transit (Chengdu, China), Lloyd Crossing Master Plan
	pedestrian facilities (sidewalks, crosswalks)	■		■	■	■				
	car share facilities	■		■	■	■				
	bicycle facilities	■		■	■	■				Drachten (Holland), Neighborhood Greenways (Portland, OR)
	bike share facilities				■	■				Capital Bike Share (Washington, DC)
	bicycle parking			■	■					bike corrals (Portland, OR)
	green infrastructure	■	■	■	■	■	■	■		Metropolitan Greenspaces Program (Portland, OR)
	urban agriculture	■	■	■						Growing Power (Milwaukee, WI)
	tree canopy/vegetation enhancement	■	■	■	■	■	■	■		Million Trees NYC
	transportation demand management (parking)				■	■				SF Park (San Francisco, CA)
	transportation demand management (zone pricing)				■	■				London Congestion Pricing
	parks and open space	■	■	■				■		The Intertwine (Portland, OR)
	pedestrian encounter zone		■	■						Hesselterbrink (Emmen, Netherlands)
People + Behavior	sustainability management association	■	■	■	■	■	■	■	■	
	district dashboard		■	■	■	■	■		■	
	public education + engagement	■	■	■	■	■	■	■	■	Sunday Parkways, Sustainable Sites Initiative (US), COOL 2012 (US), Earth Hour, Cool Capital Challenge, Food Hub (NW United States), Green Team, Green Business Certification, Water Sense EPA, TapIt, Trash Free Facilities
	conservation challenge (energy, active transit, water, carbon)		■	■	■	■	■		■	
	green energy offset									Green Tags
	renewables challenge	■	■	■		■				Solarize Portland
	water credits						■			
	car share programs		■		■					Getaround
	bike share programs		■		■	■				Velib, Brisbane City Council School Travel Program, Capital Bikeshare
	carbon credits									
	create “third places”	■	■	■						
	district brand campaign		■	■						
	community events		■	■						
	green business start up loans	■								
	EcoDistrict jobs center	■	■							
	enhance local job demand through project agreements	■	■							
	tree plantings/urban agriculture/fruit gleaning (garden share)	■	■	■				■		Portland Fruit Tree Project, Friends of Trees, Casey Trees, Million Trees NYC, Growing Power
	resource sharing		■						■	Portland Tool Libraries

Appendix C: EcoDistrict Alignment with Portland Measures of Success

	Measure	Aligns with draft Portland Plan	Aligns with Portland Climate Action Plan	Regularly updated data sets	Other Notes
Equitable Development	Diversity index	X		X	
	Income distribution	X		X	
	Dissimilarity index	X			Existing data relevance at neighborhood scale in question
	Percentage of self-sufficient community members	X			Portland data based on one time collection project
	Displacement				
Health + Well Being	% of residents with access to neighborhood parks, trails and natural areas	X			
	% of residents with access to full-service grocery stores, farmers' markets and community gardens				
	Crimes per person (personal + property)	X		X	
	% of self-sufficient community members	X			
	Resident satisfaction	X			
	% of population within 1/4 mile of healthy food	X			
	Healthy weight	X			
	Exposure to toxic chemicals				
	Outdoor concentrations of NO_x and $PM_{2.5}$				
Community Identity	% satisfied with neighborhood	X			Data based on City Auditor's office survey, may not be representative of all residents
	Walking distance from cultural institutions				
	Quality + appearance of building stock				
	Quality of parks + public spaces				
	Quality of pedestrian-scaled streetscape				
	Mix of desirable land uses				
	Commercial lease/vacancy rates				
	Walkability access	X			
	Accountability in decision making				
	Diversity of stakeholder engagement				

	Measure	Aligns with draft Portland Plan	Aligns with Portland Climate Action Plan	Regularly updated data sets	Other Notes
Access + Mobility	Walkability + access rating				
	Walk score				
	Frequency of transit service				
	Transit affordability				
	Work commute mode split				
	Daily vehicle miles traveled		X		
	Annual diesel emissions		X		
	Annual carbon emissions		X		
Energy	Annual energy demand		X		
	Individual energy demand		X		
	Building energy demand		X		
	Solar potential				
	Annual carbon emissions		X		
Water	Stormwater management				
	Pervious area				
	Potable water consumption				
	Wastewater treatment				
	Annual hydrologic balance (baseline + predevelopment)				
	Existing temperature of creek runoff				
	Pollution generating surfaces				
Habitat + Ecosystem Function	Pervious area				
	% of area under tree canopy	X			
	Land cover				
	Carbon sequestration				
	Bird counts				
	Invasive species				
	Invertebrate + vertebrate species diversity				
	Plant diversity (native + non-native)				
	Vegetated coverage				
	Soil quality				
Materials Management	Materials recovery rates				
	Compostables/organics recovery rates				
	High impact purchases				
	Salvaged products				
	Procurement policies				
	Pesticide impacts				
	Carbon emissions from waste disposal		X		

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