COMMUNITY
INVESTMENT
TOOLKIT

VOLUME 3

Eco-efficient

COMMUNITY INVESTMENT TOOLS

Employment

Metro | *Making a great place*

Eco-efficient employment is businesses realizing economic and ecological benefits by utilizing operations that produce more with less – less water, less energy, less capital, less land, less waste.

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Acknowledgments

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Community Investment Toolkit, Vol. 3

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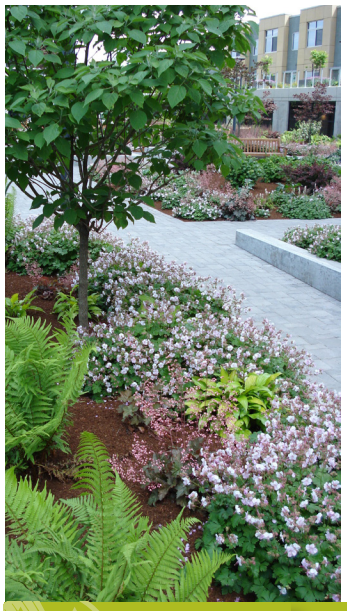

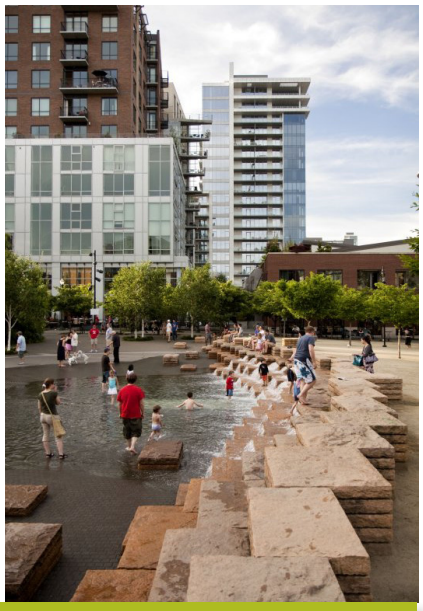

Preface

Regional choices for how we grow

In 1995, residents of the region developed the 2040 Growth Concept, a vision for how the region grows. This innovative blueprint for the future asserts that complete communities include:

- safe and stable neighborhoods for families
- compact development that uses both land and money more efficiently
- a healthy economy that generates jobs and business opportunities
- protection of farms, forests, rivers, streams and natural areas
- a balanced transportation system to move people and goods
- housing for people of all incomes in every community.

Preface

Fulfilling the 2040 Growth Concept means that existing neighborhoods are preserved and more intense development happens in appropriate areas. Corridors and regional and town centers are the focus of public investment. They are well-served by transit and provide commerce and local government services as well as urban amenities for neighboring residents. Employment and industrial areas are well-served by the regional freight network and provide protected areas for major employment and business cluster opportunities as well as access to jobs for nearby workers.

Since the region endorsed the 2040 Growth Concept in 1995, the region has grown more rapidly than initially expected, bringing new opportunities as well as new challenges. This growth accompanies the need for land that provides jobs and services near housing, which places a premium on the efficient use and redevelopment of urban land. Urban land has access to existing services and infrastructure like roads, sewers, transit and schools. The cost to provide these services is rising, and state and local revenue sources are failing to keep pace. Climate change is presenting a greater urgency for reduced greenhouse gas emissions and more sustainable practices. Faced with these challenges, this toolkit identifies cost-effective and land-efficient ways of supporting great communities.

In 2008, the region agreed on what makes great communities and developed six desired outcomes.

- **Vibrant communities** – People live and work in vibrant communities where they can choose to walk for pleasure and to meet their everyday needs.
- **Economic prosperity** – Current and future residents benefit from the region's sustained economic competitiveness and prosperity.
- **Safe and reliable transportation** – People have safe and reliable transportation choices that enhance their quality of life.
- **Leadership on climate change** – The region is a leader in minimizing contributions to global warming.
- **Clean air and water** – Current and future generations enjoy clean air, clean water and healthy ecosystems.
- **Equity** – The benefits and burdens of growth and change are distributed equitably.

Investing in our communities

What kind of projects, in what places, will spur further investment and attract the greatest market response? Public investment often stimulates private development. For example, we see catalyzing projects around light rail stations, in Lake Oswego's downtown and the South Waterfront area in Portland.

With more than one million additional people expected to live in the larger Portland metropolitan area region in the next 30 years, accommodating growth while maintaining quality of life will require substantial investment from the public and private sectors. Regional leaders have emphasized the importance of maximizing the land development potential in existing communities to balance urban land needs with the preservation of land for the agriculture economy and retaining natural features.

The 2040 Growth Concept calls for growth to be concentrated in nearly 40 regional and town centers, along transit corridors and in employment and industrial areas. By focusing development in these strategic areas, the region can more effectively coordinate public investments, provide increased transportation choices and services, utilize existing infrastructure efficiently, protect environmental resources, maintain consistently high property values, create a sense of community, and attract new businesses.

However, high-quality development and redevelopment of underused urban land sometimes requires a higher initial investment than traditional greenfield and suburban development; and sometimes, the lower costs of more sustainable development cannot be realized due to traditional planning methods and development standards. Solutions are needed to allow cities to work with developers and lenders in new, creative ways. The community investment strategy will move forward through countless public and private actions and investments, large and small, in neighborhoods, downtowns, industrial areas and natural areas all across the region.

Local, regional and state government as well as the private sector will need to act. Only by acting together with focus and determination will the region succeed in finding pragmatic solutions to tomorrow's challenges.

Preface

The cost of doing nothing[1]

- **More rural land used for development** Over 11,000 acres of rural farms and forests could be converted to urban uses by 2035 unless we find ways to encourage more development in downtowns and main streets.
- **Increased housing costs** New residents can expect to pay almost 50 percent of their income on housing and transportation unless we can find more efficient ways for us to travel and more convenient places for us to live.
- **More pollution** Greenhouse gas emissions from vehicles traveling in our region increase by 41 percent. (EPA Mobile 6)
- **More congestion** Our roadways will be 106 percent more congested during the evening commute. (Metro travel forecast model, UGB, 2 hour p.m. peak)
- **More delays** Delays on our roadways will increase by 433 percent during the evening commute. (Metro travel forecast model, UGB, 2 hour p.m. peak)
- **Cost to business** The cost of delay for moving freight on our roadways during the peak shipping period increases by 842 percent if we don't invest more in transportation. (Metro travel forecast model, UGB, 1 hour mid-day)

1. Community Investment Strategy: Building a sustainable, prosperous and equitable region. Recommendations from Metro's Chief Operating Officer. Aug. 10, 2010. p. 5.

Toolkit for investing in our communities

Technical assistance can bring these tools to life.

Metro's Community Investment Toolkit series identifies proven strategies and tools to stimulate investment in the region's centers, corridors, employment and industrial areas. The three-part toolkit addresses:

- financial incentives (Volume 1)
- local zoning and building codes (Volume 2)
- urban design (Volume 2)
- eco-efficient employment (Volume 3).

These volumes can be downloaded at **www.oregonmetro.gov/communityinvestment**

The toolkit provides important information, considerations and local perspectives for various investment tools. Local success stories demonstrate how these strategies are achieving results and provide a guide for future investors.

The toolkit was developed through extensive research and collaboration with representatives from local governments, nonprofit organizations and stakeholder groups, as well as developers, investors and citizens through advisory committees and public forums.

Achieving the benefits envisioned in the 2040 Growth Concept relies on initiative by local leaders, business leaders and governments. Metro will help to facilitate the use of new and existing fiscal tools and resources, modify local policies to be flexible to creative solutions and broaden public awareness of these tools and policies and the potential benefits they bring for local community development. The toolkit supplies information and resources to help local communities achieve the benefits envisioned in the 2040 Growth Concept in a way that best fits their community needs.

Introduction

Eco-efficient employment: tools for investing in our community

Innovative tools for eco-efficient employment promote vibrant communities throughout the region by reducing development and business costs and providing the regulatory framework that enables sustainable job growth. In order to adequately respond to climate change and support the next generation of business, public regulations and investments need to aggressively promote efficient use of employment areas through redevelopment and more sustainable design. Public and private investments in employment areas must be accompanied by new approaches to infrastructure systems, design and development codes, planning mechanisms and redevelopment investments. By reducing barriers, creating innovative policies and streamlining the permitting and approval processes, local governments can reduce a project's financial gap and encourage sustainable employment opportunities.

Tools for investing in our community

Economic trends

Research conducted for the 2009 Urban Growth Report[1] over the last ten years has documented the following trends related to job growth in the region:

- a continued shift in employment from manufacturing to other sectors
- the importance of quality of life in attracting major employers
- a change to more sustainable practices due to rising energy costs, reduced funding options and an increased desire to "go green"
- growth in office and institutional uses that are decentralized, integrated into neighborhood retail uses and connected directly to public transit
- the need for employers to provide incentives for employees to shift from driving to other modes of transportation to reduce congestion and improve air quality and greenhouse gas emissions
- continued growth in population-serving sectors, locating where people live (i.e., centers and corridors)
- the need to locate jobs in the central city, centers and corridors and other areas well served by transit and existing infrastructure
- a greater impetus for businesses to stay in the same site footprint, to mitigate neighborhood and cost issues
- momentum for more efficient building on site, adaptive reuse and multilevel parking on constrained sites
- the need for employment areas that use infrastructure efficiently or reduce demand as a result of increased infrastructure costs and lack of funding support.

Infrastructure systems: used in this document, refers primarily to the built transportation and utility systems that support our local communities and economy (roads, sewers, pipes, open spaces, etc.).

1. Urban Growth Report: 2009 – 2030 Employment and residential. January 2010.

Leading the way for 21st century jobs

The Portland metropolitan area is faced with an enormous opportunity to lead the nation in designing innovative employment areas. The region enjoys a reputation as a good place for employers to locate, and educated innovators continue to move here, seeking opportunities to create something fresh and new. Preparing for the next generation of business and new environmental policies will increase the region's competitiveness for tomorrow's jobs.

Eco-efficient employment tools

This document presents tools and best practices for governments, developers and businesses to design employment areas that respond to climate change and promote job opportunities for the 21st century. Strategies fall into three categories:

- **High-performance infrastructure** – Model approaches for building more environmentally and economically sustainable infrastructure systems that reduce resource waste and the demand on our current systems.
- **21st century design** – Code changes and planning tools for designing vibrant employment areas that facilitate community, attract industry and reduce the impacts of climate change.
- **Revitalizing employment areas** – Strategies for redeveloping and reusing underutilized employment and industrial land for future economic growth.

The toolkit highlights a number of tools within each category, describing their use within and outside of the region and potential issues and considerations that arise in their implementation. The cities and counties in the region face different political, regulatory and financial situations and will need to assess which tool, model approach or combination can best stimulate investment in their communities. Thus, the toolkit also examines the tools' flexibility and applicability.

Similarly, the toolkit presents eco-efficient tools for a range of employment areas. Employment uses in the region range from 100-acre manufacturing sites to vertical

Eco-efficient employment: businesses realizing economic and ecological benefits by utilizing operations that produce more with less – less water, less energy, less capital, less land, less waste.

mixed-use office and commercial projects along transit corridors to institutional campuses in or adjacent to residential neighborhoods. In the toolkit, the term employment or employment use refers to all of these types of businesses and locations. The toolkit presents tools targeted to all of these employment types.

It can be complicated to implement smart growth techniques in employment areas and develop eco-efficient employment projects. The planning tools and focused investment strategies described in this document provide mechanisms to reduce barriers and costs and increase incentives and flexible systems to support this type of development.

The region is home to companies that all recognize a good place for employment when they see it, and young educated innovators continue to move here, seeking opportunities to create something fresh and new.

Most importantly, the toolkit highlights successful applications of the eco-efficient employment tools demonstrating how barriers can be overcome, resulting in on-the-ground examples of sustainable development projects and job growth. These examples show that often several tools and model approaches must be combined in order to achieve desired results and frequently are used in conjunction with financial incentives such as urban renewal and special tax credit programs. The toolkit presents some of the newest research, leading experts, exemplary projects and best resources available at time of publication. These resources help our region assess employment areas and local needs and facilitate applying innovative tools and new approaches.

Economic development partnerships

Metro envisions the toolkit as a first step in collaborating with local economic development partners in implementing eco-efficient employment in the Portland metropolitan area. Local partners are key to on-the-ground implementation of these strategies, but Metro will continue to provide technical assistance, as needed and whenever possible, in order to see these tools implemented. As these tools are utilized and eco-efficient employment projects are implemented throughout the region, local partners are encouraged to engage Metro. Part of Metro's role will be to document these experiences through detailed, local case studies in order to share best practices and lessons.

It is also important to note that the toolkit provides tools specific to the relationship between land use and job growth. It does not focus on the financial incentives, tax breaks and other tools used by economic development agencies to attract new jobs. Local economic development partners – such as Business Oregon, Oregon Economic Development Association, Regional Partners, Clackamas County Business Association, Westside Economic Alliance, Greenlight Greater Portland, Portland Development Commission and Portland Business Association – have already documented these resources for local communities.

Regional recommendations

Through the process of documenting successful use of eco-efficient employment tools by cities and counties in the region, nationally and internationally, Metro and local partners identified the following recommendations to increase economic investment and better achieve the region's 2040 vision:

- Implement these tools to encourage sustainable, eco-efficient employment; modify local regulations as needed.
- Increase the use of these tools as an inter-related package, particularly as recommended by the model approaches, in conjunction with financial incentives in order to maximize effectiveness.
- Consider collaborating with other local jurisdictions, stakeholders and organizations to explore state legislative changes, regional regulatory changes or regional service programs that will make these tools work even better, particularly in the following areas:

Managing parking to maximize urban form – Assess the regional parking regulations in Title 2. Employment areas, regional corridors and centers in the region have found the supply of local parking to be much greater than the demand. In addition, a consistent barrier to redevelopment is the high price of providing parking in areas with lower land values. Businesses are realizing the high cost of parking and the opportunity to instead use this land area for income-generating operations. Creating alternative transportation options and implementing transportation demand management programs can further reduce the demand for parking, but it is essential to ensure regulations do not require the provision of parking that exceeds demand or that will interfere with employment growth and a positive community fabric.

Brownfield redevelopment for employment and industrial uses – Create a more coordinated and holistic brownfield redevelopment strategy and program in the region. Properties with unknown environmental conditions often deter developers and investors from developing these sites due to cleanup complications, risk and liability concerns and additional costs. Due to increased costs and risk, redeveloping employment and industrial properties for continued employment and industrial uses is often financially infeasible. On the other hand, these properties offer significant return on investment potential and therefore, need public investment to reduce the risks and project funding gaps. Investing in these projects is also integral to being land-efficient and sustainable, making sure redevelopment is not only possible but also more desirable than greenfield development.

Eco-efficient employment workshops – Organize technical assistance workshops that bring in national and international experts to work with local practitioners to implement eco-efficient tools in targeted employment and industrial areas. These workshops would result in implementation plans for specific employment areas. Technical assistance and outreach can jumpstart development in these employment areas, which is particularly important given current economic conditions. It can also identify critical public investment gaps, as well as coordinate regional investment actions with local, state and federal actions to leverage the most out of our existing resources. Metro can offer recommendations for implementing these tools elsewhere in the region and build partnerships necessary for investment actions.

Metro resources

Metro currently houses several technical and financial assistance programs that support eco-efficient employment and help local partners implement these development projects.

Nature in Neighborhoods helps the region balance development, human needs and the health of natural systems catalyzing innovative, on-the-ground projects. The program grants funding for capital projects that re-nature neighborhoods; educates stakeholders about nature-friendly development practices that benefit the environment and local businesses; provides technical review of potential development projects; and connects developers, builders, jurisdictional staff, design professionals and citizens with "Integrating Habitats" design approaches that balance design excellence, ecological stewardship and economic enterprise.

The Regional Transportation Plan presents the region's policies, goals and system concepts for all modes of travel, funding strategies and local implementation requirements. The plan recommends how to invest public transportation funds during the next 25 years, laying the foundation to achieve the 2040 Growth Concept. In coordination with the Regional Transportation Plan, the **Regional Flexible Fund Allocation** process identifies projects to receive a portion of federal funds available in the region. Projects may be nominated by jurisdictions, transportation or transit agencies for any transportation category except local street construction. Metro allocates these funds according to policies established during each two-year funding cycle by the Metro Council and the Joint Policy Advisory Committee on Transportation. Recent funding cycles have prioritized projects with alternative modes of transportation and improvements that increase the vitality of the region's centers, employment and industrial areas.

Livable streets, part of Regional Transportation Planning, has published three handbooks that provide practical step-by-step methods for designing safe and healthy city streets. This supports implementation of the 2040 Growth Concept by providing tools to better integrate street designs with nearby land uses and create an environment that is not only attractive, but can slow traffic and encourage walking, bicycling and use of transit. These techniques can increase transit's share of the commute and reduce congestion impacts on the freight network. The handbooks also provide green street design guidelines that limit stormwater runoff, help protect stream habitat and support an eco-efficient transportation system.

Regional Travel Options supports employers across the region in empowering their employees to find an eco-efficient commute option, such as walking, biking or taking transit. The program partners with TriMet, Wilsonville SMART and transportation management associations to reach employers. Employers can learn how to subsidize transit and get tax credits; match carpoolers in their workplace or commuters working in the area; use subsidies to start vanpools; overcome barriers to biking and walking, such as providing showers and safe places to lock bikes; and more. These programs also provide personalized assistance to employees interested in learning about commute options. Together, employers using these programs have increased the use of transit, bike and walk commutes from 26 percent in 1996 to 35 percent in 2008.

The Development Center provides financial and technical assistance to support quality development in communities across the region. Through the Transit Oriented Development and Centers Implementation program, Metro helps bring about projects that concentrate a mix of retail, housing and jobs in downtowns, along main streets and in areas with good access to the region's transit system. Working with local city staff and developers on complicated projects results in new buildings, offices and jobs close to transit such as the Burnside Rocket in Portland's east side and Pacific University's College of Health Professions and College of Optometry campus in Hillsboro.

Waste reduction assistance programs help businesses reduce construction, food and office waste. These programs help contractors, architects and developers save money, earn green building credits and keep building materials out of the landfill. In partnership with other local jurisdictions, Metro provides a free green building hotline for information about green building strategies, materials, renewable energy, stormwater management and more. The Construction Salvage and Recycling toolkit provides a listing of more than 100 local recycling options, and BoneyardNW serves as an online marketplace for buying and selling used commercial building materials. Metro also offers on-site customized assistance for businesses to reduce food and office waste.

The Climate Preparation Planning Framework will outline recommendations to build resiliency to the risks of climate change in the region. Workshops were held to develop strategies that could prepare us for changes in natural, economic, built and cultural systems. A report will be released in the fall of 2010 to provide recommendations to regional stakeholders. Metro is a partner in developing the framework, which is an extension of the Climate Futures Forums hosted by the University of Oregon Climate Leadership Initiative.

The Brownfields Recycling Program works with property owners to assess the nature of possible petroleum-based contamination on vacant sites throughout the region using grant funds from the U.S. Environmental Protection Agency. The program's focus is to enable redevelopment, enhance property values and use land more efficiently in order to support implementation of the 2040 Growth Concept. The program conducts environmental assessments, provides technical assistance, helps identify sources of funding for cleanup and works with local community representatives on redevelopment plans. The program also conducts technical workshops for any group interested or involved in the restoration and redevelopment of brownfield properties.

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www.oregonmetro.gov/nature

Transportation Planning
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www.oregonmetro.gov/RFF

Regional Travel Options
503-813-7566
rto@oregonmetro.gov
www.oregonmetro.gov/traveloptions

Transit-Oriented Development Program
503-797-1757
www.oregonmetro.gov/tod

Waste reduction assistance programs
503-234-3000
www.RecycleAtWork.com

Climate Change Preparation Planning Framework
climlead.uoregon.edu/node/136

Brownfields Recycling Program
503-797-1562
brownfields@oregonmetro.gov
www.oregonmetro.gov/brownfields

Chapter 1

High-performance infrastructure

- Systems approach (p.3)
- High-performance mechanisms (p.17)

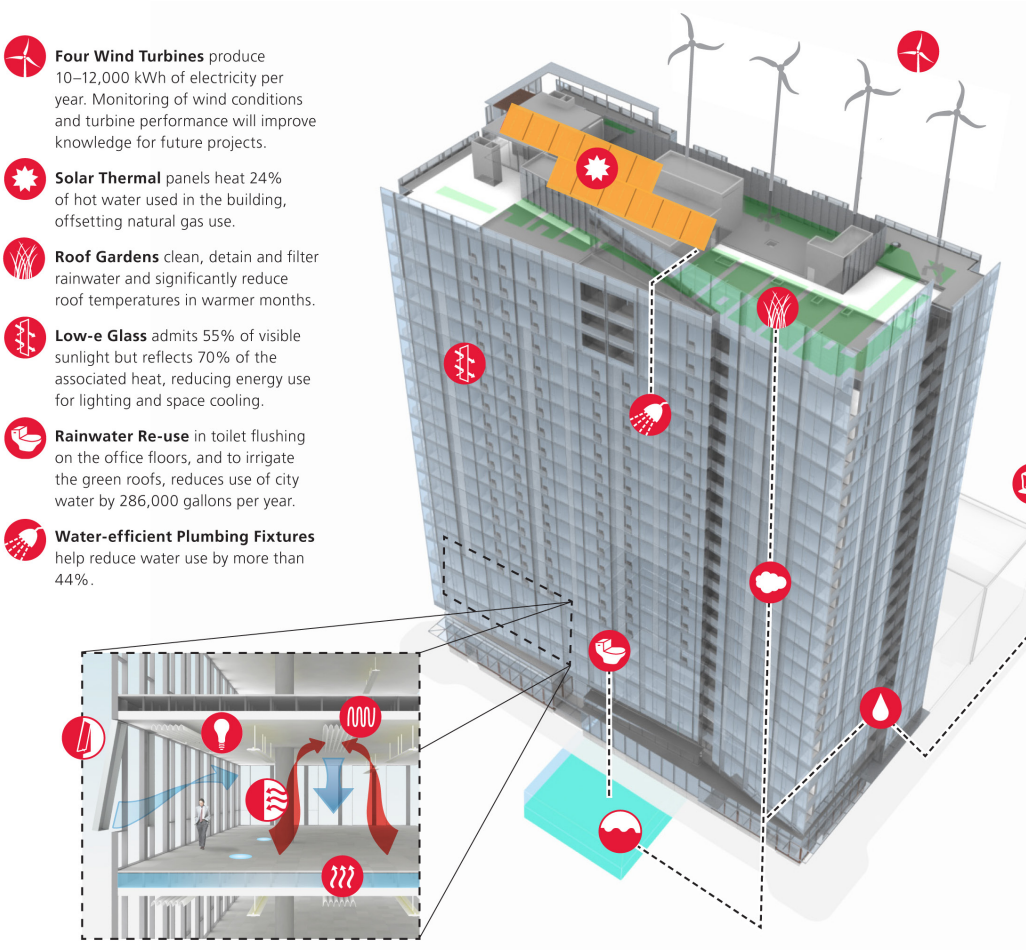
Addressing the immediate and long-term impacts of climate change and tightening fiscal budgets means changing the way we think about infrastructure systems related to energy, water, material waste and transportation use. Moving past traditional infrastructure planning approaches – which separately plan each individual infrastructure system, rely on current consumption patterns to project future demands and deplete fiscal and environmental resources – a systems approach to high-performance infrastructure systems implements creative strategies that mimic natural ecosystems. Demand is managed by reusing resources, reducing waste and delivering services more efficiently. Lowering infrastructure costs will make the region more competitive in attracting new jobs. High-performance infrastructure strategies may include

resource recovery and efficiency mechanisms like district energy, facilitated waste exchanges, cogeneration, renewable energy systems, waste-to-energy facilities, and on-site stormwater and wastewater management.

High-performance mechanisms support a more financially and environmentally sustainable system and are particularly important for employment and industrial areas and users. As the key engines for economic growth, employment and industrial areas are also major generators and users of energy, water and material resources, as well as freight and commuter traffic. It is important to support the local economy and meet the resource needs of these industries, but in a way that also reduces demand on the region's infrastructure systems and lowers the region's greenhouse gas emissions. Leading industries and communities alike are recognizing the need to change existing practices. Examples locally and abroad illustrate public-private partnerships that implement high-performance infrastructure and reap the rewards of these investments.

By using the systems approach to integrate cost-effective, high-performance infrastructure mechanisms in employment and industrial areas, local jurisdictions and businesses in the region can reduce the demand on current systems and green their bottom line. Implementing high-performance infrastructure, however, will take a new approach that integrates current planning efforts, uses creative funding mechanisms and builds broad partnerships across public and private sectors.

High-performance infrastructure mechanisms at the Indigo Twelve West building in the City of Portland's West End neighborhood



Chapter 1

High-performance infrastructure

SECTION ONE

Systems approach

A systems approach provides the framework necessary for establishing a collaborative and integrated methodology for planning and building high-performance infrastructure. Because of the quickly evolving nature of sustainable infrastructure technology, many businesses and municipalities are hesitant to adopt new sustainable strategies for infrastructure systems. However, inaction compounds current infrastructure problems and perpetuates the rapid depletion of natural and fiscal resources.

Systems approach

The systems approach enables municipalities and businesses to find innovative, individualized strategies that result in financial and environmental cost-savings. Beyond proscribing blanket solutions for complex and unique infrastructure issues, the systems approach can identify, assess and facilitate adoption of sustainable infrastructure technologies. This method fits the unique context and conditions of a local jurisdiction and identifies strategies for their specific districts, such as mixed-use transit corridors or industrial parks.

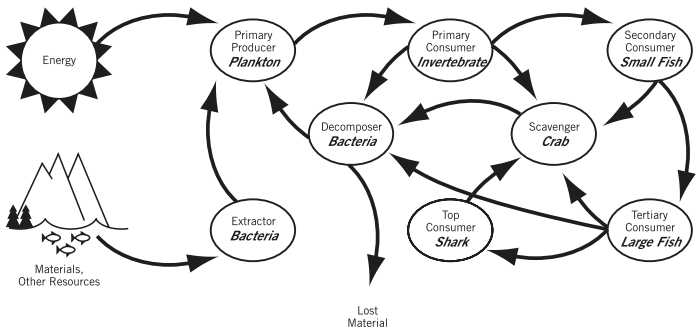
Different categories of investment reinforce each other, adding up to more than the sum of their parts to create complete living communities.

The systems approach, along with similar approaches like eco-industrial development and eco-industrial networking, challenges decision-makers to view systems holistically. Fundamental to the approach is the concept of industrial ecology, which proposes that industrial and business processes can perform better – in terms of financial, environmental and social impacts – if they attempt to mimic natural ecosystems. Like natural ecosystems, industrial processes and businesses exist within a system of interconnected resource networks. These resource networks include traditional streams like energy, materials and water and can also include resources like money markets, business and social networks. Every resource is considered for its relationship to other resources, for its impact on the whole system and for its potential for future reuse. It uncovers the relationships between resource networks in the overall system in order to find the highest and best use of all resources within a targeted area. It also supports diversity in the local economy, both in scale and activity.

Fundamental to the systems approach is the concept of industrial ecology, which proposes that industrial and business processes can perform better – in terms of financial, environmental and social impacts – if they attempt to mimic natural ecosystems.

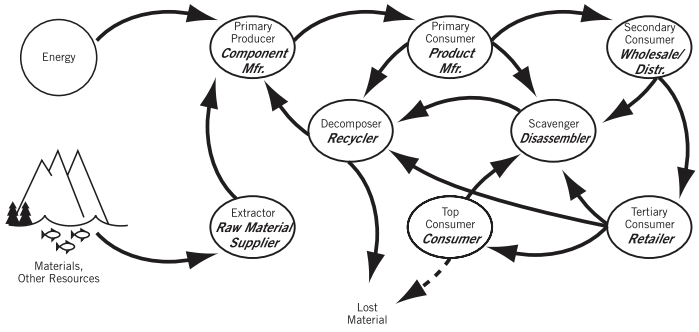
Example of a Mature Biological Ecosystem

Adapted from Pezzack, 1998 © 2000 Casavant



Example of an Industrial Ecosystem

Adapted from Pezzack, 1998 © 2000 Casavant



Natural ecosystems and business processes are similar, both in systems of interconnected resource streams and networks.

On the ground

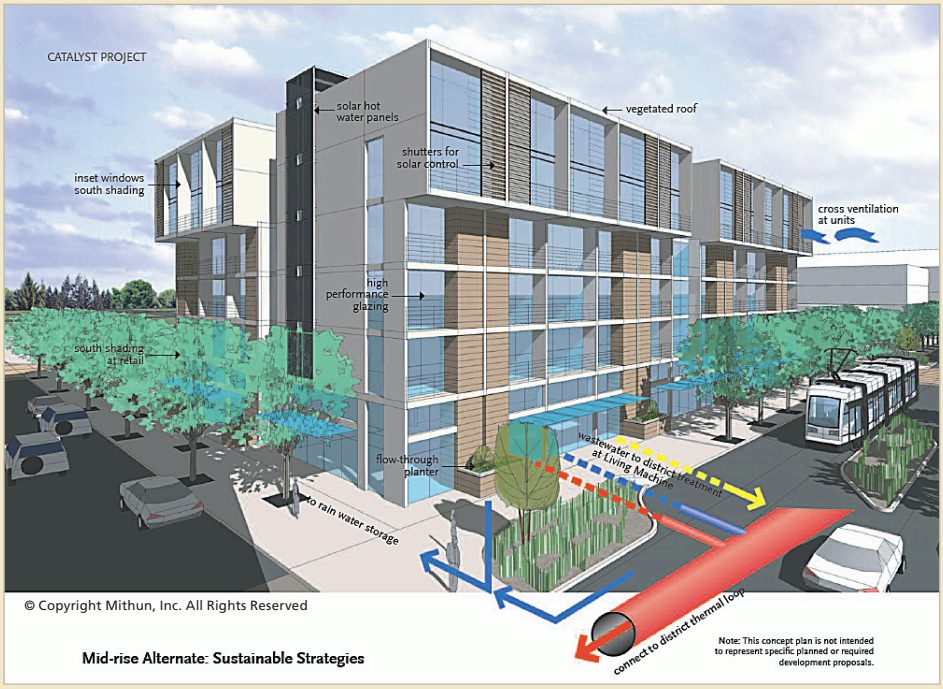
City of Portland

PoSI EcoDistrict Initiative

Launched in 2009 by the Portland Sustainability Institute (PoSI) in collaboration with the City of Portland, the EcoDistrict Initiative is creating comprehensive strategies and replicable models to accelerate sustainable development at the district level. The EcoDistrict Initiative integrates best practices in high-performance infrastructure, smart growth and urban design, zoning and building code, financial modeling and public-private capacity building. The initiative focuses on the district level because it creates an economy of scale large enough to build significant environmental and social benefit, but small enough to support "quick innovation cycles in public policy, governance, technology development and consumer behavior."[1]

By bringing together community stakeholders, property developers, utilities and the City of Portland, the initiative produces effective models for district-level development that can be replicated in other areas. The initiative focuses on four phases of development: 1) engagement and governance, 2) assessment and strategy development, 3) feasibility and project implementation and 4) ongoing monitoring. An integral part of the EcoDistrict strategy is to remove current barriers to sustainable development by providing comprehensive assessment tools, models for scalable project capital and avenues for public policy support including municipal and regulatory structures to support sustainable development. Currently pilot projects are underway in the Lloyd District, Lents, Gateway, the South Waterfront and Portland State University, which include key mixed-use employment areas.

1 Portland Sustainability Institute. The Portland Metro EcoDistricts Initiative: Integrating Environmental Performance and District Scale Development (Portland, OR: Portland Sustainability Institute, 2009) p. 2.



The EcoDistricts Initiative is a comprehensive strategy to accelerate sustainable development at the neighborhood scale by integrating building and infrastructure projects with community and individual action.

– Naomi Cole, LEED AP
Program Manager

Find contact information and websites for this and all other on the ground case studies in chapter 1 on page 43.

Systems approach

The nuts and bolts

In a systems approach every resource is considered for its relationship to other resources, for its impact on the whole system and for its potential for future reuse.

By finding symbiotic relationships between resource networks, recovering resources and cycling them back through the system, businesses and industrial processes can perform more efficiently because wastes associated with natural and financial resources are reduced. In return, additional capacity needs and infrastructure expansion projects are minimized.

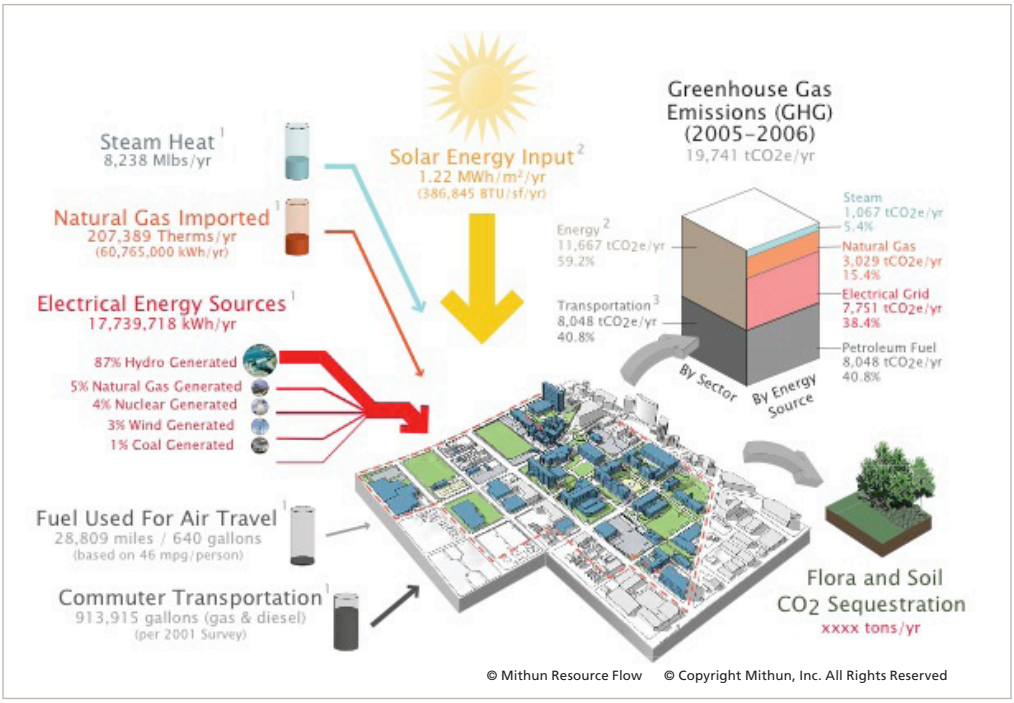
Municipalities and businesses making this shift to high-performance infrastructure are finding the site and district-level scale to be most effective. Focusing on decentralized site and district-level solutions and nesting them in more efficient, larger system improvements creates an economy of scale. The impact on infrastructure systems and the natural environment is reduced while at the same time delivering cost-effective services. Employment districts, whether in central business corridors or in larger industrial parks, are prime candidates for applying this approach. These areas offer a mix of uses and wide variety of resource needs and flows that will result in a number of resource synergies and symbiotic relationships.

How to use it:

Baseline assessments

Understanding the baseline conditions of existing resources and operations is the first step to building high-performance infrastructure systems. Greenhouse gas inventories and resource mapping are two forms of baseline assessments particularly useful in developing high-performance infrastructure. Baseline assessments that measure greenhouse gas emissions and map resource flows illuminate the climate impact of current infrastructure systems, as well as opportunities for resource synergies on site and in specific employment and industrial areas. Beyond large scale synergy opportunities, greenhouse gas inventories and resource mapping have the added bonus of revealing low hanging fruit opportunities for lower-cost efficiency upgrades.

Depending on the scale of measurement – whether single parcel, district, city, county or regional scope – greenhouse gas inventories and resource mapping illustrate opportunities for synergy networks. District-level assessments in particular create economies of scale and allow for a more complete understanding of the demands made on larger infrastructure systems. District-level assessments also allow for more targeted,



Energy inputs and greenhouse gas emissions at the district level.

nested strategies than may be feasible at a city-wide or regional scale. Regardless, it is advisable that every business or government agency have a basic understanding of both the greenhouse gas emissions and resource flows of their organizations' scope of operations.

Greenhouse gas inventory – The World Resource Institute and the World Business Council for Sustainable Development have developed the Greenhouse Gas Protocol to give businesses and governments standard protocols for measuring emissions at both the organizational and project level. The protocol has become the most widely used means for developing greenhouse gas inventories in the world. It covers direct emissions related to sources that are owned or controlled by the reporting company, as well as indirect emissions associated with the generation of imported or purchased energy. The protocol does not, however, require the measurement of many indirect, but pertinent, emissions resulting from the extraction and production of purchased materials and fuels, transportation and waste disposal. Based on the Carnegie Mellon Economic Input-Output Life Cycle Assessment method, Metro's Regional Greenhouse Gas Inventory takes a more comprehensive approach, measuring direct emissions and energy purchase, as well as indirect emissions caused by the materials, products, processes and services throughout their entire lifespan.

World Resource Institute and the World Business Council for Sustainable Development **www.wbcsd.org**

Carnegie Mellon Economic Input-Output Life Cycle **www.eiolca.net**

Resource synergy: the process of exchanging resources such as water, energy or by-products between users that results in their more efficient or full use.

Systems approach

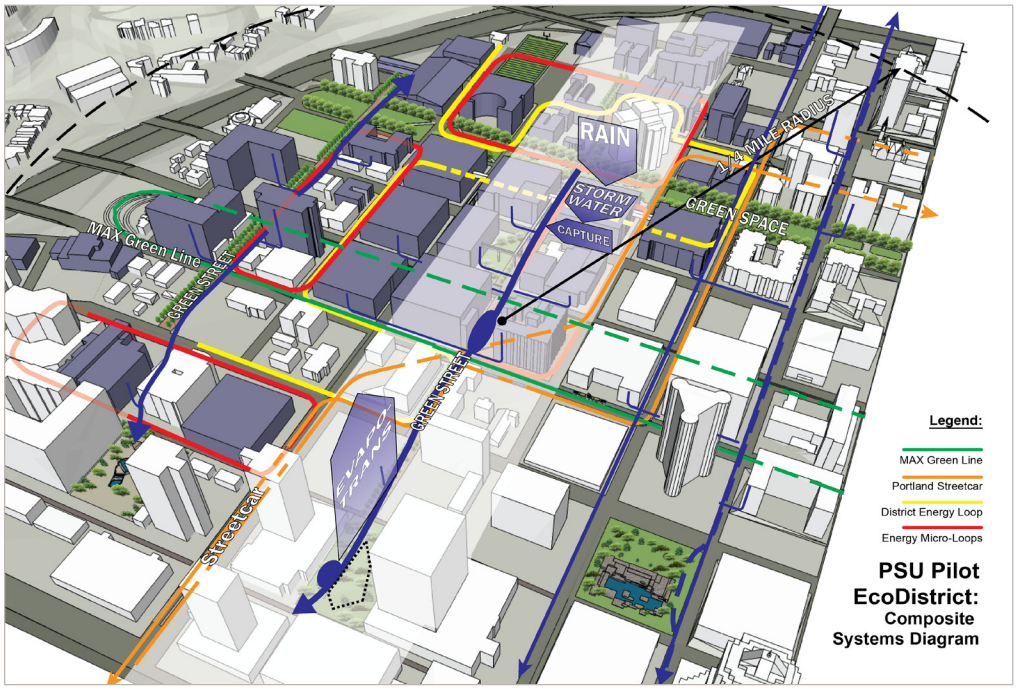
The value stream map was key to streamlining our quoting process: we broke it down, made it simple, and made it better. As our partner in launching our lean journey, CMC added value by helping us to see where we needed to improve, rather than stagnating or becoming overly reliant on outside experts for our own improvements.

– Andrew Gabelman,
President,
Chief Enterprises
Chicago Manufacturing Center,
accessed August 11, 2010
www.cmcusa.org

The Carnegie Mellon Economic Input-Output Life Cycle Assessment method is a public domain tool that helps public agencies and businesses measure direct and indirect emissions. It creates a comprehensive inventory that includes energy purchases and life-cycle emissions of daily operations, and provides a good understanding of the climate impacts of a specific employment area. It can determine which resource synergy to pursue or prioritize based on its ability to mitigate the impacts of climate change over time. In addition to the free online tools provided by the World Resource Institute and Carnegie Mellon, numerous private firms exist to help local governments and businesses create greenhouse gas inventories.

Resource mapping – Even without a greenhouse gas inventory, communities and business can begin the process of resource mapping to find resource synergy opportunities. Resource mapping explores the conditions of existing infrastructure systems and measures the current inputs and outputs (or flows) of resources. Depending on the depth of analysis, maps can illustrate a number of different resources from traditional infrastructure systems related to energy, water, waste and transportation, to social infrastructure systems related to public-private partnerships or programs that facilitate and maintain on-going synergies.

Upon completing a resource flow map, an analysis of resource needs can be undertaken for the same infrastructure systems. For example, a resource needs analysis may include the need for wood or food waste to power a combined heat and power plant, the need for greenhouse-gas neutral transportation fuel in the area or the need for non-potable water to wash fleet vehicles. Supply and demand analyses matches existing resource flows with projected needs, revealing synergy opportunities. The resulting data can support the business case for specific sustainable infrastructure technologies, such as



The Portland State University pilot project underway by the PoSI EcoDistrict Initiative.

district energy, cogeneration or anaerobic digester facilities. Individual businesses and government agencies can map their own operations and share information with other entities to find synergies. At the district level, mapping can illustrate multiple resource flows and is more likely to identify several synergy opportunities.

Integrated planning and design process

The integrated planning and design process provides a template for finding and developing synergy networks and implementing sustainable infrastructure strategies in specific employment and industrial areas. The systems approach and high-performance infrastructure systems in both new and redevelopment areas, are often very complex, demanding a process with a great deal of front-loaded research, educational training and partnership building. Intensive information sharing and collaboration among a diverse group of public and private stakeholders is necessary in order to move beyond preconceived barriers to sustainable development and toward creative technical and financing solutions. The integrated planning and design process utilizes a series of planning and design charrettes at the beginning of development, which helps overcome these issues.

Integrated planning and design charrettes bring together stakeholders, encouraging them to look at the entire life-cycle of the project and address problems beyond each participant's field of expertise.

Integrated planning and design charrettes bring together stakeholders, encouraging them to look at the entire life-cycle of the project and address problems beyond each participant's field of expertise. They integrate the skills, experience and financial resources of all the key stakeholders from the beginning of the process, before any major design decisions are made. Integral stakeholders include the municipal government, planning and design teams, community and economic development associations, technical engineers, developers, environmental experts and most importantly, the business, utility and community interests involved in the project area. Together, participants look at the elements of the development project, including its overall cost, efficiency, environmental performance, quality-of-life, creativity, future flexibility and impact on pre-determined project goals.

A preliminary integrated planning charrette asks stakeholders to formulate a set of mutually agreed upon project goals and objectives as well as a list of potential infrastructure synergies and solutions that adhere to high environmental, economic and social performance. Targeted upfront research can evaluate possible synergies that might be applied in the project area, such as district energy, cogeneration, wastewater recycling, facilitated waste exchanges and integrated, multi-modal transportation options. A matrix can help match and prioritize these potential high-performance infrastructure projects with city goals and objectives. Participants of the charrette team can review this upfront research and brainstorm infrastructure synergies ahead of time. Baseline assessments with resource maps of the current infrastructure systems, the various resource inputs and outputs of the system and the greenhouse gas emissions of the existing operations can also be done prior to the charrette to prepare the participants to identify targeted infrastructure synergies and solutions.

Success will require a holistic approach that includes comprehensive assessment tools, active citizen engagement and governance, new forms of project and infrastructure capital, and public policy support.

– Naomi Cole, LEED AP
Program Manager

The resulting knowledge, mutually-agreed upon goals and vision for development gained from the preliminary charrette can be applied later in a targeted design-build charrette. In a design-build charrette, the design and development teams use an integrated development process to gather the affected stakeholders in the building

community, such as technical planning, design, engineering and construction fields, in order to fine-tune the possibilities for design. These teams reaffirm the project goals and work together across disciplines to find solutions at the design, construction and operations phases. The design-build charrette can also be a competition, where the design team with the highest performing design – as determined by the city's pre-determined project goals – is awarded development of the project.

Integrated planning and design allows infrastructure solutions to take form because the project is viewed as an integrated entity, rather than as a series of systems working in isolation.

Members of integrated planning and design teams will change over time to incorporate different expertise at different phases of the project. This approach encourages an exchange of ideas and information. It allows infrastructure solutions to take form because the project is viewed as an integrated entity, rather than as a series of systems working in isolation. For example, a team might decide to lay pipes for a district energy system while putting down bike and pedestrian trails. Inevitably, conflicting interests and needs arise, but the charrette process is helpful in overcoming these obstacles because participants become educated about the issues. They play a part in resolving conflict and identifying coordinated solutions. Not all conflicts are resolved, but important, often interdependent, issues are explored.

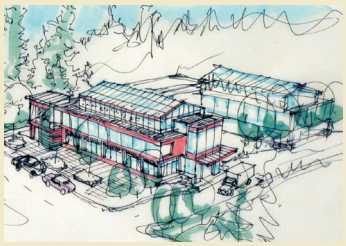
Co-location

The most effective resource efficiencies and synergy networks are created when businesses that have matching resource inputs and outputs are co-located within the same district. This presents a perfect opportunity to support cluster development by implementing high-performance infrastructure in the region's employment and industrial areas. Highly developed co-located operations that optimize economic, environmental and social performance through collaboration of resource management are often called eco-industrial parks. Co-location in an eco-industrial park allows businesses to employ strategies such as including opportunities for waste-to-energy facilities, district energy, wastewater cascading, shared logistics, shared shipping and receiving, shared parking, shared purchasing blocks for green product procurement, coordinated green building retrofits and shared informational resource centers. These strategies often reduce overhead costs associated with transactions, transportation and resource management resulting in additional reductions in impact to the infrastructure system. The resource synergies produced at these parks have resulted in significant reductions in waste, greenhouse gas emissions and demands on local infrastructure systems.

On the ground

District of North Vancouver, B.C.

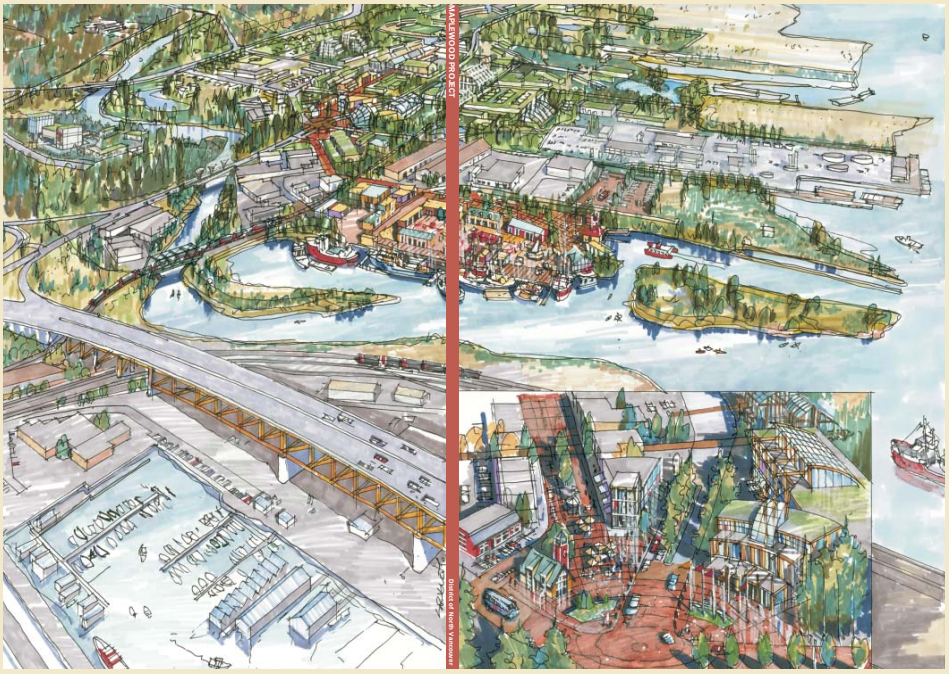
The Maplewood Project



Eco-industrial resource center

Championed by the District of North Vancouver and a broad partnership of over 40 local governments, businesses and community organizations, the Maplewood Project used the systems approach and an intensive three-day integrative planning charrette to map resources and assess resource synergy opportunities in a predominately industrial, 500-acre area of land just north of Vancouver, British Columbia. The District hired planning and eco-industrial experts to map resource flows of energy, material and water in the area, and evaluate current infrastructure systems for inefficiencies and possible improvements. The expert team convened a planning charrette and brought together design teams from a broad spectrum of design and development disciplines – including architects, engineers, local government planners, economists, utilities and local business representatives – to assess baseline conditions and think creatively about solutions that would create better efficiencies across infrastructure systems.

The final report identifies opportunities including building a biomass co-generation plant; creating better connectivity for trucks, bikes and pedestrians in industrial areas; increasing on-site stormwater recycling; and creating material exchanges between businesses that reduce the amount of material transported to the landfill. Economic analysis of the opportunities revealed that further development of the identified opportunities would create a potential tax revenue stream increase in the range of $21 to $26 million.



Systems approach

The success of an eco-industrial park is dependent on the ability and willingness of the members to create a sound business case. Initiatives that have attempted to mimic the success of eco-industrial parks without the necessary member-driven support and buy-in have thus far been largely unsuccessful.

Eco-industrial parks and high-performance infrastructure projects do not have to start from scratch. Success stories, locally and from around the world, exemplify the opportunities for local jurisdictions to support existing employment and industrial areas by identifying opportunities for resource synergies and helping implement high-performance infrastructure strategies like district energy, renewable energy systems, and waste-to-energy facilities. Many smaller steps can be taken toward building higher performance infrastructure through education, policy adoption, code changes, implementation of individual high-performance infrastructure strategies on municipal land and education about the benefits of high-performance infrastructure.

Sustainable business metrics

Sustainable business metrics give businesses and municipalities the ability to evaluate strategies that offer the best investments for their project goals and conditions. Unlike traditional business models that focus on short-term financial returns, sustainable business metrics attempt to measure the full return on investment for specific projects. It uses the financial, environmental and social costs of the project through life-cycle cost assessments and triple bottom line analysis. These metrics allow businesses and municipalities to make sustainable infrastructure investments that effectively handle volatile financial market and funding cycles, as well as the impacts of climate change.

Life-cycle cost assessments – Life-cycle cost assessments assist governments and businesses in making informed decisions about infrastructure investments by factoring in the full costs and risks of different projects. Life cycle cost assessments factor in key measures of sustainability in all project phases. Projects are measured beyond their initial capital cost to assess costs related to operation, routine and major maintenance, periodic replacement and end-of-life costs. End-of-life costs includes factoring in how long a system will be viable and the total cost associated with disposing of, reusing or decommissioning the system when it is no longer usable.

On the ground

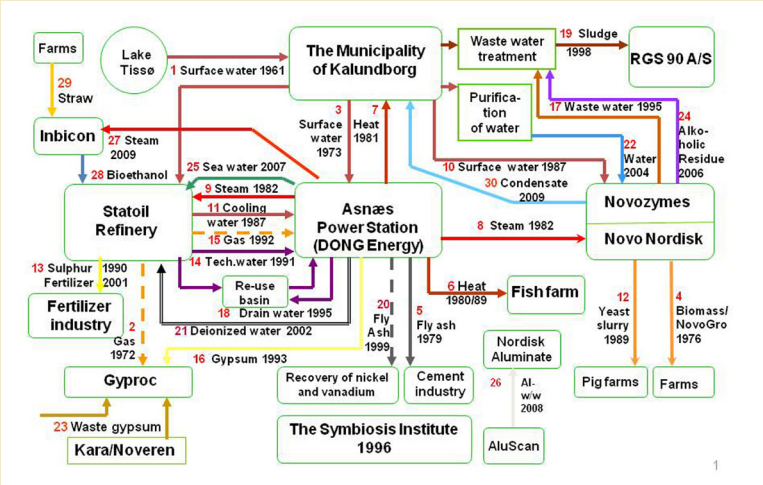
City of Kalundborg, Denmark

Industrial symbiosis

Kalundborg's industrial symbiosis employment area is the most publicized and successful example of applying industrial ecology, the concept behind the systems approach. It did not start as a strategically planned eco-industrial park or network. Rather, a few local businesses looking to improve the performance of economic investments negotiated individual exchange projects. Since the initial partnership in 1961 (between the city and an oil refinery), Kalundborg's industrial symbiosis has evolved into a network of synergy projects between independent companies, representing dozens of different exchanges related to water, energy and waste. As a result of these efforts, they have seen reduced costs, liabilities and waste as well as increased resource conservation, operating efficiencies, public health and income from the sale of waste materials.

The industrial symbiosis at Kalundborg was driven by the close relationships between the local companies. Physical proximity and local business networking opportunities helped facilitate the identification of these synergies. Geographic proximity also made implementing some of the high-performance infrastructure mechanisms financially feasible (i.e., reduced pipeline lengths or lower heating costs) and exchange projects economically advantageous to traditional approaches (i.e., reduced waste disposal or truck trips). The private sector pursued these projects to realize an increase in operating efficiencies and revenue. Incentives and public subsidies were not provided. As time passes, leadership, companies and technologies change, but the industrial symbiosis network in Kalundborg has been maintained. It has also evolved, implementing new exchange projects in a constant effort to improve performance. The Symbiosis Institute hosts visitors wanting to learn about the industrial symbiosis and monitors the progression of their industrial ecology system.

Local government supported the efforts of the businesses and implemented regulations to support the symbiosis activities. However, the real drivers were the companies.



Systems approach

Full-cost accounting encourages governments and business to assess the majority of direct and indirect project costs in their evaluations, such as overhead and administrative costs, project planning, design, property acquisition, environmental review, permitting, contingency allowance, project management and closeout activities. Life-cycle cost assessments also measure the risks associated with uncertain future events, such as the possibility of performance failure, private abandonment, the potential impacts of climate change, economic market transformation and shifting community needs. By factoring in the costs and risks over the long term, life-cycle cost assessments encourage the selection of infrastructure projects that are more sustainable and adaptable to future needs.

Triple bottom line analysis – Triple bottom line analysis evaluates environmental and social impacts of a project as well as the traditional financial return on investment. This approach is different from the narrower financial impact approach, which focuses only on direct budget impacts. Environmental and social impacts, such as greenhouse gas emissions, creation of livable wage jobs and healthy employment areas, are important but are often difficult to describe in terms of dollars. The triple bottom line approach incorporates environmental and social impacts by creating dollar translations whenever feasible and reasonable. It also considers that these impacts remain important even when they cannot be converted to equivalent dollars.

Triple bottom line assessments address financial, environmental and social impacts in three steps. First, a list is created to describe the potential impacts. Second, the elements in the list are quantified in some consistent physical units; preferably standard valuation units are used so that possible project alternatives may be adequately compared. For example, if an element of the list was the ability to manage stormwater on site, this would be quantified by the amount of impervious surface area created by each one of the project alternatives. Third, elements are monetized whenever possible to evaluate financial impacts. Formulating a standardized checklist for evaluating project alternatives based on triple bottom line assessments will then allow for comparisons across different project alternatives. Based on a project element's relative impact, the desired goals of the project team and the community's long-range vision, some factors within the checklist may be weighted differently.

This type of analysis aligns capital improvement plans and project lists with a community's aspirations, vision, goals and comprehensive plans, rather than simply relying on fiscal thriftiness. Used in conjunction with the life-cycle assessment, a local jurisdiction can account for financial, environmental and social impacts of any given investment. A simple example is the analysis of implementing traffic mitigation measures at a congested intersection. Using this type of analysis, the local jurisdiction was able to look beyond construction costs and assess the long-term maintenance costs and carbon emissions associated with choosing a roundabout versus a traffic signal. Similarly, the jurisdiction could see how local hiring options for both projects might also influence emissions as well as the overall costs and benefits to the local economy beyond just the capital investments of the project. This approach can help businesses make decisions that make them an asset to their communities by reflecting priorities beyond their financial bottom line.

On the ground

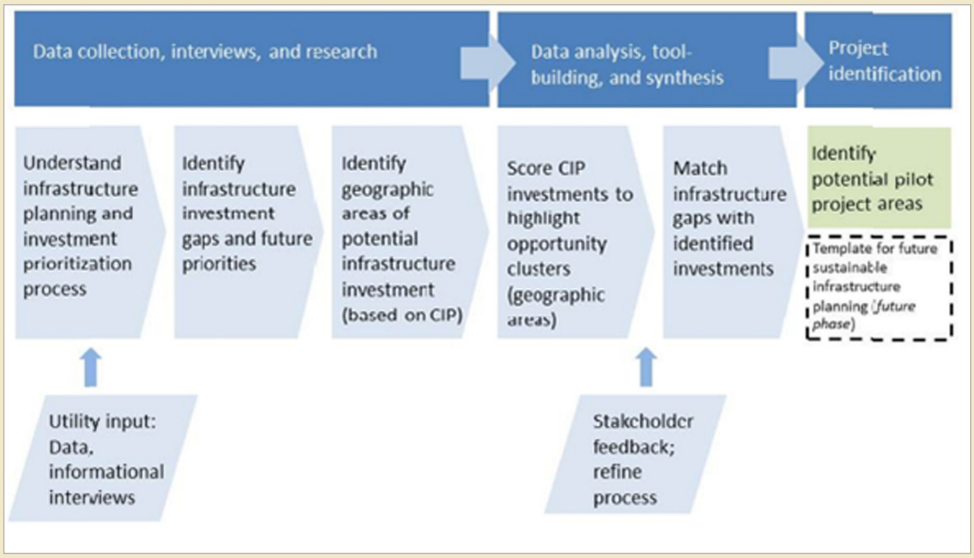
City of Seattle, WA

Sustainable Infrastructure Initiative

The City of Seattle Sustainable Infrastructure Initiative, launched in 2007, uses a systems based approach to address the challenges of climate change. The initiative integrates departmental priorities and spending to create infrastructure synergies, and is directed under three central themes:

- develop economies of scope – wherever possible, infrastructure investment must do more work across multiple lines of business
- nest decentralized solutions within central infrastructure systems, using more cost effective, semi-autonomous water and energy service districts that reduce demands on the central system
- use triple bottom line economics to compare and generate alternatives based on an integrated strategy to deliver the full range of city services – where alternative solutions are generated and considered among the different departments.

The initiative has established a series of pilot projects, collaboration between departments and new ordinances designed to hardwire sustainability into land use codes.



By factoring in the costs and risks over the long term, life-cycle cost assessments encourage the selection of infrastructure projects that are more sustainable and adaptable to future needs.

The Port of Portland's new headquarters building at the airport terminal includes a living machine and solar panels.

Chapter 1

High-performance infrastructure

SECTION TWO

High-performance mechanisms

Given the growing shortfalls in infrastructure funding, local jurisdictions and businesses must make the most of existing systems by reducing demands and costs. Innovative infrastructure projects can bridge this shortfall. Such projects have been shown to reduce water and energy consumption as well as wastes that go to landfills, reduce on-site building space and land needed for traditional infrastructure facilities, minimize freight traffic and congestion, and lessen the need for additional infrastructure capacity and spending. These reductions create more efficient, high-performing systems. Newer infrastructure techniques that take the systems approach and mirror natural ecosystems are more eco-efficient, reducing environmental as well as financial costs over time. Local jurisdictions and businesses can encourage, prioritize and implement these innovative projects by using the mechanisms that follow to advance high-performance infrastructure systems.

High-performance mechanisms

The nuts and bolts

A central imperative of our time is to do more with less.

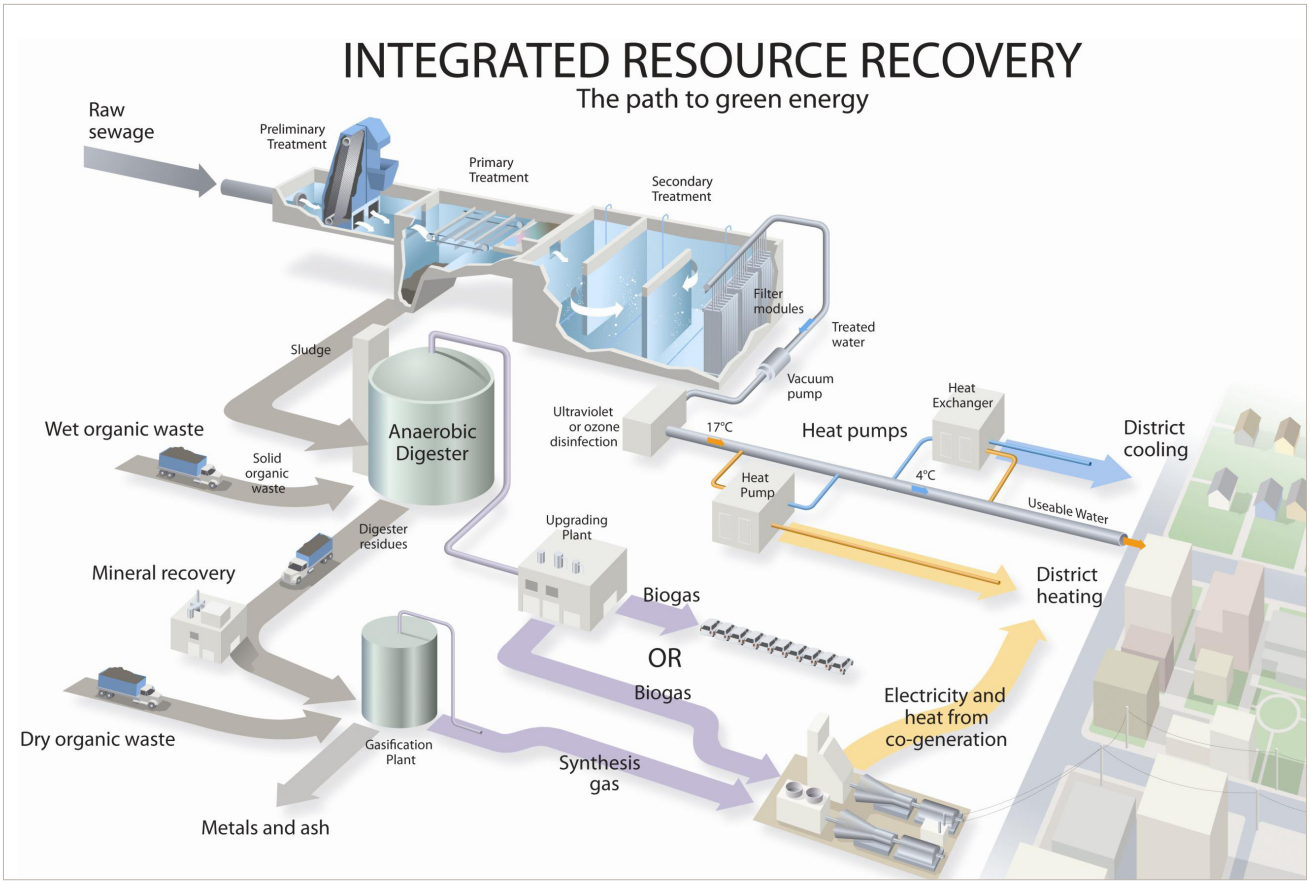
Through the systems approach, governments and businesses can identify innovative infrastructure projects such as district energy, anaerobic digestion and facilitated waste exchanges. High-performance mechanisms create the financing capacities, technical assistance programs and performance indicators for implementing these innovative infrastructure projects. These tools make high-performance infrastructure projects come to life and ensure that local communities achieve their economic and environmental aspirations.

How to use it:

Innovative infrastructure

The following infrastructure models and techniques are typically analyzed as part of the systems approach. The analysis considers these infrastructure options within the local context to determine which strategies and mechanisms best fit. These strategies, once implemented, can result in higher performing infrastructure systems than traditional models.

District energy – A district energy system is a network of insulated pipes underneath an area of buildings that transports heating for space heat and hot water, cooling for air conditioning and cold water, or both, to all the buildings from a central utility plant.



High-performance infrastructure mechanisms for an integrated resource recovery system

The system reduces the space and costs associated with traditional boilers and chillers in individual buildings and allows for more adaptability to changing fuel sources because more than one type of fuel source may be used. The central utility plant can use traditional fuel sources like natural gas, but is most sustainable when operated with combined heat and power facilities that use local biomass such as waste wood and food, biogas such as landfill gas, water from surrounding rivers and lakes, heat from industrial plants, and heat from surrounding buildings or heat pumps. Alternative sources reduce demand on the electrical grid as well as risks associated with traditional fuel cost volatility.

On the ground — City of Saint Paul, MN

District energy

Saint Paul's district energy system is the largest and arguably one of the most successful district energy systems in North America, heating more than 185 buildings and 300 single-family homes (31.1 million square feet) and cooling more than 95 buildings (18.8 million square feet) in downtown Saint Paul and adjacent areas. Since its installation, the system has enabled the city to eliminate 150 smokestacks, reduce sulfur dioxide and particulate emissions by more than 60 percent and reduce CO2 emissions by 280,000 tons per year.

The venture was originally envisioned by then Mayor George Latimer as a response to the energy crisis of the late 1970s. Latimer championed the project, lobbying state and federal governments for assistance in replacing a former steam system with a modern district energy system. His initiative grew into a public-private partnership among the City of Saint Paul, State of Minnesota, U.S. Department of Energy and the downtown business community.

The district heating system was installed in 1983 and ten years later the system began offering district cooling service to downtown building owners as well. In 2003, Saint Paul's district energy system became a green energy service provider. The city constructed an affiliated combined heat and power plant that is fueled by a renewable resource – clean, urban wood waste that would otherwise be sent to the landfill. Using renewable energy and the combined heat and power plant simultaneously produces about 65 megawatts of thermal energy for district energy and 25 megawatts of electricity for the public utility company. Approximately 45 percent of its peak load and 90 percent of its annual energy load is met with biomass, and excess steam heat produced in the summer is used to run chillers, while excess electricity in the winter is exported to the electrical grid. The entire system is designed to be as energy efficient as possible, fuel flexible and result in stable rates for its customers.

EcoDistricts provide an opportunity to rewire the DNA of cities, transforming how city departments work together in defined neighborhoods, and how residents and businesses perceive the vital 'ecosystem' services that provide the basis for urban living and commerce. Done well, EcoDistricts offer the prospect of solutions to some of our most pressing challenges.

– Tom Osdoba, Managing Director, Center for Sustainable Business Practices, University of Oregon

District energy systems are most effective within districts that have a mix of uses, such as mixed-use employment and institutional uses, or in areas with a large amount of waste heat or materials. These systems can be placed at varying scales, from small areas like the district energy system at the Oregon Health and Science University South Waterfront campus, to the cooling system in the Pearl District of downtown Portland, to city-wide developments like St. Paul District Energy.

Most district energy systems significantly reduce consumption of fossil fuels. They are emerging as a key strategy for reducing greenhouse gas emissions among local governments in the United States. Although easier to construct in newly developing areas without existing infrastructure and development, local and national examples prove that district energy systems can be successfully implemented in older, established areas. District energy systems have been very successful in areas with compact development patterns and an efficient mix of uses, such as high density mixed use employment corridors and institutional areas that will have significant and consistent resource flows. District energy systems can also be placed in lower density developments, especially when there is opportunity for future infill development and an increase in uses.

Combined heat and power – Also known as cogeneration, combined heat and power is the simultaneous production of electricity and heat from a single fuel source. The electricity and heat produced can come from a variety of different fuel sources such as natural gas, oil, coal, biomass, biogas or waste heat. Heat can be recovered from electrical generation through heat exchangers and used to heat buildings on one site or in a district energy system. Electricity can be used on site or sold back to the grid. Combined heat and power is highly efficient and safeguards against unstable energy costs, thus providing considerable savings on energy bills.

Combined heat and power requires less fuel to produce a given energy output and avoids transmission and distribution losses that occur when electricity travels over power lines. It can also be designed to provide high-quality electricity and thermal energy to a site regardless of what might occur on the power grid. Impacts of outages are lessened and power quality is improved for sensitive equipment. Because less fuel is burned to produce each unit of energy output, combined heat and power reduces air pollution and greenhouse gas emissions. Further greenhouse gas reductions can be

Brewery blocks circa mid 1990s

Brewery blocks circa mid 2000s

On the ground

City of Portland

Brewery Blocks district cooling

The City of Portland has a district cooling system that offers on-demand chilled water through an underground distributed piping network to meet the air conditioning and cooling needs for all of the buildings of the Brewery Blocks in the Pearl District. The system was developed in 1999 to 2001 by Gerding Edlen and Portland Energy Systems, with financial assistance from Portland General Electric. The city granted a franchise to Portland Energy Solutions to construct, operate and maintain the pipeline system with all the necessary facilities. Since its inception, the ownership of the district cooling system has changed hands a number of times, but is currently owned by the Portland District Cooling Company, an affiliate of Marubeni Sustainable Energy, Inc.

The system allows building owners and tenants to avoid the capital, energy, operating and maintenance costs associated with owning and operating their own chilled water system. It also provides energy savings and net reductions in water and sewer usage as well as charges for its customers. In 2008, Portland District Cooling Company began expansion of the network to also serve other buildings outside of the Brewery Blocks in the surrounding Pearl District, and may be considering connecting the system with a district heating system for the North Pearl District.

Cooling district with rooftop chilling units

realized when using only waste heat fuel sources or biomass and biogas fuel sources from biogas digesters and gasification plants. Technologies continue to improve, increasing efficiency and decreasing potential health implications.

Many jurisdictions across the Portland metropolitan area are already siting renewable energy systems on municipal facilities and promoting these systems through local code changes and incentives.

On-site renewable energy systems – On-site renewable energy systems such as solar panels, on-site wind turbines, geothermal pumps, and other biomass reduce the demand on the energy grid. They also reduce the risks associated with climate change regulations and fossil fuel energy costs. These on-site systems are becoming increasingly more financially feasible through power purchase agreements and the realization of their long-term benefits. Many jurisdictions across the Portland metropolitan area are already siting renewable energy systems on municipal facilities and promoting these systems through local code changes and incentives.

Recovering water for reuse, heat and power applications – High-performance systems also include the on-site collection, treatment and reuse of stormwater and wastewater. Instead of discharging into the environment, stormwater is diverted to ecological uses. These are low-impact development techniques that reduce the amount of impermeable surface area and follow natural drainage and hydrology. Wastewater is treated and reused for regulator-approved non-potable uses such as toilet flushing, irrigation and washing of fleet vehicles, or treated for potable uses, returning it to a potable water reservoir.

Heat can also be captured from treated wastewater through heat pumps that recover low temperature heat from various sources and make it available to surrounding buildings. Treated wastewater provides a highly efficient source of extractable heat because it is significantly warmer than many other sources. In addition, nutrient materials in sewage biosolids can be extracted from wastewater for fuel in waste-to-energy facilities such as biogas or gasification plants.

Wet and dry organic wastes for cogeneration – Wet and dry organic waste can be recovered to produce heat and energy. Wet organic wastes such as wastewater treatment plant biosolids, food waste and manure can be recovered through aerobic composting or anaerobic digestion. Both methods significantly reduce greenhouse gas emissions, divert waste from landfills, cut transportation costs of disposal and

Rooftop solar panels

Microturbines at OHSU-South Waterfront

On the ground

Greater Vancouver Regional District, B.C.

B.C. Bioenergy from Biogas Project

The B.C. Bioenergy from Biogas Project, initiated by Greater Vancouver Sewerage and Drainage District in B.C., Canada, adopts innovative technologies at the Lulu Island wastewater treatment plant to reuse its wastewater for energy use. The sludge by-product of the treatment plant will be turned into biogas, which will then be converted via cogeneration into electricity and heat for the plant. The demonstration project will reduce the plant's operating costs, improve electricity self-sufficiency, displace electricity from the grid and reduce truckloads of sludge residual that are hauled hundreds of miles for disposal, thereby eliminating associated emissions and waste disposal. The project is expected to be a model for increasing the productivity of other wastewater treatment plants. The project stemmed from a study on integrated resource recovery commissioned by the Canadian Ministry of Community Development.

On the ground

City of Beaverton

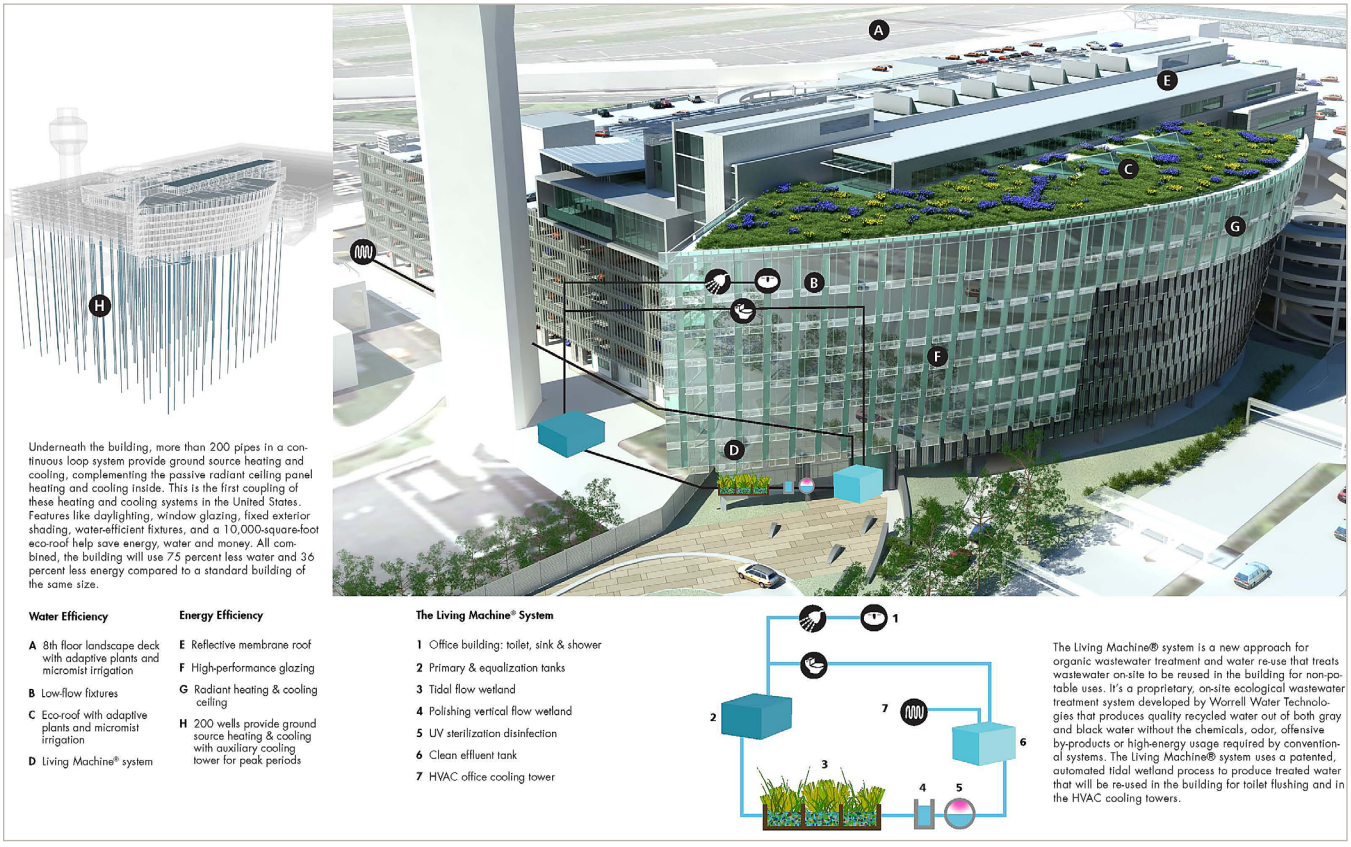
Tektronix materials exchange

Tektronix Inc., located in Beaverton, Oregon, used IMEX, an online materials exchange network for the Northwest Region, to find a material input. Tekronix posted a wanted listing for caustic soda solution (sodium hydroxide) in small or large quantities of up to 10,000 gallons a month, for use in their Beaverton wastewater treatment facility. After two months they were approached by Protective Environmental Services, a waste broker in Seattle, Washington, who had a client with 50,000 pounds of sodium hydroxide as their by-product. The material was given to Tektronix at no charge except for transportation, saving the company $7,000 and saving the broker's party $5,000 in hazardous waste disposal.

provide soil nutrients for nearby agriculture. Anaerobic digestion can use wet organic waste to provide greenhouse gas-neutral energy for cogeneration. Anaerobic digesters use bacteria to convert wastes into biogas and residues. Biogas can be upgraded into methane and used in fleet vehicles or in fuel cogeneration plants to produce energy and heat, and the residues can be used in either agricultural applications or in gasification plants. Gasification plants use dry organic materials to produce synthesis gas, which can be burned in a boiler for heat or in a cogeneration plant to produce heat and electricity. There is some evidence that anaerobic digestion and gasification are economically feasible only in areas that can be supplied with more than 10,000 tons of feedstock per year. Smaller scale developments may choose instead to utilize aerobic composting techniques to recover wet organic waste materials and use other fuels for cogeneration plants.

Material exchange – Material exchanges provide markets where the material waste or by-products of one company or agency can be used as the raw material for another. These exchanges divert waste from landfills and usually decrease greenhouse gas emissions. They also reduce the cost of waste disposal. While some material and waste exchanges operate from a physical building, most are typically web-based and connect potential buyers with sellers. Sellers advertise their by-product materials and it is usually up to the buyer and seller to figure out the financial, legal and transportation logistics of the exchange transaction. Some exchanges are run by private, for-profit businesses, while others are operated by state and local governments.

Port of Portland's new headquarters building, which utilizes an ecological wastewater treatment and water re-use system, a 10,000 foot square green roof, a ground source heating and cooling system, radiant ceiling panels, day-lighting and water efficient fixtures.



On the ground

City of Richmond, B.C.

Eco-industrial policy framework

In 2005, the City of Richmond hired an eco-industrial consulting firm to evaluate existing policies and provide recommendations for integrating eco-industrial opportunities into the city's regulatory framework. The city wanted to use eco-industrial development as a tool to encourage sustainability and economic growth. They hoped eco-industrial development would:

- maximize business competitiveness and profitability
- simultaneously meet job creation, environmental and community objectives
- create better places to work that optimize employee health
- reduce or minimize impacts on local and global ecosystems
- reduce the impact of infrastructure systems by promoting smart resource management.

Audits of existing codes and policies illuminate opportunities to implement innovative infrastructure.

The assessment and final recommendations were presented in an eco-industrial report for the City of Richmond. The report concluded that the best way to encourage eco-industrial development is to integrate eco-industrial concepts into all statutory land use planning documents, strategic plans and professional terms of service references. The consultants suggested that the best means of doing this is to host educational seminars and disseminate outreach materials to city departments and employees. The report also highlighted that eco-industrial approaches must be integrated into the economic development strategy and that specialized eco-industrial training is needed for economic development staff.

The report specifically mentioned that the City of Richmond should pursue eco-industrial development on its own lands to lead the way for private development. If this is not feasible, however, the city should encourage eco-industrial development in the private sector by looking into incentives and technical assistance programs. For instance, the development of a GIS-based system will help external parties identify and evaluate a business case for resource exchanges. They also suggested creating a green development guide for businesses and other partners that highlights the value of infill, shared infrastructure, green development and the financial merits of better land use. The guide would include eco-industrial specific information, such as how to facilitate by-product synergies, create improved site design principles and plan for industrial parks that facilitate green infrastructure and synergies between businesses.

The City of Richmond has taken steps toward integrating the eco-industrial approach into its policy framework and economic development strategy. However, full policy integration and the development of a GIS system and green development guide have not been completed due to the lack of on-going resources and a project champion.

Technical assistance

Synergy networks identify synergies that help industries and businesses increase profits.

CMC helped us focus on the key processes and value streams of our operation and taught us the tools required to continuously improve and optimize them. We look forward to continuing our cooperation with CMC to further eliminate bottlenecks and inefficiencies throughout the company, on the shop floor as well as in the office.

– Patrick Mitsuuchi-Stork, Manufacturing Engineering Manager, Midwest Folding Products, regarding his collaboration with the Chicago Manufacturing Center

Chicago Manufacturing Center, accessed August 11, 2010 www.cmcusa.orgs

Sustainable, high-performance infrastructure mechanisms are complex and still emerging. Thus, a number of local governments are using technical assistance tools to assist businesses and developers in realizing the benefits of high-performance mechanisms. Technical assistance can range from a simple information guide on eco-efficient tools to assistance with feasibility analyses and resource mapping. Local plans for high-performance infrastructure as well as available resources will determine what type of technical assistance is best in a given community.

Informational guides for developers – Providing developers with an informational guide on the basics of high-performance infrastructure strategies can encourage developers to explore the feasibility of different options and can encourage adoption of strategies that meet their individual needs. Guides should include basic information, highlighting the value and financial merits of these mechanisms, long-term and immediate costs and benefits, and direction on where to access more information and financial resources. These guides should also provide information on any high-performance infrastructure projects the community developed plans for as well as incentives the local jurisdiction adopted to promote high-performance infrastructure.

Facilitated synergy networks – Synergy networks identify synergies that help industries and businesses increase profits. They reduce natural resource and financial waste through a large, organized network. By establishing a broad network of industries and businesses, facilitated synergy networks create the economy of scale needed to maximize waste reduction and match the resource outputs with resource inputs in various systems. A facilitator then navigates and coordinates within the network to reduce costs associated with resource generation, management, treatment and disposal.

The resources addressed by networks are usually affiliated with waste, water and energy flows. However, networks can also include business and social resources that might be necessary to find creative funding mechanisms for natural resource synergies as well as organizational capacity for shared transportation demand strategies, shared facility space and coordinated collocation efforts. The number and kind of resources addressed by a network depend on the local context and the facilitator. Organizing entities can choose to address one resource synergy, such as waste exchanges, or they can address a host of opportunities ranging from a green purchasing block program to coordinated green building retrofits.

Networks can be organized by government agencies, private businesses or nonprofits. In the case of eco-industrial parks, park managers are often the principal organizer. The most successful networks are created through public-private partnerships where members have mutual, vested interests in reducing business and environmental costs. Public-private partnerships provide the resources and structure needed for an on-going facilitated synergy network.

A fee may be imposed on members based on available resources and the services a network wishes to provide. Networks that provide significant technical assistance and actively search for new synergies often charge a fee that is nominal when compared to the average savings they facilitate for each business. Some networks also offer a

On the ground

U.S. Business Council for Sustainable Development

By-product synergy

The U.S. Business Council for Sustainable Development developed a process called by-product synergy to cultivate facilitated waste exchanges. Businesses, nonprofits and government organizations sign up to be involved in a by-product synergy network and work with experienced project teams to catalog their organization's material inflows and outflows in a confidential database. Participants work with the project team to develop action plans and find commercially viable exchanges through the database and facilitated workshop sessions. The project team also helps the participating organization address any technical, regulatory or logistical barriers to exchanges. Some by-product synergy networks use dual-membership models that allow members to purchase more advanced facilitation services or procure a basic set of services for a reduced price. This allows both big and small companies to realize the financial and environmental benefits of by-product exchanges.

One of the most successful examples of a by-product synergy network is the **Chicago Waste to Profit Network**. In 2005, the Department of Environment for the City of Chicago was looking for a proven, but exciting process for developing eco-industrial activities in the Chicago region. At the same time the **Chicago Manufacturing Center** had begun collaborating with the U.S. Business Council for Sustainable Development to create a by-product synergy process. With assistance from EPA Region V, the Chicago Waste to Profit network was launched. The network uses a fee-based system to provide members with in-depth practitioner support on technical assessments, data analysis, synergy creation and implementation. The Chicago Manufacturing Center works with businesses to develop a sustainability and growth strategy based on the business' priorities and environmental goals. The strategy establishes incremental steps that result in increasing payoffs. The focus of the network is meeting long-term business material supply needs, finding innovative solutions and building strong business relationships. Assistance includes monthly networking meetings and an online material exchange database.

In 2006, through the Chicago Waste to Profit network, Goose Island Brewery underwent a carbon footprint analysis for a keg of their most popular beer. It analyzed the entire life cycle – from agriculture to production to transportation – and included a model formula for calculating and fine-tuning future products. The brewery was excited to identify improvements in economic and sustainability performance. Other documented results include: more than 182,000 tons of solid waste diverted from landfills, 127,000 tons of CO2 equivalent emissions reduced and $17 million dollars in beneficial economic impact to local companies. The success of the program is largely due to the buy-in from businesses, cultivated by the Chicago Manufacturing Center's existing connections and the economic benefits realized by the member businesses. The program's success has led to the creation of a statewide by-product synergy network. By-product synergy networks in Seattle, Kansas City and Houston have also experienced reduced waste and greenhouse gas emissions, efficient use of natural resources, and legally protected forums in which companies can explore material resource reuse opportunities.

Our work with CMC has made an enormous difference for us. As a small company, you have to be ahead of the market. People who wouldn't give us an interview in the past now want to talk.

– Marvin Klein, President, PortionPac Chemical Corporation
Chicago Manufacturing Center, accessed August 11, 2010
www.cmcusa.orgs

two-tiered structure, with database and informational access to companies participating within the free level of the network and fee-based service that identifies resource synergies and financial savings.

In either case, networks create resource synergies by providing opportunities for existing businesses to interact and share resources. Most networks provide these opportunities through facilitated face-to-face, meet-and-greet sessions to identify potential synergies. Having an established network facilitator that supports implementation can significantly increase the realization of these synergies and high-performance infrastructure projects.

Networks that provide significant technical assistance and actively search for new synergies often charge a fee that is nominal when compared to the average savings they facilitate for each business.

Governments can engage with businesses and, using GIS systems, find resource matches. The facilitated network can also help businesses deal with legal and logistical transactions involved in the exchange. Facilitated materials exchange networks may also choose to start a By-product Synergy Network, an initiative run by the U.S. Business Council for Sustainable Development.

Facilitated synergy networks can include more than waste exchange. A green purchasing block program allows public and private entities to purchase green products and services – ranging from office supplies to solar panels – in bulk quantities for a reduced rate. It may also include a green revolving loan program to fund green building retrofits and more sustainable site design strategies. The revolving loan is paid back through the savings earned on energy bills or waste hauling.

Before implementing specific programs, organizers of facilitated networks and governments interested in offering technical assistance programs should first ensure similar programs do not already exist. They should then work with local businesses to determine the greatest needs in the local employment or industrial area.

Technical assistance centers – It is helpful to employ a stable resource for technical assistance because sustainable, integrated infrastructure systems are complicated and ever changing with developing technology. Setting up a technical assistance center, or eco-efficiency center, provides a physical place and one-stop shop for individual businesses or facilitated networks to get the information they need to implement

Solar panels at airport parking, Port of Portland

Pipes at Beaverton Central Plant

high-performance infrastructure strategies. Technical assistance centers may provide support in testing the feasibility of applying specific solutions. Partnerships with local university systems can provide reduced-cost technical assistance as well as on-the-ground research and practical experience for advanced learning.

Funding mechanisms

To be truly successful, the high-performance infrastructure strategies outlined in this volume must be prioritized for funding, replacing traditional infrastructure projects. In order to do so, comprehensive plans can be revisited to incorporate these new techniques, and capital improvement plans can prioritize high-performance infrastructure projects. Once integrated into policy and comprehensive plans, these strategies can be funded through traditional infrastructure funding techniques, including general funds and system development charges. In addition, tax increment financing is a strong infrastructure funding mechanism for implementation in urban renewal areas.

Some jurisdictions cannot fund sustainable infrastructure developments from traditional sources. Creative financing mechanisms may be necessary. Creative financing mechanisms often combine funds from a variety of municipal departments as well private entities over several phases of a project. Integrative capital funding, developer agreements and power purchase agreements are some examples of current creative approaches to financing sustainable infrastructure initiatives.

Businesses will embrace resource efficiency and sustainability if services are delivered efficiently.

On the ground — City of Portland

BEST Business Center

The Businesses for an Environmentally Sustainable Tomorrow (BEST) Business Center provides free tools and advice to help businesses in Portland become more profitable and sustainable. It is a one-stop shop technical assistance center for businesses to evaluate their operations in the areas of energy, water, waste and recycling, purchasing, green building and transportation.

In 2006, the Portland Office of Sustainable Development commissioned research with dozens of local small businesses. The research revealed that businesses will embrace resource efficiency and sustainability if services are delivered efficiently. The BEST Business Center was created through partnership with city and regional government programs and energy utilities, including the City of Portland Bureau of Planning and Sustainability, City of Portland Water Bureau, Metro, Pacific Power, Portland Development Commission and Portland General Electric. The BEST Business Center streamlines access to financial incentives and technical assistance for greening business operations. These services are tailored to help each business conserve resources, improve efficiency, save money and provide a healthy and quality workspace for employees.

The BEST Business Center helped us evaluate what changes we could make that would be most beneficial to the environment, our guests and our community.

– Mike Duggan, Property Manager, McMenamins Kennedy School
The BEST Business Center, accessed August 11, 2010 bestbusinesscenter.org/about-us/

Integrative capital funding – or a citywide systems approach, cities will need to look at staff and funding resources in total when making new infrastructure investments. Integrated projects that focus on solutions across infrastructure systems only excel when different departments have the budget to participate, the time to collaborate and the tools to make agreements for joint funding responsibility. This requires advanced preplanning and clear lines of communication across departments. It is also best demonstrated through targeted pilot projects with teams devoted to cross-departmental collaboration.

Power purchase agreements for renewable energy systems – Power purchase agreements are financial arrangements in which a third-party developer purchases, owns, operates and maintains a renewable energy system (often solar) that is placed on a host customer's property. The host customer agrees to purchase the system's electric output from the provider for a predetermined period. This financial arrangement allows the host customer to receive stable and sometimes lower cost electricity while not assuming the risk of ownership and operation. In turn, the provider or investor acquires valuable financial benefits such as tax credits and income generated from the sale of electricity.

Developer agreements – In order to achieve municipal expectations for infrastructure improvements, a city can define the development expectations in an agreement that includes the developer and pertinent utility provider. The three-party, public-private partnership can contain interlocking development and service agreements to commit the parties to build out the project to the city's expectations and create a powerful mix of incentives and disincentives. Such interlocking agreements can prove crucial in ensuring development while preserving the community's vision.

Financial incentives

Financial incentives facilitate implementation of sustainable infrastructure strategies and include funding from various state departments and the Energy Trust of Oregon. These resources or credits can make a project financially feasible. Incentives include:

Business Energy Tax Credit – The State of Oregon's Business Energy Tax Credit can be used for investments in energy conservation, recycling, renewable energy resources, sustainable buildings and less-polluting transportation fuels. Any Oregon business or

On the ground — City of Corvallis

Wastewater treatment plant

The City of Corvallis used a power purchase agreement to retain a private developer to install and operate a solar and biomass energy project at their municipal wastewater treatment plant. The city pursued the project because it wanted to use distributed renewable energy to stabilize the price for power at their wastewater facility. The city decided, however, that it did not have the staff and technical capacity to operate the system and entered into a power purchase agreement with a private developer to own and operate the system. Through the process, the city learned that power purchase agreements come with some costs, including liability insurance on equipment, interconnect agreements and net metering agreements. Overall the agreement allowed the city to integrate a cost-effective, sustainable infrastructure system that reduces demand on the electrical grid and provides stable, renewable energy.

On the ground — City of Beaverton

Beaverton Round Central Plant

Built as part of the Round project in downtown Beaverton, the Beaverton Central Plant is a district energy system owned by the city. When development is complete, it will provide nonelectric space conditioning and hot water to 100 million square feet, including the entire mixed-use Beaverton Round project. The plant is nearly twice as efficient as more conventional plants built for the same price. Despite early private development financing issues, the city's net cash flow exceeded $200,000 within the first fiscal year of plant operation under city ownership while the project was only half complete. The plant stayed viable due to a development agreement between the city and various developers as well as collaborative financing mechanisms, including: 1) developer financing in exchange for a long-term central plant lease, 2) the Business Energy Tax Credit which can be transferred to a third-party and 3) the resources of the Small Energy Loan Program to fund multiple phases of plant expansion. The plant is expected to generate nearly one million dollars in net annual cash flow once the Round is complete. City investment in the plant offsets costs that would otherwise be borne by developers bringing utilities to each site and installing heating and cooling systems building-by-building, thus creating an incentive to private development.

government agency may qualify, including but not limited to manufacturing plants, stores, offices, apartment buildings, farms and transportation. The tax credit can cover costs directly related to the project, such as equipment, engineering and design fees, materials, supplies and installation. A project owner may transfer a tax credit to a pass-through partner in return for a lump-sum cash payment (the net present value of the tax credit) upon completion of the project. The pass-through option allows nonprofit organizations, schools, governmental agencies, tribes and other public entities and businesses without tax liability to transfer their tax credit to a partner with a tax liability.

Businesses that qualify for the Small Energy Loan Program often qualify for the Business Energy Tax Credit as well.

Small Energy Loan Program – The State of Oregon's Small Energy Loan Program creates loans for projects that save or use alternative energies. Applicants can include individuals, businesses, schools, cities, counties, special districts, state and federal agencies, public corporations, cooperatives, tribes and nonprofits. Though there is no legal maximum loan, the size of loans generally ranges from $20,000 to $20 million. Limited funds are available for energy evaluations for schools and public buildings that spend more than $10,000 on energy usage per year. Commercial renewable energy and waste heat projects may qualify for lower tax-exempt rates. Businesses that qualify for Small Energy Loan Program often qualify for the Business Energy Tax Credit as well.

Energy Trust of Oregon – Energy Trust of Oregon helps customers of Portland General Electric, Pacific Power, NW Natural and Cascade Natural Gas to manage energy costs through energy efficiency and renewable energy projects. Government facilities and businesses of all sizes – including small retail shops, office buildings, grocery stores, healthcare facilities, auto services and small and large industrial facilities – can receive cash incentives and technical assistance. They may receive help finding a contractor and installing energy efficiency and renewable energy solutions like solar electric, solar water heating, geothermal pumps and cogeneration. Energy Trust of Oregon also offers cash incentives, early design assistance and technical assistance for new buildings.

Local improvement district – LIDs collect fees from local property owners in order to pay for infrastructure improvements including new construction or the reconstruction of deteriorated facilities. Local jurisdictions can create a LID to pay for specific high performance improvements in employment and industrial areas by assessing a fee. The fee is based on state statute collection guidelines for assessments.

On the ground

City of Portland

OHSU Center for Health and Healing

Located in Portland's South Waterfront, the 16-story OHSU Center for Health and Healing was the first medical and research facility to achieve the LEED Platinum certification and is expected to save $660,000 in annual operating costs because of its energy efficiency measures. OHSU developed high-performance infrastructure on the South Waterfront campus and used the Business Energy Tax Credit. The site qualified for a $1.1 million tax credit, which the university transferred to a private business partner in exchange for a lump sum cash payment using the pass-through option program.

The campus includes a district energy facility with a central utility plant (combined heat and power generation) powered by five 60-kW Capstone micro turbines. This energy will be combined with solar energy produced on site to provide electricity and hot water to the OHSU building. The plant uses up to 80 percent of the source energy with a 47 percent reduction in waste heat.

Central utility plant at OHSU-South Waterfront

If a local government reaches its taxing limits imposed by Measures 5, 47 or 50, the LID will need vote approval for the city to issue LID bonds for these projects.

Sustainability indicators and performance benchmarking

Sustainability indicators measure the performance of infrastructure systems, allowing governments and businesses to be most effective and efficient with their environmental and financial resources. The lack of measured or measurable results of some of the newer high-performance infrastructure strategies has proven to be a barrier to implementation. Quantitative results measured through performance benchmarking provide concrete examples. Documented results can help the business community secure financing to implement sustainable approaches. These results can also be used for on-going management, adapting practices and projects to ensure the most environmentally and fiscally efficient sites.

High-performance mechanisms

The drive toward innovation in sustainable business practices requires conscious attention to performance metrics. These metrics are essential to determining the impacts of innovation and, if developed explicitly, can be the basis for crafting and refining business strategies.

– Tom Osdoba, Managing Director, Center for Sustainable Business Practices, University of Oregon

Comprehensive and effective benchmarking systems measure to some extent the water, energy and material use on land, as well as key economic and social indicators. Sustainability indicators for industrial and employment sites include measures for eco-efficiency, financial annual reporting, industrial ecology and community sustainability initiatives, such as climate action plans.

Specific indicators may include, but are not limited to:

- total number of businesses receiving or giving by-products
- total number of businesses sharing services or facilities with other businesses on site
- total energy consumed
- total waste heat produced
- total amount of energy produced on site
- total potable water consumed
- percentage of material recycled.

Many of these data points may be hard to obtain because they depend on individual business data. However, individual businesses and municipalities can research past indicator systems and use surveys to acquire information they would like to measure to track performance over time. Using baseline assessments and individualized target goals, success is measured by reductions in resource waste and increased resource synergies.

Measuring indicators over time and over the adoption of different sustainable infrastructure strategies enables cities and businesses to discern which sustainable technologies prove most viable, which policies are most effective and which projects to prioritize based on their unique goals. Performance benchmarking can also help the local jurisdiction identify potential barriers to implementation, and prompt proactive or aggressive plans for implementing these infrastructure strategies.

On the ground

City of Devens, MA

Devens Enterprise Commission

The Devens Enterprise Commission in Devens, Massachusetts is one of the most successful examples of eco-industrial development in the United States. When 4,400 acres of former Air Force base land was opened for redevelopment in the early 1990s, a design charrette was conducted with the goals of creating an economically viable area, cleaning up the site, protecting the aquifer at Devens and implementing sustainable strategies like a comprehensive business recycling program.

The charrette resulted in the Devens Reuse Plan and the Devens Bylaws in 1994, both of which weave eco-industrial initiatives into zoning, density, floodplain, water resource and wetland protection provisions. To oversee implementation of the plan and the bylaws, the state chartered the Devens Enterprise Commission, which acts as a comprehensive local planning board, conservation commission, board of health, zoning board of appeals, historic district commission and most importantly, as a one-stop permitting center.

A culvert that was day-lighted and restored to a wetland

To monitor sustainable development on the project area, Devens Enterprise Commission enacted sustainability indicators that include eco-industrial measures such as renewable energy use and solid waste recovery. In 2005, the commission also initiated the EcoStar Program to recognize businesses that achieve high sustainability standards. These include: business linkages for efficiency, energy efficiency and conservation, reduced transportation impacts, material reuse, green building design and climate change mitigation. Members that incorporate 15 standards into their routine operations earn the designation of EcoStar Achiever and the related branding and recognition benefits. In 2009, the commission also established the Devens Eco-Efficiency Center, a non-profit organization aimed at expanding on the EcoStar program by providing additional technical assistance services. Their goal is to enable businesses and organizations to implement practices that save money and make more efficient use of resources. The Devens Eco-Efficiency Center assists businesses with cost-saving energy initiatives, including conservation campaign assistance, facility benchmarking and comprehensive energy efficiency assessments.

Keep in mind

Collaboration The systems approach requires assembling a broad base of stakeholders across public and private sectors, including the planning, development and business community, as well as technical experts, economists and community members. In order for an integrated solution to be created, all the stakeholders of the team must buy in to the project goals and objectives from the beginning. A strong stakeholder team can be built by planning educational forums and using integrated planning and design charrettes. Although a great deal of front-loaded partnership building is necessary, a strong stakeholder team will be able to find integrated infrastructure solutions and creative financing options.

The Sustainability Guide was valuable because it was customized to my own business. I also appreciated that they came out to my restaurant so we could review it together.

Mounir Gabriel, Owner
Mummy's Restaurant

Local management Infrastructure strategies and support programs will be shaped depending on the local community's resources, and their ability to get support from other public and private entities. A city can simply decide to share the information provided in this chapter with local stakeholders, use the systems approach to shape infrastructure planning and economic development projects, or they can develop a more robust technical assistance program that pursues priority areas through facilitated networks and targeted programming. With existing economic development staff and an increasing number of sustainability coordinators, implementing these type of networks or programs may be readily feasible.

In jurisdictions without this capacity, or in areas with strong business involvement, staff can work with local business councils or economic development alliances to develop facilitated networks, targeted programs or education materials that support high-performance infrastructure. In many cases, these efforts can be led by key businesses because of the potential for significant operating cost savings and the growing need to respond to climate change. Local jurisdictions may decide to contract with eco-industrial practitioners. In doing so, requests for proposals should clearly outline the municipality's sustainability priorities. Integrating sustainability as key scoring criteria for selecting contractors at the planning and construction phases will create incentives for innovative, high-performance project proposals.

Identifying projects With limited resources, businesses and jurisdictions will want to consider a number of factors before deciding which projects to pursue first. Key considerations include challenges and priorities, any specific geographic areas targeted for investment and whether the project lends itself to future projects. It is also important to consider any data consistently tracked that could be readily analyzed.

Public-private partnerships Many of the best examples of projects that incorporate sustainability were made possible through the development of solid public-private partnerships. Local government, affected businesses and utilities each have control of different aspects of implementation of these tools. Projects that were most successful saw these entities work together to ease regulatory costs, find innovative ownership and financing options, remove preconceived barriers to sustainable infrastructure and make commitments to the long-term sustainability of the project. Each of these partnerships, their goals and resulting commitments were unique to the specific area and the strategies identified through the systems approach.

Ownership For systems-based resource utilities such as on-site renewable energy projects, water treatment facilities or district energy systems, municipalities must choose whether to pursue public or private ownership. Private district facilities sometimes experience multiple changes in ownership and are influenced by corporate priorities and projects, not just public infrastructure and sustainability goals. Public ownership can provide the long-term stability necessary for project success and can also provide a possible revenue stream. Before taking on a project, a city should consider its staff capacity to properly manage the project, as well as its long-term financial implications. If a city does not have the staff or financial capabilities, the best option is for the city to craft a request for proposals for private development – making sure the RFP is crafted in a way that prioritizes expertise, project goals and outcomes over short-term financial costs.

Managing risk Sound infrastructure investments reduce long-term financial risk by providing reliable, sustained delivery of necessary resources and services. Current consumption and waste patterns deplete natural resources, increase wear and tear of current systems and are subject to future unreliability. Reducing consumption levels and integrating resource recovery and reuse in infrastructure planning will reduce environmental impacts and demand on current infrastructure systems. It will also lead to more reliable delivery of services and reduced business risk in the long term. There is price volatility associated with traditional systems, their resources and their potential unavailability. Reduced resource usage leads to lower costs, which equals additional savings.

Twinbrook Station, February 2009

Economic development Employment and industrial areas with high-performance infrastructure can attract a significant number of new jobs. Like other infrastructure investments, they attract more businesses that complement existing businesses. They can also bring sustainable industries and those interested in establishing more sustainable operations. An economic development agency can reinforce the benefits to businesses, including reducing initial and on-going operating costs.

Scale When assessing the application of the systems approach and different sustainable infrastructure strategies, it is best to consider first the scope of the development in terms of scale, use, geographic and environmental conditions. Although public-private partnerships at the district level can increase the use of integrative resource recovery and cross-system infrastructure planning, these mechanisms can be utilized for various scales of development.

To find the best approach, know the scope of development, research past projects of similar scope, and assemble an integrated planning team to assess opportunities. Some strategies, such as district energy, may work best within a mix of uses or on a campus. Others may be more suited for strictly industrial areas, such as placement of an anaerobic digester plant to create waste-to-energy opportunities. Whereas co-location is essential for a biomass district energy system, other approaches, like waste exchange, can be facilitated for a decentralized, even regional, system. Likewise, some of these tools are applicable at the business level. Businesses have completed resourcing mapping exercises and partnered with other local industries, resulting in significant cost savings for both organizations. Although these one-on-one synergies may not have as broad of an impact as an eco-industrial park or regional system, they can still have significant environmental and fiscal benefits.

Recognition To further encourage adoption of sustainable infrastructure strategies, cities can create a program that recognizes businesses that adopt innovative approaches. Beyond green building certification such as LEED, these programs can specifically relate recognition to the planning goals and local aspirations of the specific area of development. They can also recognize adoption of strategies beyond green building, such as district level resource synergy opportunities like waste exchanges, co-location, district energy, shared wastewater reuse, multi-modal development and shared facilities and parking.

On the ground

City of Portland

Oregon Sustainability Center

A large-scale example of a technical assistance center is currently planned for construction in Portland. The Oregon Sustainability Center, organized by Portland Bureau of Planning and Sustainability, Portland Development Commission, Oregon University System, Portland Community College and the Oregon Living Building Initiative, will be one of the world's highest performing commercial buildings and a living laboratory of state-of-the-art sustainability technologies and best practices. With support from Oregon BEST, it will accelerate the commercialization of Oregon-based products and services acting as a hub for collaboration and a vehicle for innovation.

The Oregon Sustainability Center will include a research component using sustainability indicators to measure and improve the performance of local development practices and innovative technologies. The research department will be connected with local businesses to turn research into marketable products and services. Research themes include: net-zero energy building technologies and strategies; water use and rainwater retention; material utilization; waste and life cycle environmental impacts; occupant health and performance; and integrated performance-based design, construction and operations. This research will directly connect with the growing renewable energy, energy efficiency and green building industries in Oregon. Through the unique public-private partnership, the Oregon Sustainability Center will deliver rapid results in the areas of infrastructure, green buildings and retrofits, food systems, ecosystem service markets and natural systems. The Oregon Sustainability Center will also house First Stop Portland, a program of Portland State University's Institute for Metropolitan Studies that will promote business-to-business exchange and peer networking with global delegations.

The Oregon Sustainability Center is also planned to be the first large-scale building to achieve the Cascadia Region Green Building Council's Living Building Challenge – a rigorous standard that requires net-zero energy and water consumption and net-zero carbon production. This standard also requires the sourcing of building materials from within the region and elimination of red-listed chemicals often common to building materials, such as PVC. Designed to assist Oregon companies in better serving the market and the environment, this partnership of government and academic institutions will help businesses identify ways to eliminate toxic ingredients from their products. The design and construction of the building will generate more than 1,300 jobs, creating a base of specialized knowledge in the region.

Putting it together

Forward-thinking municipalities and businesses are changing the way they think about, plan for and use energy, water, material waste and transportation infrastructure. The systems approach to high-performance infrastructure systems implements creative strategies that mimic natural ecosystems, reuse resources, reduce waste, deliver services more efficiently and provide a stable mechanism for managing demand. Local jurisdictions and businesses that implement these strategies can reduce the demand on current infrastructure systems, green their bottom line and mitigate the risks associated with climate change.

Tips for implementation

- Coordinate infrastructure planning between systems such as water, waste disposal and street expansion.
- Use the relationship between resource networks and the highest and best use of all resources within a targeted area rather than projected consumption levels to determine future infrastructure needs and projects.
- Develop public-private partnerships to pursue high-performance infrastructure strategies, develop appropriate mechanisms and build projects.
- Include integral stakeholders to the systems approach – planning and design teams, community and economic development associations, technical engineers, developers, environmental experts and most importantly, business, utility and community interests.
- Build strong stakeholder teams by planning educational forums and using integrated planning and design charrettes.
- Begin with a baseline assessment to identify major opportunities for resource synergies (major resource or waste streams) and reduce greenhouse gas emissions (operations that are key emission generators).
- Establish performance measures and use a baseline assessment to compare and track progress in achieving desired outcomes.
- Use life cycle cost and triple bottom line analyses to uncover the real costs and benefits of a project and ensure decisions support multiple local aspirations (i.e., a project will achieve transportation standards and connectivity goals, reduce short- and long-term environmental impacts and realize the economic development benefits of hiring locally).
- Focus on decentralized, site- and district-level solutions that can nest into a larger, more efficient system.
- Plan for a mix of uses, such as mixed-use employment and institutional uses, or in areas with a large amount of waste heat or materials for effective district energy systems.

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On the ground

Toronto Metropolitan Region

Partners in Project Green

Partners in Project Green is a large-scale initiative spearheaded in 2008 by the Toronto and Region Conservation Authority and the Greater Toronto Airports Authority to transform one of Canada's largest employment areas – a 30,000 acre area around the Toronto international airport – into the Pearson Eco-Business Zone. The project integrates economic development and climate change initiatives to green existing businesses and attract new industry. The project area is a growing industrial area providing employment for more than 355,000 people, but also consumes a large amount of energy, emitting approximately 1.7 million tons of greenhouse gas emissions per year.

In the short-term, Partners in Project Green is working with existing businesses within the designated Pearson Eco-Business Zone to realize the financial benefits of addressing environmental issues through targeted sustainability programs. These programs include municipal policy development and regulatory alignment to encourage green buildings and industries, district energy feasibility assessments and a coordinated green purchasing program that make green products more affordable to businesses. It also includes coordinated green building retrofits that use a revolving loan fund to pay back improvements through utility bill savings. Partners in Project Green is working to integrate on-site stormwater management by retrofitting parking lots to adopt low-impact development techniques, to develop a green job development program called Green Job Corps and to measure the triple bottom line returns of green techniques in existing business parks.

A number of the programs and projects generate revenues, such as fees for green retrofit assessments. The rest of the project and programs are funded primarily by the Greater Toronto Airports Authority and the municipalities of Peel and Toronto, with some specific program funding from the provincial and federal governments. The success of Partners in Project Green is due to the broad base of support of over 250 business leaders and government representatives, all who have committed to the vision of making the area a place where waste becomes usable bio-gas, where businesses integrate sustainable business metrics, and where commuters make sustainable transportation choices resulting in a healthier and more enjoyable place to work.

Partners in Project Green is working with existing businesses to realize the financial benefits of addressing environmental issues through targeted sustainability programs.

Tips for implementation

continued from page 40

- Integrate high-performance infrastructure goals in comprehensive plans, capital improvement plans and all infrastructure system department goals to ensure the framework and funding sources exist to pursue the systems approach.
- Tailor infrastructure solutions, projects and operations to specific business needs and the local context.
- Consider using existing technical assistance programs and organizations to assist businesses in taking advantage of high-performance infrastructure techniques.
- Establish specialized assistance programs to fit local infrastructure strategies and available resources.
- Recognize local businesses that implement high-performance infrastructure and other eco-efficient employment tools.
- Establish a committed project champion to implement initial high-performance infrastructure projects as well as a strong framework integrated throughout the business plan or local government's departments and policies.

Doing nothing is not an option. The longer we do nothing, the more it will cost our region and the nation, both environmentally and economically. Protecting the environment is essential for our economy and our future.

Peggy Fowler, CEO
Portland General Electric
The BEST Business Center, accessed August 11, 2010
bestbusinesscenter.org/about-us/

Resources

For more information on the case studies, visit or contact:

City of Portland: POSI EcoDistrict Initiative
Portland Oregon Sustainability Institute
1600 SW 4th Ave., Suite 800
Portland, OR 97201
pdxinstitute.org

The Seattle Sustainable Infrastructure Initiative
Seattle Department of Planning and Development
700 Fifth Ave., Suite 2000, P.O. Box 34019
Seattle, WA 98124-4019
206-684-8880
www.seattle.gov/dpd/Planning/Sustainable_Infrastructure_Initiative/Overview

The Maplewood Project
District of North Vancouver
Sustainable Community Development Department
604-990-2387
www.district.north-van.bc.ca

Kalundborg Industrial Symbiosis
Industrial Symbiosis Institute
Hareskovvej 19C
DK–4400 Kalundborg
www.symbiosis.dk

St. Paul, Minnesota: District Energy
Hans O. Nyman Energy Center
76 Kellogg Blvd. West
St. Paul, MN 55102-1611
651-297-8955
www.districtenergy.com/

Brewery Blocks Cooling District
www.breweryblocks.com
Business Analysis for a Neighborhood Energy Utility in the North Pearl District:
daily.sightline.org/files/Portland_NEU_Business_Analysis_FINAL%20REPORT_6April09.pdf
Portland Office of Sustainable Development
721 NW Ninth Ave., Suite 350
Portland, OR 97209
503-823-7222

The B.C. Bioenergy from Biogas project in Metro Vancouver, B.C.
British Columbia Ministry of Community and Rural Development
250-356-6575

Resources

Beaverton Central Plant
City of Beaverton, Business Services
4755 SW Griffith Drive
Beaverton, OR 97076-4755
503-526-2631

City of Richmond Eco-Industrial Policy Framework
City of Richmond Business & Development Department
6911 N. Three Road
Richmond, BC, V6Y 2C1
604-276-4000
ecoindustrial.ca/projects/RichmondEINPolicyReport_withAppendices.pdf

Chicago Waste to Profit Network
Chicago Manufacturing Center
312-542-0430
www.cmcusa.org/index2.cfm

The Devens Enterprise Commission
33 Andrews Parkway
Devens, MA 01434
978-772-8831
www.devensec.com

City of Corvallis
Wastewater Operations
245 NE Third St.
Corvallis, OR 97339
541-766-6934
www.ci.corvallis.or.us/index.php

OHSU Center for Health and Healing
OHSU Campus Planning, Development & Real Estate Dept.
3181 SW Sam Jackson Park Road
Portland, OR 97239-3098
503-494-2454
www.ohsu.edu/cpdre

Partners in Project Green
Toronto and Region Conservation Authority
5 Shoreham Drive
Toronto, Ontario
M3N 1S4
416-661-6600
www.partnersinprojectgreen.com

Resources

Businesses for an Environmentally Sustainable Tomorrow (BEST) Business Center
503-823-7037
503-823-3919
www.bestbusinesscenter.org

Oregon Sustainability Center
www.oregonsustainabilitycenter.org

For more information on baseline assessments, business metrics and performance indicators, visit:

World Resource Institute and the World Business Council for Sustainable Development
www.wbcsd.org

Carnegie Mellon Economic Input-Output Life Cycle
www.eiolca.net

The Natural Step
www.thenaturalstep.org

Sustainable Industries Performance Indicator Framework
www.ecoindustrial.ca/usgbc_toolkit

The Energy Star program
U.S. Environmental Protection Agency and the U.S. Department of Energy
www.energystar.gov

For more information on the integrated design process, visit:

Whole Building Design Guide
www.wbdg.org/design/engage_process.php

For more information on technical and financial resources, visit:

Keep Oregon Cool Planning Guide
Oregon Global Warming Commission
www.keeporegoncool.org/content/strategic-planning

Local Governments for Sustainability (ICLEI)
Action Center for implementing a sustainability program
www.icleiusa.org

A Guide to Eco-Industrial Networking for Greater Vancouver Municipalities
Metro Vancouver, Canada
www.metrovancouver.org/about/publications/Publications/EINMunicipalGuide.pdf

Resources

A Guide to Integrated Resource Recovery
British Columbia Ministry of Community and Rural Development
www.cd.gov.bc.ca/lgd/infra/library/resources_from_waste.pdf
www.cd.gov.bc.ca/lgd/infra/resources_from_waste.htm

Energy Trust of Oregon
www.energytrust.org

Oregon Department of Energy
A Community Energy Planning Guide
www.oregon.gov/ENERGY/GBLWRM/docs/CommunityEnergyPlanningTool.pdf

The Business Energy Tax Credit
www.oregon.gov/ENERGY/CONS/BUS/BETC.shtml

Energy Loan Program
www.oregon.gov/ENERGY/LOANS/selphm.shtml

The Database for State Incentives for Renewables and Efficiency (DSIRE)
www.dsireusa.org/incentives

For more information on material exchanges and by-product synergy networks, visit:

Northwest Materials Smart
www.nwmaterialsmart.org

Boneyard Northwest Commercial Buildings Material Exchange
www.boneyardnw.com

U.S. Green Building Council, By-product Synergy Networks
www.usbcsd.org

ResourceFull Use, Columbia Corridor Industrial Area: The Zero Waste Alliance
One World Trade Center
121 SW Salmon St., Suite 210
Portland, OR 97204
503-279-9383
resourcefulluse.cadmusweb.com/index.php?page=Home

Chapter 2

21st century design

- Innovative design and development codes (p.49)
- Innovative planning and development (p.69)

Communities that wish to retain and capture new industry, especially in light of current economic conditions and employment trends, must rise to the challenge of the 21st century market. Trends in our region show fewer manufacturing jobs and more service and institutional jobs, employment locations near infrastructure and workers, and an increased interest in more sustainable business practices. A 21st century design approach includes tools to attract sustainable business and encourage job growth. It reduces impacts to infrastructure systems for cities and counties. It creates a fundamental framework with wide-ranging benefits including reducing greenhouse gas emissions, promoting active modes of transportation, increasing community interaction and building healthier communities.

21st century design goes beyond green buildings to address sustainable design through high-performance infrastructure systems, sustainable landscapes, connectivity with surrounding areas and communities, facilitating the potential for future economic growth and business expansion. Implementing 21st century design standards for employment and industrial areas means focusing new employment in existing communities, creating pedestrian-scale compact development that uses current infrastructure systems, protecting agricultural and natural resources and contributing to healthier, economically viable communities. Such developments reduce underutilized space on site, turning large lawns and parking lots into active landscapes that promote walking and bicycling, natural habitat formation and easy, safe access to surrounding areas. They also allow employees to access amenities such as groceries, banks and restaurants without relying on single occupancy vehicle trips. They create transitions between neighboring areas that ease the tensions between residential, commercial and industrial uses.

Local jurisdictions can achieve these results through innovative design and development codes as well as innovative planning and development processes. This section presents best practices for local governments to support 21st century jobs by presenting tools that can be applied in a variety of contexts including newly developing landscapes, suburban commercial and employment areas that are re-envisioning themselves, infill developments and transit-oriented developments. Using these 21st century design tools as a guide, local jurisdictions can tailor design codes and planning processes to specific areas, producing creative, cost-effective, individualized solutions that ensure high-performance results.

Kirkland Parkplace, a mixed-use employment redevelopment project in Kirkland, Washington

Chapter 2

21st century design

SECTION ONE

Innovative design and development codes

Economic trend analyses illustrate that more and more businesses, from large corporations like Intel and Target, to medium size manufacturing enterprises, and to local mom and pop shops are increasingly choosing to locate in areas that incorporate a mix of uses. They are selecting areas that are easily accessible and pedestrian friendly and employ green building and green site design practices. Companies are demanding nontraditional design that reduces costs associated with freight transportation and parking, and more importantly, provides the competitive advantage of going green, attracting a desirable employee base and mitigating climate change risks. To remain regionally competitive, it is integral that local design and development codes do not create barriers to achieving these goals. Local jurisdictions can go a step farther by creating incentives and flexible regulatory requirements. In doing so, the region will move toward its 2040 vision and local communities will advance their sustainability goals.

The nuts and bolts

Cities can review their policies and zoning codes to promote or, at the very least, not hinder sustainable site design. Whether incorporated as required standards or optional guidelines, effective 21st century design and development codes address high-performance infrastructure, modern mobility, transitions, future growth and sustainable landscapes.

How to use it:

Systems-based codes

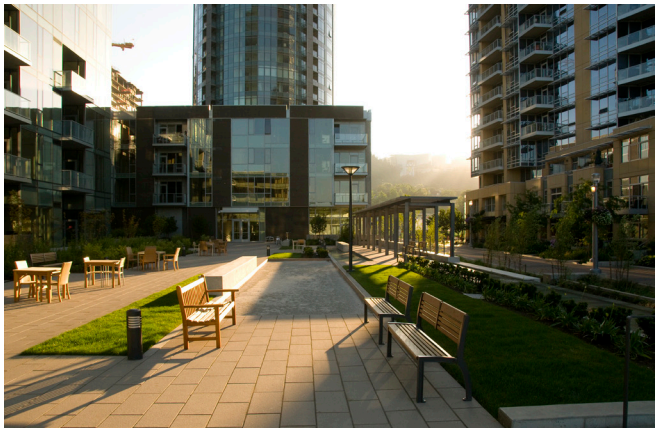
By incorporating the systems approach (both language and concepts) into local zoning codes, governments remove barriers and promote adoption of high-performance infrastructure solutions. Systems-based codes increase environmental performance by incorporating standards related to integrated resource planning and life cycle impacts of development on individual energy, water and waste systems. Local governments can address individual infrastructure systems separately through their zoning code. Site plans are often used to compliment local codes and build high-performance infrastructure systems.

Twenty-first century design and development codes address high-performance infrastructure, modern mobility, transitions, future growth and sustainable landscapes.

Environmental management plan – Local governments may require a developer to submit a summary environmental management plan that provides a narrative description of the opportunities considered by the developer to reduce resource needs and waste generation through energy, wastewater, stormwater, heat recovery and material reuse strategies. Among other things, this may include options for recovering waste heat and wastewater for reuse or sale to surrounding businesses and a discussion of the opportunity for resource synergies.

Construction management plan – A construction management plan outlines how construction will attempt to minimize waste by using recycled materials, separating waste from recycled materials during construction, identifying materials to be diverted from disposal, minimizing construction traffic, using locally sourced materials and minimizing health impacts on construction personnel.

Resource synergy lists – Systems-based codes can promote resource synergies by encouraging or requiring a developer to submit a list of resource inputs and outputs



South Waterfront in Portland

Beaverton Central Plant in the Beaverton Round

On the ground — City of Wood Buffalo, Alberta

TaigaNova Eco-industrial Park

TaigaNova Eco-Industrial Park is a 78-acre industrial park developed by the Wood Buffalo Housing and Development Corporation in Wood Buffalo, Alberta, Canada. Not particularly known for green development, the city is incorporating high-performance infrastructure and 21st century design strategies through the park's bylaws and development guidelines.

The city requires that developers submit a resource synergy list that includes inputs and outputs related to energy, fuels and lubricants, water, materials, products and wastes, along with resource needs such as training, logistics and transportation. The developer must also submit a statement confirming they have obtained a list of existing business resource needs and waste production on neighboring sites in the park. Requiring the list ensures that developers pay attention to resource synergy efficiencies and opportunities. The city requires developers submit construction and environmental management plans as well in order to measure, and potentially mitigate, development and life cycle impacts of the project. The city is also using a flexible menu approach to their development guidelines, requiring that developers conform to 22 of the 43 proposed standards.

Find contact information and websites for this and all on the ground case studies in chapter 2 on page 82.

related to the future developments' operational use of material products (paper, waste wood, cement, food scraps, etc.), water intake and outtake and energy (waste heat, etc.). Cities may include logistical resources associated with business operations, such as storage space, logistics facilities and parking.

Local governments can determine the breadth and detail of the list, as well as the level of response they will require. Cities can use these lists to encourage businesses to share resources in several ways. Cities can locate businesses depending on the resource pairings or can encourage specific site design layouts to maximize synergies. They also can facilitate resource matches between existing businesses with complementary resource by-products and resource needs or simply require or encourage businesses to share their resource list (or certain components of their list) with other businesses to find economical synergies independent of city involvement.

Energy efficiency – Codes that lead to high-performance energy infrastructure encourage the use of energy efficiency technologies, renewable energy systems, cogeneration, district energy, general waste heat recovery for heating purposes, and on-site energy generation. Variance processes can be expedited and improved to allow for easy adoption of these mechanisms when existing code unintentionally creates barriers to implementation.

To promote energy efficiencies, city staff can review codes to make sure elements such as maximum height requirements and building permit processes do not impinge on the use of renewable energy systems, like solar panels and wind turbines, or grant over-the-counter building permits for standard rooftop PV and small-scale wind systems that do not exceed roof support capabilities for minimum building codes. Staff can support distributed renewable energy systems by creating a simple checklist

for fast-track permitting. They can also promote on-site energy generation and resource synergies by allowing private utilities to provide electricity and other services on site. Alternatively, cities can require that a certain percentage of energy is produced on site from renewable energy sources or via cogeneration.

To encourage district energy systems, cities can allow the layering of service corridors to permit energy systems under transit corridors, parks and trails. Cities can require feasibility studies in the development review process to assess the site design necessary for future installation of district energy. They may also require a feasibility report on pooling backup systems with other buildings on site, if applicable, to reduce space and energy needs and encourage the placement and orientation of buildings to maximize passive solar energy.

Water efficiency – Codes that encourage high-performance infrastructure promote water efficiency through building water, wastewater and stormwater. Building codes can require that water usage be below a certain percentage of the baseline water usage for commercial buildings, as determined by Energy Policy Act of 1992. Model codes encourage the collection, treatment and reuse of stormwater and wastewater on-site for groundwater recharge. They also offset potable water use for nonpotable purposes, such as irrigation and washing of fleet vehicles. More ambitious codes require the on-site collection and reuse of a certain percentage of both stormwater and wastewater. Cities can also opt for a report that evaluates the feasibility of using or selling reclaimed stormwater or wastewater to replace nonpotable water. Innovative codes have also required that buildings be plumbed to be retrofit-ready for solar hot water and nonpotable water systems.

Modern mobility

Connectivity – Modern mobility standards with more innovative codes encourage easy accessibility and movement of both people and vehicular traffic. Commercial, mixed-use and industrial developments can all be designed in a way that encourages non-vehicular modes of transportation, such as walking, biking and taking transit. Encouraging alternative modes, particularly for work trips, will reduce significant costs associated with impacts on roads and parking infrastructure, traffic congestion, the freight network and greenhouse gas emissions, and will encourage more healthy, active lifestyles.

On the ground

City of Portland

Green bundle

The City of Portland is developing code amendments to foster sustainable infrastructure technologies and practices, including a green bundle of amendments to promote:

- **district energy systems** – clarifying the land use categories in the zoning code to ensure that neighborhood-scale renewable energy production is allowed in residential and commercial zones
- **larger eaves to promote energy conservation** – allowing buildings to have larger eaves that project deeper into the setback
- **solar panels** – clarifying how rooftop solar panels and equipment are treated in building height calculations and creating the opportunity for installation of panels on buildings that are already built to the maximum height, exempting them from design review
- **wind turbines** – allowing small-scale wind energy systems to exceed zoning code height limits, either as stand alone towers or when incorporated into building architecture, exempting them from design review
- **eco-roofs** – exempting them from design review
- **water cisterns** – allowing cisterns within zoning code setbacks, within specific parameters, that would be exempt from design review

Eco-roof on the M Financial building in Portland

Design and development codes

In employment areas, cities should avoid building and correct existing developments with winding, loosely connected streets and large surface area parking lots typical of late 20th century design. Instead, cities can use local codes to encourage building new or redeveloping existing street grids with shorter block lengths and establishing interconnected pedestrian and bicycle trails with appropriate landscaping and lighting to make routes safe and attractive. Cities can also require amenities on employment sites – such as benches, bicycle racks, showers and lockers, and covered transit station shelter areas – placed at or near building entrances. Metro's street design handbooks provide design recommendations for making streets of all types (highway to regional streets to boulevards) greener, more enjoyable, bike-friendly and pedestrian-oriented.

In thriving economies that support 21st century design, parking ratios have been lowered significantly, often turning existing parking minimums into the new maximums and removing parking minimums altogether.

Parking – Reductions in parking minimums and implementation of parking maximums, in conjunction with sound transportation demand management plans, is truly the best way to promote non-vehicular transportation and reduce significant infrastructure and business operating costs. Many existing parking requirements exceed ratios needed to increase sustainability and support efficient, multi-modal designs. Industries are realizing the high price of parking and seeing opportunities for expanding profitable business operations onto these large parking lot footprints. In thriving economies that support 21st century design, parking ratios have been lowered significantly, often turning existing parking minimums into the new maximums and removing parking minimums altogether. Employment capacity can be increased in these areas, allowing the market, local conditions and business needs to determine how much parking is necessary. In addition, local codes can require shared parking plans in large employment areas and commercial districts. Strategically locating parking can enable shared parking opportunities with neighboring businesses. During development review, local jurisdictions can provide recommendations for siting and require project proposals that take advantage of shared parking opportunities with existing businesses.

TDM programs – Cities can implement progressive transportation demand management (TDM) programs on their facilities and encourage or require TDM programs for employment-based development. TDM programs at large companies are often implemented to reduce the amount of required or needed parking. TDM programs can be a major incentive to a developer and make a project financially feasible by reducing parking requirements and associated costs. More successful

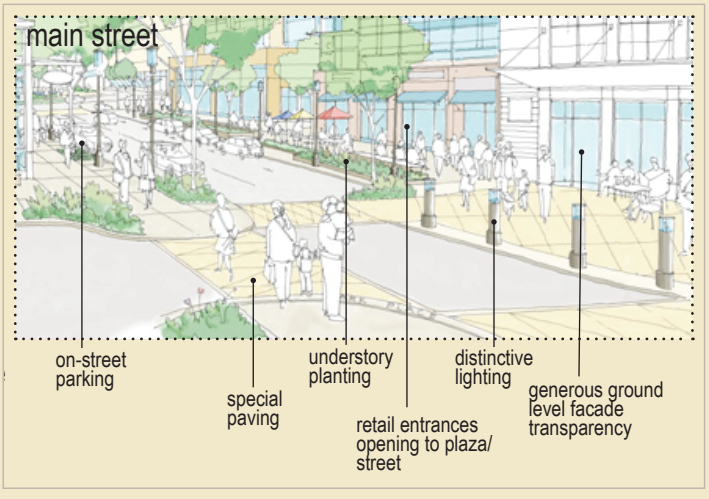
On the ground

City of Kirkland, WA

Kirkland Parkplace

Kirkland Parkplace is the proposed redevelopment of a traditional suburban employment area into an intense, 1.8 million square foot mixed-use employment center with 1.2 million square feet of office space and underground structured parking. Situated a few miles from downtown Kirkland, the site is currently dominated by surface area parking, winding roads and scattered one- and two-story office and retail buildings. Planners worked with the citizens, the city and local stakeholders to make design guidelines that create a vibrant employment area, while addressing community values, economic demand and the need to build more sustainable, compact development.

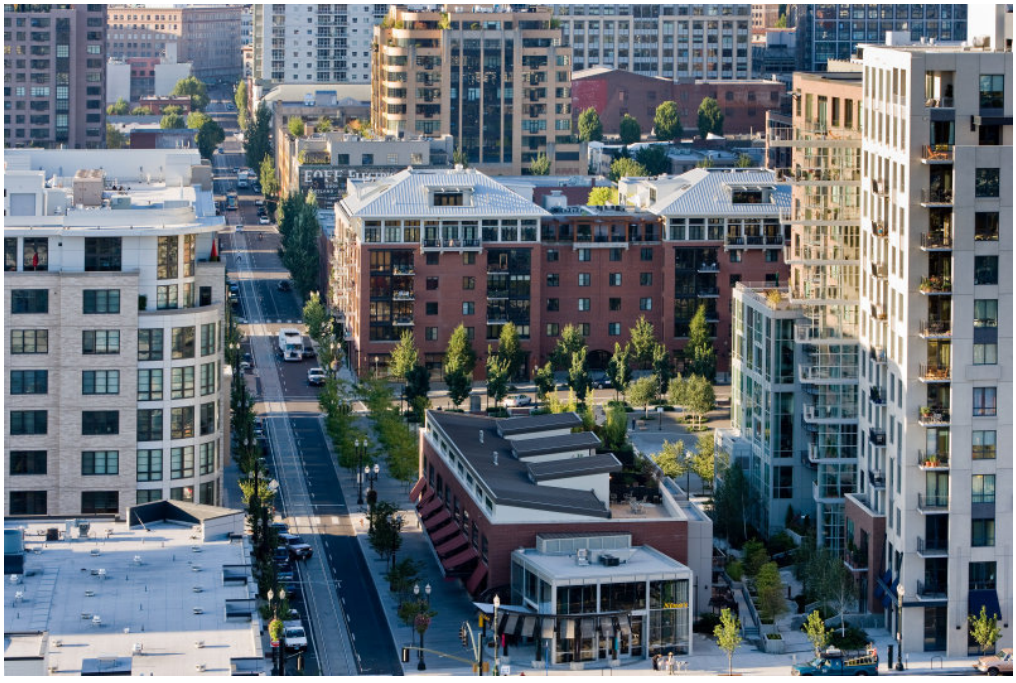
The Parkplace design guidelines alleviate community concerns about tall buildings by communicating clear intentions. They provide visual aids to demonstrate pedestrian movement, building massing and sustainability. The guidelines encourage pedestrian connections throughout the site. They require narrow streets to calm traffic, buildings to address park and promenade streets, and a minimum of 10 percent of the site to be used as pedestrian-oriented spaces in the form of courtyards, plazas, atriums, etc. The developer also worked with the city to reduce parking requirements, making underground parking structures financially feasible given the density of development.



Likewise, the guidelines use innovative approaches to scale and building mass in order to reduce bulk and monotonous building design. The guidelines include: breaking down the scale of buildings into smaller and varied volumes with graduated stepbacks, reducing the number of allowed blank walls, and reducing the length of the street wall by pulling back portions of the building. The guidelines also encourage sustainable development through low-impact development techniques and require that the developer work with the city to find sustainable approaches, including LEED Silver status for all office buildings.

TDM programs charge for employee parking, reduce prices for carpools and energy efficient vehicles, and offer free transit passes or cash incentives for taking other modes of transportation. Such measures reduce the costs of building and maintaining surface parking, and greatly reduce the carbon footprint of the site. Parking placed in the back or side of building entrances gives preferential treatment to people who walk, bike or take transit. Cities can also require that preferential parking spaces (at or near the entrance of the building) are reserved for carpooling or energy efficient vehicles. Metro's Regional Travel Options program can work with cities to tailor a program to meet their specific needs.

Supporting uses – Developments can also integrate supporting retail and commercial uses on site or on neighboring properties to reduce vehicle trips and create vibrant employment areas. Integrating retail and placing it in such a way that maximizes use by employees and minimizes off-site trips, allows access to amenities such as groceries and banking services, and reduces vehicular traffic and impacts to freight mobility. Retail nodes can be incorporated into employment areas, integrating services more efficiently than large-scale strip development. This design ensures services are for the local employees and do not attract significant external traffic. Supporting uses make non-vehicle transportation options more attractive, ease freight movement and reduce greenhouse gas emissions, congestion and impacts to the transportation system.



Transitions

21st century design creates better transitions between employment areas and surrounding neighborhoods. Transition techniques ease conflicts between different uses. Many transition techniques are relevant to employment and industrial areas, particularly at their edges. Transition techniques include allowing higher building heights nearer to complementary uses (like adjacent commercial and industrial areas) and gradually reducing height maximums closer to residential or other non-complementary uses.

Cities can review their zoning codes to ensure that these uses are not prohibited.

Liner uses and buildings – Liner uses are structures or spaces placed at the edge of a property with an existing use set back considerably from the street or neighboring property. Liner uses and buildings provide creative transitions that optimize movement and space. They also provide an excellent opportunity to increase employment capacity and site efficiency, allowing additional income-bearing square footage on site, promoting modern mobility and better urban form. Unlike traditional landscaping and fencing buffers, which often create barriers to movement, liner buildings and uses welcome supporting industries and complementary uses. In areas between employment and non-employment areas, they can take the form of community spaces such as small retail buildings, public plazas and parks. Liner buildings fit well in employment areas, particularly sites with extensive setbacks and parking lot frontages. Cities can review their zoning codes to ensure that these uses are not prohibited. Cities can also suggest liner uses and buildings during design review or require them if industries want significant setbacks (in this case, make sure to establish nominal setback standards).

Shared, mixed-use areas – In employment and industrial areas without space for liner uses and buildings, a similarly creative transition approach incorporates complementary and mixed uses at the edges of these areas. This approach can be useful for institutional campuses, particularly those located in existing communities and neighboring residential areas. Encouraging mixed-use developments in transition areas eases residential concerns about encroaching development by creating amenities such as retail stores, restaurants and work space. These uses benefit both the residential and institutional communities. For example, a hospital may locate office space, counseling services or health and wellness classrooms in a mixed-use area where neighbors can easily access those services. Private development may include pharmacies, post offices,

Liner uses for the new Fred Meyer development in the City of Wilsonville include complimentary commercial and residential uses as well as active and green spaces.

restaurants and grocery stores benefitting employees and residents. Mixed-use areas remove a border or barrier creating a shared space where people interact and benefit from the neighboring use. Developing mixed-use areas between institutional and residential uses provides employment opportunities for the neighboring community and can spur community programs such as health and wellness programs or community fitness events.

Sustainable landscapes

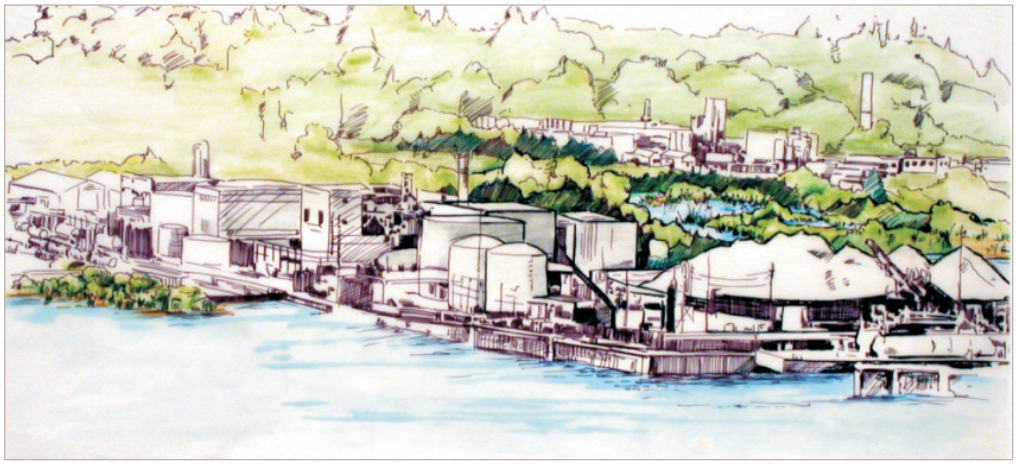
Sustainable landscaping codes implement low-impact development techniques that reduce the amount of underutilized space on site as well as the demand to local infrastructure systems.

Codes and guidelines that promote sustainable landscapes aim to restore, protect and integrate natural resources into site designs. Sustainable landscaping is an important new approach for employment and industrial areas. By the late 20th century, these areas were often characterized by requirements that set aside large, uninterrupted portions of space for parking and grassy areas requiring significant landscaping maintenance. Sustainable landscaping codes implement low-impact development techniques that reduce the amount of underutilized space on site as well as the demand to local infrastructure systems. Sustainable landscape practices reduce toxins and waste to the landfill, conserve water and energy and improve air quality. Implementing sustainable landscape codes protects important natural resources and helps meet local sustainability goals. They can lower costs for businesses both in maintenance fees and by reducing on-site space dedicated to nonprofit-generating uses.

The most effective sustainable landscape codes integrate low-impact development techniques, layered landscaping designs, active open space standards and shared facility requirements.

Low-impact development – Low-impact development practices are a key component of achieving sustainable landscapes. After removing barriers to habitat-friendly development practices, as required by Metro's Urban Growth Management Functional Plan, cities and counties now allow developers to use low-impact development practices. This approach can address increasing climate change concerns and local interest in environmental sustainability.

Local governments can offer educational material, create incentives and adopt more progressive code requirements. They can reduce minimum setbacks and implement



Proposed stormwater system and wetland on the Nexen Chemicals site, part of the Maplewood project

On the ground

City of Boston, MA

Longwood Medical and Academic Area

The Longwood Medical and Academic Area is located on a 213-acre site, three miles southwest of downtown Boston, and constitutes one of the premier medical, research, academic and cultural communities in the world. This mixed-use institutional area boasts 40,000 jobs, 18,000 students and over $5 billion in annual revenues. In 1972, representatives from several area institutions formed a nonprofit organization to address common concerns and promote a sense of community among those who live and work in the area. The organization implemented a number of initiatives making the institutional area a better neighbor to the broader community while enabling local industries to grow in place. Twenty-four medical and academic institutions are located in the area, including hospitals and health centers, research and educational facilities, public and private secondary schools, healthcare related industries, an art museum and a religious institution. This organization illustrates how collaborative planning promotes multi-modal improvements for the institutional community and creates positive relationships with surrounding neighbors.

Initiatives improve the accessibility and attractiveness of the area through planning and development, parking and transportation, collaborative programs, telecommunications and childcare services. Planning and development initiatives include workforce development, open space planning, capital improvements and short- and long-range planning studies. These efforts identified transition areas and techniques to integrate the different uses in the surrounding community. Recent zoning code updates identified clear residential neighborhood boundaries as well as adjacent, pre-existing non-residential uses along major avenues. Local plans call for redeveloping these corridors over time with a mix of neighborhood and institutional uses, including research facilities, high-density housing providing walk to work opportunities, supporting office uses and neighborhood retail. Since the rezoning, four mixed-use development projects have been built. They include housing, neighborhood retail, offices, research facilities and smaller support life-science companies. Positive physical and economic impacts have inspired a nearby neighborhood to consider similar mixed-use transition areas as a means to spur revitalization and increase steady job opportunities.

Transportation related initiatives include personalized assistance for choosing the most efficient and cost-effective commute option, ride-matching and emergency ride-home programs. They also set a maximum parking ratio of .75 spaces per 1,000 square feet of development, which has reinforced these transportation efforts. Institutions voiced concern over the low ratio, but the market has continued to drive growth in the area. Transportation planning efforts have resulted in additional commuter rail to the area and shifted commuter travel, with a 14 percent reduction in solo drivers, 7 percent increase in transit ridership and a 5 percent increase in walkers/bicyclists, since 2002.

Designers maximize credits by layering vegetation – a tree with an understory of shrubs is worth more than a tree by itself. This leads to more lushly planted designs, which typically look better and provide greater ecological value.

"Honor Award: Seattle Green Factor," Analysis and Planning: 2010 ASLA Professional Awards accessed September 4, 2010 www.asla.org/2010awards/519.html

Natural landscaping techniques better achieve the aesthetic and environmental mitigation goals of open space requirements.

maximum setback standards for employment and industrial areas. Restrictions can be placed on landscaping techniques and new building construction materials to avoid toxins. Stormwater requirements can address pervious surfaces, bioswale infiltration basins, layered landscaping with native species, greenroofs and rainwater harvesting. Metro's Nature in Neighborhoods program provides information on innovative low-impact development and existing projects (see page xvi for more information). The International Living Building Institute, through the Living Building Challenge, lists toxic building materials to avoid.

Layered landscapes – Sustainable landscapes reduce the amount of underutilized space on site by discouraging large landscaped lawns in favor of more natural, layered landscapes to meet open space requirements. Layered landscapes mirror the natural environment and thus, integrate multiple levels or layers of native species. The resulting landscape can differ from project to project, but will integrate pervious ground surfaces, such as dirt paths, bioswales and pervious pavers; habitat at the human level, including shrubs, flowers, wetlands or green walls; and a habitat canopy, using multiple layers of trees as well as green roofs. These codes also allow additional habitat, such as bioswales, green roofs and green walls, to count toward open space requirements. Each layer, rather than just a footprint, counts toward habitat and open space requirements, allowing businesses and communities to maximize the use of a property and mitigate development impacts within smaller spaces. Traditional open space requirements set aside a percent of the site footprint, which does not necessary result in sustainable, low-impact development.

Layered landscapes also require less maintenance and operating costs, relying on local climate with less watering. Layered landscapes filter and absorb on-site stormwater runoff, reducing drainage into the stormwater sewer system. Layered landscapes produce aesthetically pleasing open spaces that have greater height than landscaped lawns. The result is a more attractive employment area with a better buffer between the area and surrounding uses.

Active open space – Sustainable landscaping codes design required open space portions of a site to be useable and engaging, providing an amenity to the local workforce and the larger community. Companies can also meet modern mobility and connectivity standards by connecting on-site active uses, such as pedestrian and bike paths, to

On the ground

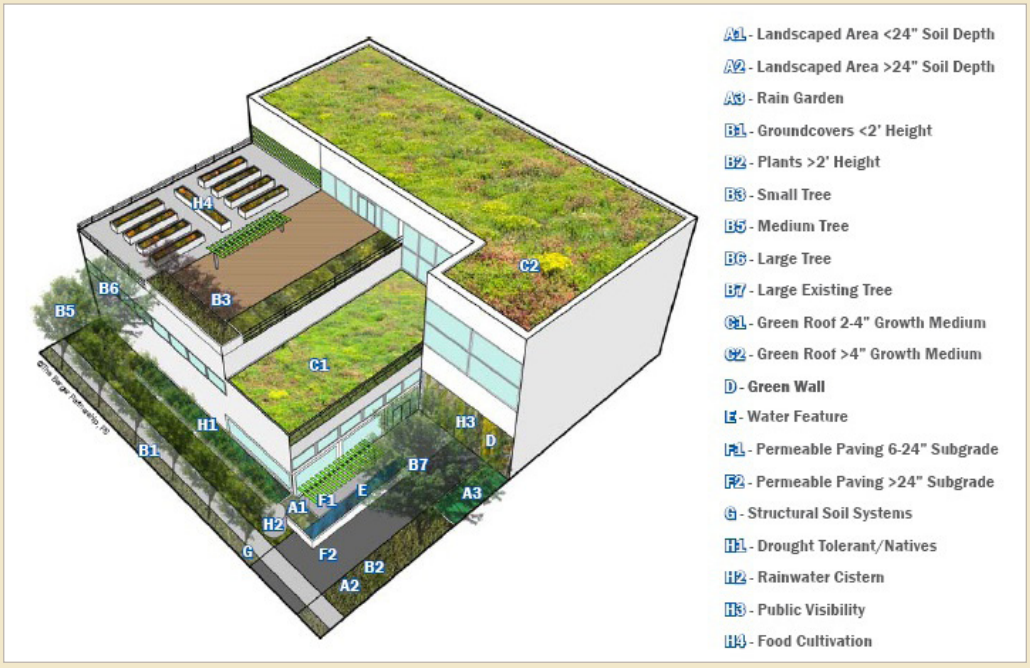
City of Seattle, WA

Green Factor

The Seattle Green Factor is a landscape requirement designed to increase the quantity and ecological function of planted areas in Seattle, while using a menu system that allows flexibility for developers and designers to meet development standards. Modeled after the Berlin Biotope Area Factor, Seattle adopted the Green Factor in 2007 as part of the Neighborhood Business District Strategy in an effort to increase stormwater retention and the effective use of green space on commercial sites. New development projects in Seattle's neighborhood business districts now use the Green Factor for meeting the city's landscape requirements.

Developers demonstrate that their projects meet the Green Factor by using a score sheet. The menu scoring system outlines different greening strategies for developers to achieve the aggregate required vegetation score. These strategies encourage larger plants, permeable paving, green roofs, vegetated walls, preservation of existing trees and layering of vegetation along streets and other areas visible to the public. The Green Factor strategies are weighted and expressed as a ratio according to their ecologically effective land area of development. Design strategies that promote layering of plant material, low water use or propose large or protected trees are given a higher score based on their contribution to ecosystem function. As designers add landscape features, the score sheet automatically calculates a project's Green Factor score, allowing the developer to easily experiment with different combinations.

Previously, the landscaping requirement mandated a percentage of open space on a development site, but did not ensure that landscaping would be green or sustainable. Green Factor calls for a 30 percent vegetated requirement measured by ecological effectiveness rather than square feet. This approach supports layered landscapes that have a high Green Factor score but a smaller footprint. For example, permeable pavers, green roofs, trellis systems and rain gardens each contribute much higher scores to meeting the 30 percent requirement than a traditional lawn or ground cover. Green Factor increases the amount and quality of urban landscaping and gives flexibility to developers to use their properties more efficiently.



This Green Factor Composite Model depicts the elements of Green Factor and how they relate spatially to a building and its landscaping. The model shows the maximum Green Factor credits possible, with a score that greatly exceeds the minimum score requirement.

We really have to rethink the integration of neighborhoods, design, nature, architecture and planning and how all these things make our lives work for us.

Susan Szenasy, Editor in chief, Metropolis magazine, *Integrating Habitats* jurist

neighboring sites and local transit. Through more natural and sustainable design, such as unpaved paths with layered landscapes, these spaces can also meet habitat and landscaping requirements. The most innovative landscape codes combine these approaches in order to use active open space areas to meet landscape, open space, pedestrian and connectivity requirements within the same footprint. Businesses can maximize operations while protecting habitat, creating a positive aesthetic and providing community amenities.

Shared facilities – Cities can achieve sustainable landscapes that reduce non-functional, underutilized space by encouraging development of shared facilities and amenities between companies. Shared facilities and amenities may include parking, storage areas, joint-logistics facilities, recreational areas and employee bicycle and pedestrian trails. Sharing facilities and amenities can drastically reduce the costs of development and operation. Local governments can encourage shared facilities in their code and design guidelines in several ways:

- introducing language into educational materials and design guidelines regarding the importance of shared facilities
- requiring shared parking agreements among property owners in an employment area
- requiring that parking facilities connect to those on adjacent parcels
- requiring openings through fenced areas between lots to enable shared facilities and pedestrian movement.

Expansion and reuse

21st century design codes also address the needs of business expansion and reuse, an increasing market trend. Expanding business in place and reusing existing buildings capitalizes on the benefits of existing development, including close access to employees, transportation infrastructure and amenities.

Efficient site designs that increase business investments on site and reuse existing building stock reduces the demand for additional land and infrastructure, leading to economic growth, resource conservation and greenhouse gas emission reductions in existing communities. Strategic infill and reuse often spurs additional economic investment in the area, creating more employment opportunities and enlivening communities.

Stacking and clustering – In areas where market conditions do not allow for high-density development, cities can encourage full-site utilization and opportunities for future business expansion by encouraging the stacking and clustering of buildings on site. The stacking of complementary uses and clustering of buildings allows for future on-site development, while maintaining adjacent natural habitats in the interim. Stacking and clustering allows future developers significant space to work with when developing additional buildings. This provides flexibility for different businesses and uses, rather than accomodating small or fragmented spaces. Furthermore, this approach typically entails simpler infrastructure extensions. The space saved by stacking and clustering buildings can also lead to improved environmental conditions, natural habitat conservation or mitigation efforts.

To encourage stacking and clustering of buildings on site, cities can include language into their area plans and design guidelines. Language should assert that stacking and clustering be functional and aesthetically pleasing, as well as complement the character of the existing area and not inhibit additional growth and high-performance infrastructure. Full-site utilization plans are a useful tool to determine the best way to cluster buildings (described in the following section). Cities and counties may want to consider requiring these plans to ensure site designs will not prohibit or complicate future development. To guarantee stacking opportunities and efficient clustering, cities can require vertical development for amenable uses (e.g., offices), site plans that use clustering and shared facilities or even engineering plans that enable future stacking opportunities for low intensity structures.

Building reuse – The reuse of existing building stock is integral to achieving the region's goals for sustainability and mitigating climate change. Creative reuse and redevelopment of buildings drastically reduces greenhouse gas emissions associated with demolishing old buildings, expanding infrastructure and developing greenfields. However, preconceived notions and regulatory and financial barriers to reuse still exist.

Despite this, some older, multistory buildings are being reused across the country for employment and industrial use, including multi-tenant small manufacturing and bulk warehouse spaces. These developments use creative designs, reduce code barriers and maximize financial incentives. One such design for multi-tenant manufacturing and warehouse is the tiered "wedding cake," which places manufacturers or warehouse facilities with larger floor-to-ceiling space requirements on the first floor and places smaller operations with goods that have less frequency of turnover on the higher levels of the building. Mechanized pallet lifts distribute goods between floors. Smaller operations, such as a manufacturer who builds inventory and ships it with less

On the ground — City of Black Diamond, WA

Industrial area design guidelines

On the outskirts of King County, the City of Black Diamond is transitioning into a rural town center. Although they lack the land values for more compact development, Black Diamond is proving that rural areas can improve the livability of employment areas by implementing site efficiency standards, as well as standards for improved pedestrian accessibility, better transitions between uses and preservation of green space and natural resources.

To improve site efficiency, the Black Diamond design guidelines have no minimum setbacks and maximum setbacks of 20 feet. They also promote shared parking access and shared parking areas and emphasize pedestrian-friendly environments. Design guidelines encourage the clustering of buildings to reduce the amount of underutilized space and preserve green space and natural resources.

frequency, are attracted to these spaces because they come with reduced rent and the ability to share the cost of logistic operations. Larger operations are attracted to lease higher-level space for future expansion opportunity. This can create synergies between tenant operations, allowing companies to share logistical facilities and environmental permitting. Sometimes they create opportunities to complement product development, such as when one company makes a part needed by another business on-site.

These developments use creative designs, reduce code barriers and maximize financial incentives.

Cities can work with developers to review and improve codes, procedures and financial incentives that make redevelopment feasible. Codes that make redevelopments particularly expensive, such as seismic upgrade requirements, energy efficiency standards and overly specific, rigid requirements, should be reviewed frequently to properly balance safety with long-term economic redevelopment and sustainability goals. For example, applying energy efficiency standards to old buildings may make a project infeasible, deterring development. It may also trigger expensive efficiency measures that conflict with other objectives such as national historic preservation standards. It is important to consider a variety of goals in these areas and provide flexibility to support projects with the best financial, social and environmental returns.

Code review is also important in new construction developments to encourage future reuse and expansion. New building design strategies make buildings more easily adaptable to future tenants. For example, open and raised floor designs make it easier to adapt to the needs of future tenants or the changing needs of existing tenants. Open and raised floors that use castellated beams instead of typical studs and drywall allow for modular interior walls, simplifying modification of interior spaces and giving owners and tenants space flexibility. This also drastically reduces costs associated with rearranging the layout. Another strategy to encourage future reuse is to require that new buildings be adaptable to the structural needs of growing sectors. For example, an area projected to experience significant growth in the healthcare field could require new buildings to have increased ceiling heights to prepare the buildings for future reuse even if the initial tenants are not healthcare providers.

Before and after a building redevelopment project in the Lents Town Center and Urban Renewal area.

On the ground

City of Portland

Seismic requirements

Working to assess barriers to redevelopment, the City of Portland found that many developers are deterred from redeveloping buildings because code requirements trigger seismic upgrades. Retrofitting a building to meet seismic codes is expensive, often doubling the price of the renovation. The expense of seismic upgrades makes tenant rental space more costly and can trigger the need to upgrade the building to a higher use and occupancy rating.

Responding to seismic concerns and state legislation, the Portland Bureau of Development Services strengthened seismic codes in 1994, lowering the trigger points for seismic upgrades. However, because of developer concerns and barriers to redevelopment, they created a Rehabilitation Code Task Force to review the seismic codes to facilitate redevelopment, while at the same time maintaining strong standards for safety.

The Task Force made code changes, including:

- providing more generous allowances for buildings undergoing a change of occupancy, including allowances for live/work spaces, in some instances without the need for a full seismic upgrade
- allowing mezzanine additions without triggering a full building seismic upgrade
- basing requirements for strengthening an existing building on the percentage of building damage
- adjusting requirements for seismic improvements to unreinforced masonry buildings.

While these adjustments are beneficial, some developers believe seismic codes still remain a barrier to redevelopment.

Seismic upgrades are part of the renovation and LEED certification of the Science Building II at Portland State University.

Design and development codes

Cities can encourage reuse by emphasizing its importance in plans and design guidelines and working individually with developers on specific projects.

Many of these examples are context-specific, but generally cities can encourage reuse by emphasizing its importance in plans and design guidelines and working individually with developers on specific projects to:

- lead them through code requirements
- expedite variance and other permitting processes for innovative building designs that are more flexible for future reuse
- identify financial incentives for projects that support city goals.

Financial incentives may include the use of enterprise zones, tax-increment financing, tax abatements and strategic investment funds. State and local financial incentives for green building techniques and energy efficiency can further help in making building reuse technologies financially feasible and closing any project funding gaps. By working closely with developers in these areas, cities can encourage the revitalization of existing employment areas and construction of new buildings with future reuse opportunities, making the community's building stock and local economy more sustainable.

An abandoned grocery store in Denton, Texas, redeveloped into a new public library branch in 2003, adapting its existing footprint and removing approximately 75 parking spaces from the foreground of the site to provide room for linear outdoor spaces to engage the adjacent residential neighborhood and park.

On the ground

City of Boise, ID

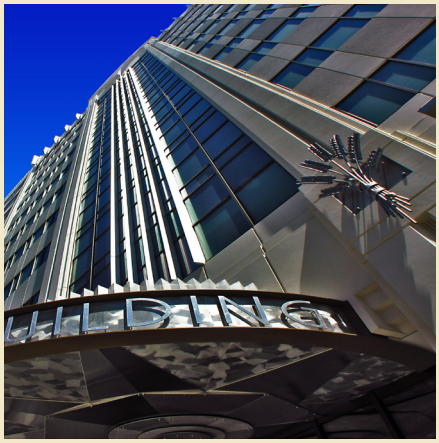
Banner Bank Building

The Banner Bank Building, a commercial office building in Boise, Idaho, is a model for designing buildings to be more flexible for future reuse. It uses innovative technologies to make it easily adaptable for new tenants, including:

- **Open floor plates:** The building has large open floor plates, uninterrupted by structural components. It uses large, deep castellated beams that span from the core to the perimeter of the building. The open floor plates allow tenants to easily modify their interior spaces with minimal expense using modular walls. Castellated beams also cut costs because fewer columns were required and the beams use 12 percent less steel than traditional beams.
- **Modular walls:** The interior walls are not made of typical studs and drywall, but instead are made of locally-made formaldehyde-free particleboard panels. Wall panels and hardware are reusable multiple times and substantially reduce materials needed for tenant improvements for the life of the building. They also reduce tenant improvement construction time by 60 to 70 percent, creating new floor plans quickly, with no dust and little noise. Modular walls, combined with the raised floor system, drastically reduce costs associated with rearranging the layout and provide the owner and tenant tremendous space flexibility.
- **Raised floor plates and underfloor air system:** The raised floor plates and underfloor air system support a unique power and telecommunications system that is found in power boxes mounted to the raised floor, instead of hard wired outlets in the walls. These boxes can be relocated anywhere and are reusable for decades. Each light fixture is connected with an internet-based module that allows it to be individually controlled at a computer.[1]

These technologies are transferrable to most new office and tech-flex buildings. Most of these building standards were new to Boise, but by working closely together, the developer and planning department made the building code, city goals and the new building technologies align.

1. "Banner Bank Building," Lifecycle Building Challenge, accessed August 20, 2010, www.lifecyclebuilding.org/2007/entries/106289text.htm



The Banner Bank Building was the fourth building in Idaho to be LEED-certified at any level, and only the 16th building in the country to be certified platinum. That the project was completed by a local developer, with local designers and builders, and at no additional cost compared to a typical building, is remarkable.

"Downtown Boise Building Wins Region 10 Phoenix Award," Brownfields Update for the Pacific Northwest
accessed September 4, 2010
www.nwbrownfields-update.com

Mixed-use, transit-oriented employment redevelopment in the Brewery Blocks in Portland

Chapter 2

21st century design

SECTION TWO

Innovative planning and development

Innovative planning and development tools help local jurisdictions and businesses effectively implement 21st century design and development codes. Current market conditions in some locations can make it impossible to build out properties to 21st century design standards. Similarly, many businesses choose locations with additional land where they can grow over time. Innovative development processes enable current investment while also ensuring the optimal use of the property and the site's ability to achieve 21st century design when fully developed. Industry trends and local market conditions also tend to change more quickly than local zoning and development codes can respond. Similarly, each development site has unique characteristics and an employer with its own business needs. Municipalities that use innovative planning tools offer flexibility and responsiveness to market needs while still meeting land use and design goals. As such, these innovative planning and development tools facilitate projects that maximize long-term economic opportunity and environmental sustainability.

The nuts and bolts

Cities and counties can implement outcome-based design guidelines and/or menu-based zoning codes implementing 21st century site design while offering flexibility to developers. Establishing incentives, financial or through expedited processes, can promote the use of guidelines and encourage projects to achieve more sustainable development. One option is recognizing projects that meet the LEED-ND standard, which certifies projects that realize sustainability benefits beyond the individual site.

Local municipalities can create incentives or requirements for developers to complete full-site utilization plans. These plans support the long-term optimal use of the property while promoting existing investment interest. Alternatively, property owners can use unconventional leasing agreements that allow a primary company to lease space to supporting industries until they are ready to expand. Municipalities may consider using unconventional leasing on publicly-owned property to build a catalytic project spurring additional investment and economic activity.

Outcome-based design guidelines emphasize innovative strategies and goals that a jurisdiction may be interested in implementing but uncertain on how to enforce, and they provide tangible information to cutting edge businesses and developers.

How to use it:

Design guidelines

Design guidelines tend to be easier to modify than development codes, allowing them to respond and adapt more quickly to the market and advances in technology. Guidelines provide an advantage to jurisdictions that do not have the capacity to frequently update their development codes. Visionary design guidelines encourage a range of sustainable strategies that are potentially easier to implement than code standards. Jurisdictions can create a holistic wish list of design strategies, covering a range of traditional and newer, more sustainable infrastructure topics. These include energy, water, materials and land use and transportation infrastructure, as well as other site design strategies, such as site layout, access and movement, green building and low-impact development techniques.

The design guidelines help developers and businesses identify strategies that are pertinent and financially feasible given the existing site conditions and the proposed business development. The design guidelines can serve as a powerful educational resource if they include detailed information and resources on high-performance infrastructure and 21st century design. With this type of information, jurisdictions can encourage the development and adoption of more innovative, sustainable design strategies.

Outcome-based design guidelines emphasize innovative strategies and goals that a jurisdiction may be interested in implementing but are uncertain on how to enforce, and they provide tangible information to cutting edge businesses and developers. Design guidelines allow local governments to document innovative strategies and goals for future application as technologies and business designs advance, and these innovative approaches are easier and cheaper to implement. Because guidelines are an optional provision, however, local jurisdictions may not realize the implementation of the strategies to the degree they envisioned, and therefore, may want to consider integrating a few required elements into the development code.

On the ground

Alameda County, CA

Bay-Friendly landscape guidelines

The Bay-Friendly landscape guidelines provide best practices for gardening and landscaping to support the ecosystems of the San Francisco Bay watershed. The guidelines use an integrated approach to optimize soil health, water conservation, wildlife habitat and waste reduction through natural landscaping practices. There are fifty-five best practices organized under seven principles: landscape locally, landscape for less to the landfill, nurture the soil, conserve water, conserve energy, protect water and air quality and create wildlife habitat. Best practices cover the design, construction and maintenance phases and focus on preventing waste, stormwater runoff and contamination from toxins by using native plants; natural watering, fertilizing, and pest management; and reusing material on site. A scorecard accompanies the guidelines for landscapers to use when constructing new landscapes. The scorecard tracks and allocates points to any Bay-Friendly features incorporated into the design. Bay-Friendly recommends a point minimum beyond the nine practices required by code.

The guidelines support lower maintenance costs and reduced greenhouse gas emissions from decreased use of motorized landscaping equipment and less waste transportation to landfills. They help reduce emissions by preventing plant debris from decomposing without oxygen in landfills. Likewise, reducing landscape debris will support sustainability and land use efficiency goals by conserving landfill space. By focusing on conserving water, energy and topsoil and reducing stormwater runoff, these practices can prevent or reduce stormwater pollution. Benefits include fewer future brownfield issues and an overall gain for community health.

Alameda County Waste Management Authority and Alameda County Source Reduction and Recycling Board produced the *Bay-Friendly Landscape Guide*. At the time, 110,000 tons of plant debris was going to the landfill each year and hazardous waste disposal costs from landscaping were approximately $65,000 per year – only a small fraction of pesticides actually disposed of properly. The guidelines were written for the professional landscape industry to encourage them to be proactive and part of the environmental solution. Bay-Friendly has since extended its scope to include technical assistance to public agencies in the form of guidelines and additional resources, grants and design assistance, workshops and custom trainings and model policies and ordinances.

Bay-Friendly is a holistic approach to gardening and landscaping that works in harmony with the natural conditions of the San Francisco Bay Watershed. Bay-Friendly practices foster soil health, conserve water and other valuable resources while reducing waste and preventing pollution.

Bay-Friendly Landscaping and Gardening,
accessed August 21, 2010
www.stopwaste.org

Flexible menu approach

By offering developers options, cities can include the most innovative standards in the menu and maintain the code's relevance as technology advances and new companies emerge.

The flexible menu approach allows jurisdictions to create the right balance of required code elements and visionary design guidelines, enabling innovation while also ensuring implementation of key eco-efficient design elements. The approach requires a basic set of code provisions and creates a supplementary menu of other guidelines that are encouraged but optional. Businesses have the flexibility to adopt the specific strategies that best fit their needs and site conditions. By creating a menu of guidelines and offering flexibility, the code can better respond to the business market, giving developers a range of options that meet the purpose of the code while producing variety within the urban landscape. By offering developers options, cities can include the most innovative standards in the menu and maintain the code's relevance as technology advances and new companies emerge.

The flexible menu approach has been used both as an overall system for design and development codes as well as for individual site design requirements such as open space standards. Cities can set a target number of guidelines from the menu that must be included in a site design, or they may require that a minimum score be met, setting point values for each menu item based on its ability to achieve the overall intentions of the design guidelines. A developer can create any combination of elements in the site design as long as it meets a minimum point value. Alternatively, cities can require that site designs integrate certain threshold criteria. For example, a site design may require a bio-swale and a certain number of trees and then allow the developer to choose how to reach the rest of the required points.

When using the flexible menu approach as an overall code system, cities generally require specific threshold criteria and then use supplemental, menu options within each section of the code. Cities can opt to simply require an overall threshold rather than specify individual scores within each section of the code. This approach allows flexibility and trade-offs between code standards. For example, a project may go above and beyond in implementing sustainable landscape design to compensate for constraints related to reuse and expansion. The city should determine the required versus optional guidelines based on their local priorities, goals, capacity and context.

LEED-ND

Local governments can use the LEED-ND framework to encourage high-performance infrastructure and 21st century designs. With one of the largest collections of LEED-certified buildings in the United States, the Portland metropolitan region has widely adopted LEED (Leadership in Energy and Environmental Design) certification as a means to develop green buildings and reduce the region's carbon footprint. To address sustainable development beyond green building practices, the U.S. Green Building Council, the Congress for the New Urbanism and the Natural Resources Defense Council teamed up to develop a new LEED rating system for neighborhood level planning (defined typically as 40-to-160 acre developments). Combining principles of smart growth, New Urbanism, and sustainable infrastructure and green building practices, LEED-ND has three environmental categories: smart location and linkage, neighborhood pattern and design and green infrastructure and buildings.

On the ground

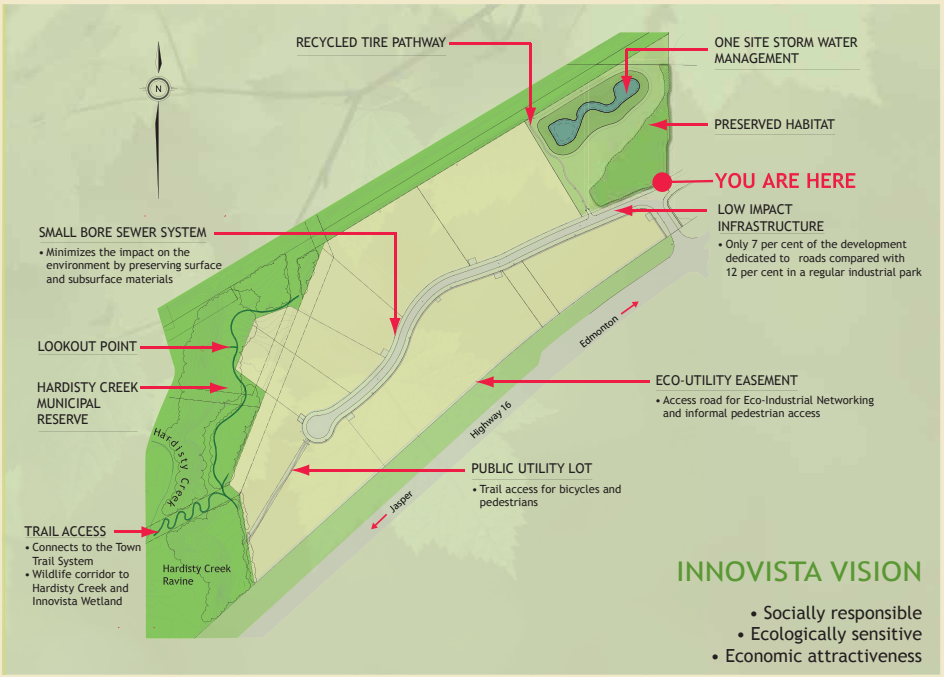
City of Hinton, Alberta

Innovista Eco-Industrial Park

The Innovista Eco-Industrial Park is a sustainable industrial park developed by the Town of Hinton in Alberta, Canada. Although remote, the town uses flexible menu guidelines and an eco-industrial development guideline checklist to ensure sustainable development. The checklist covers 80 different development guidelines, categorized by:

- predevelopment planning
- parcel layout and orientation
- energy systems
- water, stormwater and wastewater
- landscaping and open space design
- access and movement
- construction

Ideally, a proposed development must meet 50 of the 80 guidelines to be approved. However, the city realizes some guidelines are hard for developers to implement under current conditions and therefore, some elements are not strictly enforced. City staff works one-on-one with businesses and thus far, the checklist has proven to be useful in educating developers and moving toward more sustainable practices. It provides an opportunity to recognize developers implementing 21st century design standards but who cannot necessarily afford LEED certification.



Innovative Planning and Development

The environmental gains are much larger when you capture them at a point when a neighborhood is planned and designed.

– Eliot Allen, Principal, Criterion Planners
"Next big thing: green neighborhoods," Sustainable Life, accessed September 4, 2010 www.usgbc.org/News/USGBCInTheNewsDetails.aspx?ID=4336

Smart location and linkage encourages, among other things, brownfield redevelopment and infill in areas with existing infrastructure services and along transit corridors. It promotes siting that avoids imperiled species, ecological communities and floodplains and promotes wetland and water conservation.

Neighborhood pattern and design presents requirements for walkable streets in compact, connected developments. LEED-ND awards credits for strategies like reduced parking, transportation demand management and local food production.

Green infrastructure and buildings addresses green building certification, optimal building energy and water efficiency and construction-activity pollution prevention. In this category, LEED-ND gives additional credits for strategies like on-site renewable energy sourcing, district heating and cooling and advanced stormwater and wastewater collection and reuse.

LEED-ND also includes a forth category, **innovation and design process** to encourage an integrated design process and innovative system-based approaches.

Local governments can use the LEED-ND framework to analyze existing zoning and building codes and comprehensive plans to encourage high-performance infrastructure and 21st century designs. Cities can tie incentives such as fast-track permitting, design review exemption and tax credits to projects that reach LEED-ND certification. Certification can add considerable time and costs to a project that may prevent businesses from locating in an employment area. Communities can adopt design guidelines, checklists or menu-based design codes that use LEED-ND standards and provide incentives to projects that meet all or some of these standards. See page 87 and page 106 to read about two projects, Twinbrook Station in Rockville, Maryland and Dockside Green in Victoria, B.C., which both plan to obtain LEED-ND certification.

Dockside Green Inspiration Café, part of the Dockside Green LEED ND project (left), and the Twinbrook Station LEED ND project (right).

Full-site utilization plan

A full-site utilization plan is a development tool that responds to existing market conditions and project feasibility while facilitating future expansion opportunities that achieve 21st century design. Often, municipalities do not have the current market conditions to create more compact, multi-modal employment areas. Full-site utilization plans can remedy this problem. These plans phase development to optimize use of land and expansion opportunities allowing a site to reach full capacity over time.

Full-site utilization plans typically illustrate the location of potential future building pads, facilities and potential street right-of-ways. These plans can include a narrative of potential future building types, the mix of uses, density, vehicle parking requirements and a general overview of the anticipated phasing of development. Developers are encouraged to demonstrate how the proposed project will not encumber future phases of development and will achieve the community's economic and environmental goals. Planning officials should review the plan not only for its adherence to the master plan, zoning codes and potential design guidelines, but also for its ability to be realistically implemented.

Local jurisdictions can require full-site utilization plans for all employment and industrial areas. Alternatively, a city may require these plans where there is no set maximum height or density requirement and/or where proposed development does not yet meet maximum site density requirements. By focusing on these areas, cities can reduce underutilized employment areas and enable future expansion and infill opportunities. Similarly, developers can use these plans to maximize long-term development opportunities and profits.

Unconventional leasing

Many institutions and businesses are saving money on facility placement by entering into unconventional leasing partnerships and avoiding the underutilization of land. These leases create an alternative to traditional land banking, which leaves large parcels vacant indefinitely, creating an income-bearing alternative to share or reduce the cost of new development. This allows businesses to increase their investment by using sites more fully.

(The) goal is to foster neighborhoods that have a gentler impact on the environment, that reduce carbon emissions and that meet broader social and quality-of-life goals, such as housing affordability and locating jobs near homes. Developers can score higher in the new ratings system by preserving wetlands, enabling community gardens and farmers markets, and meeting other goals.

"Next Big Thing: Green Neighborhoods," *Sustainable Life,* accessed September 4, 2010 www.usgbc.org/News/USGBCInTheNewsDetails.aspx?ID=4336

In unconvential leasing, when a company acquires a site that exceeds their existing needs, they use only a portion of the existing structures, and lease the extra space to other entities. When ready to expand, they remove leases from the market and use the space for their growing operations. Rather than land banking vacant land, which is becoming less financially feasible, unconventional leases essentially bank space by leasing it out, thereby reserving the possibility of future expansion while also generating income. Leasing partnerships also allow businesses, agencies and institutions to maximize space using joint facilities.

The most successful leasing partnerships are those with complementary uses, such as institutional and corporate offices or research facilities that incorporate retail. These partnerships can result in a 24-hour consumer population as well as collaboration opportunities for specific projects and work-force training programs. Co-location is another successful leasing partnership: a primary user with a very specific resource flow can lease space to businesses that recycle that output into their own operations or energy creation. These approaches are applicable for new development as well as redevelopment projects. Likewise, leasing agreements can work in large-tract employment and industrial areas as well as infill areas where land can be scarce. Infill areas with an existing mix of uses and a longer daily activity spectrum support accessibility, economic activity and synergy opportunities for employers engaged in lease agreements. In large employment areas, lease agreements are also commonly used by large tract manufacturing facilities to build tenant space (or manufacturing malls) for supporting businesses.

Performance benchmarking

Performance benchmarking enables governments to assess the effectiveness and implementation of local policies and eco-efficient tools. This measurement tool is also relevant for assessing zoning codes and design guidelines. Performance benchmarking ensures that local regulations reflect best practices and support practical application of sustainable strategies on employment and industrial land.

Performance benchmarking evaluates the way a project performs in specific areas. Indicators should reflect community and sustainability goals integrating triple bottom line performance measurements. Indicators specific to 21st century design include:

- natural habitat density
- open space density
- median distance to neighboring business
- road density
- pedestrian and bicycle friendliness
- bicycle facilities
- parking intensity
- alternative commute modes
- commute length
- average distance to an alternative fuel source station
- access to public transit
- access to greenspace and trails.

On the ground — City of Vancouver, WA

Full-site utilization plan

The Vancouver Section 30 Employment Plan addresses a largely undeveloped 550-acre area outside downtown Vancouver that the city envisions becoming a leading 21st century urban employment center. Zoned as employment center mixed-use (ECX), the city wants to attract emerging technology and provide family wage jobs. The city also envisions this area as a healthy neighborhood where workplaces, greenspaces and commercial retail amenities are easily accessible. In order to create this vibrant employment district, the city is encouraging compact development through a phased approach. The city requires that developers submit full-site utilization plans for all proposed developments, unless they meet or exceed the maximum allowable floor area ratio. In their full-site utilization plan, a developer must include information about: the future locations of potential building pads, parking structures and right of ways that will create an urban style street grid; the building types and uses that could develop over time; and the anticipated phasing and timelines for development. Developers are encouraged to provide shadowplats and maps that demonstrate how phased development could occur.

On the ground — City of San Francisco, CA

San Francisco State University

San Francisco State University's College of Business is using an unconventional leasing partnership to create a thriving mixed-use institutional, employment, and retail center in downtown San Francisco. The college teamed up with Westfield Development to create a 1.5 million square foot mixed-use center, located adjacent to a BART light rail station and multiple bus and streetcar lines. The university leased out two floors of office space for a 15-year period. Almost immediately, Microsoft leased the entire seventh floor and other clients signed on soon afterward. Microsoft and the college have collaborated on a number of projects benefiting both the student population's professional development and Microsoft's businesses operations. The presence of students supports retail enlivening the area from morning to night.

When updating code provisions or establishing new design guidelines and requirements, it is important to conduct a baseline assessment of each indicator in some existing employment areas. These performance indicators will be measured again for new development projects using the new standards. New design standards should show an increase in natural habitat, open space and road density; a decrease in median distance to neighboring businesses, space dedicated to parking, average commute lengths and average distance to an alternative fuel source station; and additional bicycle and pedestrian facilities, green commuters and access to public transit, key services, greenspace and trails.

Measuring indicators over time and the adoption of different design standards enables cities to discern whether code provisions are creating the desired outcomes and adapt them as needed. Performance benchmarking can also help the local jurisdiction monitor development and uncover barriers to building 21st century designs. Cities may find that certain code provisions need to be pursued more aggressively or more flexibly in order to see significant change and desired outcomes.

On the ground

City of Portland

University of Oregon White Stag block

The University of Oregon is using unconventional leasing practices to plan for future student population growth in Portland. Instead of developing a new satellite campus in a traditional campus setting, the University decided to locate in the White Stag building, the Bickel Block and the Skidmore Block in the heart of downtown Portland.

The location is directly on the light rail line, adjacent to a park with bicycle paths and near the hub of the city's transportation corridors. The university leased the ground floor of all three buildings as well as all five floors and the basement of the White Stag building. Anticipating future growth, the university secured leasing for more floors than it currently needs. It currently leases the upper floors of the remaining two buildings to other tenants, but plans to take them over when ready to expand. Starting in 2016, the university has an option to buy the complex from the owner.

Before and after redevelopment photographs of the White Stag University of Oregon buildings.

The University of Oregon's Portland presence boasts a home that matches the world-class quality of the university's programs. The White Stag block, a refurbished, 103,000 square-foot green facility … features the latest in sustainable technologies and green building design.

"Landmark Structure Houses University of Oregon's Portland programs," University of Oregon accessed September 4, 2010 http://pdx.uoregon.edu/index.php?p=about

Keep in mind

- **Flexibility:** Optional guidelines that require discretionary review provide significant flexibility for businesses and developers. However, given they are optional, implementation of these new designs may not be realized. Some jurisdictions have voiced concern with some design guidelines that are too subjective and do not state clear and objective standards. Clear zoning code standards reduce these legal concerns and ensure projects achieve 21st century design but may be too prescriptive and unresponsive to site conditions and business needs. Menu-based code provisions provide flexibility while requiring a certain number of design elements. Menu-based code provisions should be clear and objective, reducing legal concerns while still offering flexibility.

- **Incentives:** Businesses are naturally risk-averse and tend to operate on relatively tight timelines. Extensive zoning requirements, full-site utilization plans or LEED-ND certification may create additional time and costs to a project. Incentives can allay these concerns. Incentives can include fast-track permitting, local fee waivers and design review exemptions for project applications meeting pre-established prioritization criteria.

- **Local management:** Adopting specific 21st century design standards and menu-based standards with a scoring mechanism provides clarity and reduces review time at the local level. Guidelines require more discretionary review and staff expertise to determine whether the site design in fact meets the purpose of the design guidelines and whether the proposed combination of optional standards is sufficient to avoid delays. Local jurisdictions may contract out to experts in sustainable design to review development permitting.

- **Systems approach:** Achieving 21st century site design requires more than improved design and development codes and strategies. A jurisdiction should adopt a vision for eco-efficient employment within its comprehensive plan, guiding other planning and policy efforts to adopt these approaches and tools. This is extremely important in making sure infrastructure planning efforts include plans, regulations and project lists that enable and implement high-performance infrastructure. Without this overarching guidance, efforts across departments may not support the systems approach. Supporting a systems-based approach does not necessitate extensive code regulations. A jurisdiction can focus on removing code barriers and encouraging eco-efficient tools by supporting businesses through incentives, recognition, technical assistance, alternative planning tools and flexible processes for innovative solutions.

Putting it together

Implementing 21st century design can attract business and encourage job growth. It also helps reduce impacts to infrastructure systems, reduces greenhouse gas emissions and builds healthier communities. It goes beyond green buildings to address sustainable design at the community level.

Tips for implementation

- Remove code barriers to implementing high-performance infrastructure, such as height restrictions prohibiting renewable energy systems, making allowances for private utilities to provide services on site and allowing the layering of service corridors.
- Ensure codes support liner uses and buildings and transition areas (through design and allowed uses) to create more efficient communities and increase neighborhood interactions.
- Revisit parking standards for employment and industrial areas to ensure they do not create unnecessary and avoidable cost burdens to local business or prohibit 21st century design.
- Revisit landscaping standards to promote native, layered habitats that provide active open spaces and use land more efficiently.
- Use LEED-ND as a guide for local codes.
- Use a mix of design guidelines, standards and flexible menu approaches to increase flexibility in achieving local goals and reducing barriers to the market.
- Work closely with developers to review and improve codes and procedures to make 21st century design feasible.
- Collaborate with developers trying to build innovative and sustainable projects and find solutions to local code and permitting barriers.
- Support partnering on projects that use unconventional lease agreements.
- Support transportation demand management programs to further reduce the need for parking.
- Create incentives such as fast track permitting, design review exemption and tax credits for projects that use these tools.
- Use performance benchmarking to ensure that local regulations reflect best practices and do not hinder sustainable strategies for employment and industrial land.
- Consider requiring, or addressing during the design review process, design elements (e.g., sharing facilities, stacking uses and clustering buildings) and plans (e.g., environmental management, full-site utilization and district energy feasibility plans) for increasing a project's sustainability, land use efficiency and expansion opportunities.

Resources

For more information on the case studies, contact or visit:

TaigaNova Eco-Industrial Park
Wood Buffalo Housing and Development Corporation
9011-9915 Franklin Ave.
Fort McMurray, AB T9H 2K4
780-799-4050
www.wbhadc.ca
TaigaNova Development Management Team
780-799-4074
www.taiganova.com

City of Portland
1900 SW Fourth Ave.
Portland, OR 97201-5380

Bureau of Planning and Sustainability
Suite 7100
503-823-7700
www.portlandonline.com/planning

Bureau of Development Services
Suite 5000
503-823-7300

Commercial Development Assistance
503-823-7313 (Small Business Liaison), 503-823-4281 (Major Projects Group)
www.portlandonline.com/bds

Longwood Medical and Academic Area
Medical Academic and Scientific Community Organization, Inc.
375 Longwood Ave.
Boston, MA 02215
617-632-2310
www.masco.org

Seattle Green Factor
Department of Planning and Development
700 Fifth Ave., Suite 2000
Seattle, WA 98124-4019
206-684-8600
www.seattle.gov/dpd/permits/GreenFactor

Kirkland Parkplace and Black Diamond Industrial Area
LMN Architects
801 Second Ave., Suite 501
Seattle, WA 98104
206-682-3460
www.lmnarchitects.com

Resources

Banner Bank Building
C Squared
106 North Sixth St., Suite M-2
Boise, ID 73702
208-345-1665
www.c-squaredboise.com

Bay-Friendly Landscape Guidelines
Alameda County Waste Management Authority & Alameda County Source Reduction and Recycling Board
1537 Webster St.
Oakland, CA 94612
510-891-6500
www.StopWaste.org

Town of Hinton
Economic Development Department
2nd Floor, 131 Civic Center Road
Hinton, AB T7V 2E5
780-865-6004
www.eip.hinton.ca
www.town.hinton.ab.ca

LEED-ND
U.S. Green Business Council
www.usgbc.org/DisplayPage.aspx?CMSPageID=148

Vancouver Section 30: Urban Employment Center Subarea Plan
City of Vancouver
Community Development Department
4400 NE 77th Ave. Suite L-50
Vancouver, WA
360-487-7950
www.cityofvancouver.us

San Francisco State University
835 Market St.
San Francisco, CA 94103
Capital Planning, Design & Construction
415-338-1698
www.sfsu.edu/~downtown

University of Oregon White Stag
Venerable Properties LLC
70 NW Couch St., Suite 207
Portland, OR 97209
503-224-2446
www.venerableproperties.com

Resources

For more information on removing code barriers to high performance energy systems, visit:

Taking the Red Tape out of Small Scale Distributed Renewable Energy
www.newenergychoices.org/uploads/redTape-rep.pdf

For more information on innovative transitioning techniques, best practices in parking management, visual tools and citizen engagement techniques:

Metro's Community Investment Toolkit, Volume 2: Innovative Design and Development Codes
Metro Planning and Development
600 NE Grand Ave.
Portland, OR 97232
503-797-1839
www.oregonmetro.gov/communityinvestment

Eco-roof built as a part of redevelopment in the South Waterfront in Portland

Chapter 3

Redevelopment and reuse

Redevelopment and reuse of the region's existing infrastructure and building stock is crucial to achieving local community aspirations and regional goals for environmental, economic and community sustainability. Focusing investments on redevelopment and reuse reduces the impacts of climate change, protects natural resources and safeguards valuable agricultural land. It also maintains a solid urban fabric in existing communities and encourages economic development, enlivening economically depressed areas and creating jobs in areas served by existing transportation, water, energy, and waste infrastructure systems. Redevelopment and reuse provides businesses access to infrastructure systems, people and markets.

Unfortunately redevelopment of land for employment and industrial use can be difficult due to lease and sale rates lower than that of commercial or residential uses. This can be further complicated by additional costs such as

The nuts and bolts

It is investment – by both the public and private sectors – that converts a great plan into vibrant, safe and prosperous communities. The investments we've made together in everything from light rail lines and natural areas to new housing and industry built our economy and quality of life. To succeed we'll need to target our investments carefully and work collaboratively like never before.

those associated with demolition and environmental cleanup. However, these projects can be feasible when public entities play a role in making projects more financially, environmentally and socially desirable.

Local jurisdictions make investments to support private development everywhere that they envision growth – in newly developing areas or those experiencing redevelopment and infill. By prioritizing investments in redevelopment areas with existing infrastructure, services, and populations, local governments can use limited resources more efficiently. Likewise, these projects restore the tax revenue on delinquent properties and increase community vitality. Strategic investment in redevelopment projects that would not otherwise come to fruition can result in more jobs, income and property taxes.

How to use it:

Local governments can take a leadership role in promoting redevelopment in many ways. They can convene and engage key stakeholders to explore the vision for a specific area, inspiring potential investment projects. They can create public-private partnerships, drive the contractual negotiations and secure funding necessary to move projects forward. They can prepare a site-readiness analysis to save potential buyers and developers significant time and money. A more traditional approach includes infrastructure investments or land acquisition as a means to assemble parcels into larger employment areas. The most challenging sites require multiple types of investment, including more unique and site-specific tools and creative legal and intergovernmental agreements to address potential liability concerns.

Strategic public investments

Targeted investment opportunities can revitalize vacant and underutilized properties, including the redevelopment and infill of underperforming suburban office parks, commercial strip malls, corporate and institutional campuses and environmentally contaminated sites. These areas provide opportunities to increase employment capacity given their access to existing infrastructure systems, transportation networks, potential labor force and supporting retail and services. These sites also typically have unused, zoned capacity due to site design standards as described previously in chapter 2, 21st century design. Investments in land, high capacity transit corridors, structured parking, high-performance infrastructure and environmental remediation often deliver a good return in economic growth and additional redevelopment.

Many of the most successful redevelopments involve public leadership through coordination of public and private stakeholders. These stakeholders include members of the business, development and banking sectors, along with representatives from the local planning and economic development agencies and community members. Convening partners early in the process – through an integrated design charrette as described in chapter 1, High-performance infrastructure, or another collaborative process – can lead to the application of redevelopment tools that make a project feasible. Tools can include legal agreements on the roles and responsibilities for

On the ground

City of Rockville, MD

Twinbrook Station

The Twinbrook Station Project in Rockville, Maryland, is transforming 26 acres of existing park and ride surface lots along the red line of the subway system into a 2.2 million square foot, mixed-use community with over 325,000 square feet of new Class-A commercial space. The project, which aims to create a transit-oriented destination, grew out of the Maryland National Capital Park and Planning Commission's lead in convening stakeholders. They brought together the Montgomery County Council and Government, area residents, local businesses owners, planners, architects and others. The resulting Twinbrook Charrette and Concept Plan envisions a pedestrian-friendly alternative to sprawl, encourages high-density, mixed-use development and fosters community and transit use.

In accordance with the principles of the Twinbrook Charrette, the Twinbrook Station Master Plan fully integrates the proposed mixed-use development into the surrounding retail corridor, office/service district and adjacent residential neighborhoods, unifying the entire area with a distinctive identity and sense of place. It connects a new urban street grid with shorter blocks, public amenities, and 50% green cover with a new public green that will anchor the development adjacent to the subway station. The site plan also situates buildings with the highest density – 8 to 14 stories – closest to the subway station, gradually transitioning to the lowest density buildings at the edges of the site. The station was the first project in the Washington, DC, area to be awarded Stage 2 LEED-ND Gold-level certification, underscoring the project's commitment to green building, as well as sustainable neighborhood site design.

Twinbrook Station aerial at beginning of redevelopment in February 2008 (above) A mixed-use employment project within the area as envisioned at project completion(left)

Find contact information and websites for this and all on the ground case studies in chapter 3 on page 109.

In Beaverton, Portland Community College worked with TriMet to integrate a satellite campus into the Willow Creek park and ride, increasing employment opportunities as well as educational and job training programs on a high capacity transit corridor.

brownfield clean up, funding mechanisms for resolving financing gaps, identified projects for design-build competitions and conditions for a development agreement.

Station areas – Land along existing and future high capacity transit corridors and park and rides provide a prime opportunity for public investment. These parcels are often publicly-owned and have additional capacity for density and a greater mix of uses. Local jurisdictions throughout the country have taken advantage of the opportunity to redevelop these sites into mixed-use employment projects with direct access to transit. The market is showing an increasing trend for office, high-tech, tech flex and institutional uses along transit lines that create mixed-use, employment-centered, high-density districts. Transit-oriented developments that incorporate employment give business access to the market place and residents access to jobs and amenities. Implementing a design that creates a destination in its own right spurs significant redevelopment. Redeveloping these areas for employment uses that are well-suited to more vertical development that can locate in transit corridors enables local jurisdictions to reserve larger employment and industrial areas for those business uses that need additional space.

Structured parking – As discussed in chapter 2, parking ratios and strategies should be analyzed. In employment and industrial areas, surface parking can limit the utility and profit generation of a site. Minimum parking standards in these areas are often too high to create efficient, sustainable employment areas. Too much parking inhibits the effect of transportation demand management strategies and direct links to transit. Furthermore, the cost of parking is extremely high. Reducing parking requirements helps businesses use land more efficiently and increases the potential for additional jobs through the expansion of business onsite.

Structured parking creates shared parking and reduces the footprint of each development project in an employment and industrial area, while meeting parking needs and requirements. Structured parking can be cost prohibitive on a project-by-project basis, but it creates a significant incentive for businesses to locate in a district or employment area. Local jurisdictions can prioritize parking structures as part of their transportation network, and use system development charges, general funds and tax increment financing to finance the development or cost gap between surface and structured parking.

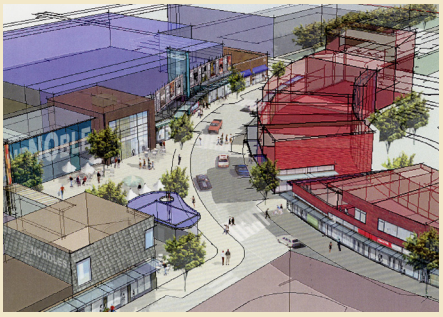
On the ground

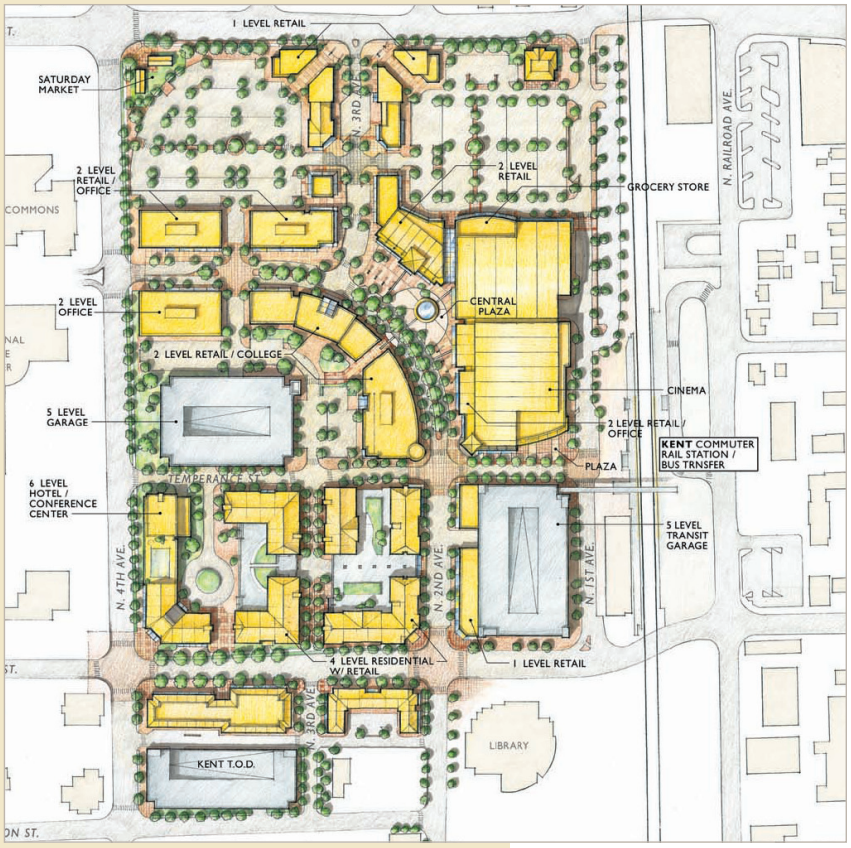
City of Kent, WA

Kent Station

The city of Kent made several targeted, strategic investments along a light rail line to create more than 500 jobs and develop a thriving, 470,000 square-foot retail, education, entertainment and residential development project called Kent Station. On the site of an old glue factory, the city envisioned building a transit-oriented development with high-employment capacity that could serve as an economic anchor and maintain a strong community feel. The city made two strategic investments. In 1999, the city contributed $4 million to Sound Transit, the price difference between a structured parking facility and a surface parking lot. The city then purchased 19.9 contiguous acres adjacent to the Sounder commuter rail station and parking garage. The $14 million purchase enabled the city to stimulate and control redevelopment of prime downtown property by selecting a developer that shared their vision. In 2004, the city council sold the property to Tarragon Development, who completed phase one of development in 2005.

The city also committed resources to the project by completing an environmental review process for the site, including an assessment of the mitigation required for redevelopment. With assistance from state and federal grants, the city invested $2.2 million in infrastructure improvements, including environmental cleanup and construction of the primary road leading to the development. Overall, the city is investing $17.3 million into the project, which will create more than 500 jobs and provide a vital and identifiable city center with homes, jobs, services and shopping for the greater Kent community. The long-term return on investment will come from the phased sale of land to the developer and a significant increase in tax revenues.





LEED-ND could work in redevelopments as well, such as abandoned brownfields, where the cost of cleaning up pollution is a barrier to reuse of the land. Getting a LEED-ND label could enable a brownfield development project to attract more financing.

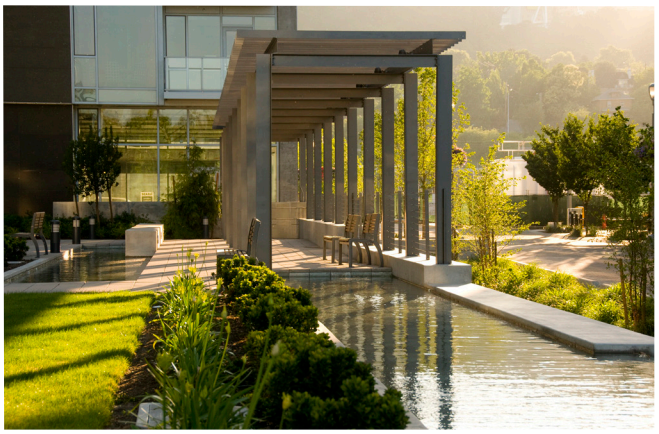
Elliot Allen,
Principal at
Criterion Planners

High-performance infrastructure – A significant number of redevelopment projects in employment and industrial areas throughout the country and abroad are investing in implementing high-performance infrastructure to attract employment growth. These investments can attract employers and green jobs, while addressing the growing need to respond to climate change. Sound infrastructure investments reduce long-term financial risk to businesses, which make employment areas with high-performance infrastructure extremely attractive. It can lead to local job growth and the return of business to unused and underutilized employment areas.

Brownfield redevelopment projects – Investment in a brownfield property by a local jurisdiction can sometimes be the only means to revitalizing the site and the surrounding community. Properties with unknown environmental conditions often deter developers and investors from developing these sites due to clean-up complications, risk and liability concerns and additional costs. Since most brownfield incentives and liability protection mechanisms are more available to public property owners, local governments can be integral to reinvestment in these sites.

Despite the expense associated with redeveloping brownfields, these properties are almost always located in areas with existing infrastructure, saving the government and businesses additional costs. Redeveloped brownfield sites generate significant tax returns by increasing the value of the redeveloped and neighboring properties.

Oregon Department of Environmental Quality provides numerous tools to help manage brownfield cleanup and liability. Resources include current information on site clean-up and state, federal, and third-party liability; grant assistance to examine the extent of site contamination; funds for clean-up; and project managers trained to reach "No Further Action" decisions at lowest cost. The successful cleanup of many contaminated sites has been contingent on close collaboration with DEQ, including the use of prospective purchaser agreements, described in the following section on legal agreements.



On the ground

City of Troutdale

Reynolds industrial site

The 350-acre Reynolds industrial site is being transformed from an EPA Superfund site into a thriving industrial area through significant leadership from the Port of Portland. Located between the Columbia and Sandy rivers, the area was the site of the Reynolds Metals Inc. aluminum plant. Fifty years of aluminum manufacturing created significant contamination of the site, leading EPA to list it as a Superfund in 1994. The plant operated until 2002 and was demolished between 2003 and 2006. Reynolds completed site clean-up to allow for industrial development.

In 2007, the Port of Portland purchased the site for $17 million. To make the site ready for industrial development, the Port invested $1.2 million in planning and another $14 million in local infrastructure improvements. The Port continues to operate cleanup, on behalf of Reynolds, at an expected cost of $1.2 million. The Port also leveraged approximately $35 million in state and federal public monies to secure transportation and trail improvements to the site and surrounding area. To attract future business development, the Port applied to the state for enterprise zone status, offering tax abatements to businesses that locate on the site.

The effort paid off in less than a year when FedEx Ground purchased 78 acres and began construction of a 441,000 square foot regional freight distribution hub. Initial employment on the FedEx site is expected to exceed 750 jobs and is projected to grow to more than 950 employees. Overall, full build out of the entire Reynolds industrial site is projected to bring in $46 million in state and local revenue per year and 3,500 new jobs, with $141 million in personal income and $218 million in local purchases per year.

As a member of the East County Community, the Port is working with our partners to attract quality businesses and jobs, solve transportation issues and support the Columbia-Cascade River District.

Port of Portland
Troutdale Reynolds Industrial Park
(Portland, OR: Port of Portland, 2009)

With limited resources, local jurisdictions can also encourage redevelopment and reuse by taking steps to help prevent future contamination. Code changes that eliminate toxic materials from building developments and establish sustainable landscaping standards (as outlined in chapter 2, 21st century design) can prevent additional brownfield sites. This increases the efficacy of existing investments and reduces barriers to future investments.

Land acquisition and banking

Public land acquisition and land banking are mechanisms that enable jurisdictions to make strategic public investments and initiate redevelopment of underutilitized, vacant or brownfield properties. Land acquisition gives cities the leverage to guide development in accordance with their local aspirations, either by developing the property themselves or by selling it to developers who share the city's vision for redevelopment through a development agreement. Land acquisition can take many forms. Some cities in the region have been directly involved in land acquisition, as well as land assembly – the aggregation of several properties from private property owners – for immediate redevelopment. These activities can be financed through general funds, urban renewal funds or a separate fund generated from a portion of existing fees or revenue streams.

A more formal way of approaching land acquisition is land banking, or the holding and management of properties for strategic investment over time. While traditionally used as a mechanism to redevelop blighted residential areas, land banking is increasingly being used by cities across the country as a means to attain broad-reaching and long-term planning, economic development and brownfield redevelopment goals. Land banking can be a targeted mechanism for redeveloping commercial and industrial property. By acquiring and aggregating land, and investing in site-readiness activities such as brownfield assessment, cities can create opportunities for redevelopment and future job growth. They can invest in key areas, assemble land for larger lots and prepare shovel-ready sites to attract business.

Traditional land banking usually entails acquiring land through the tax foreclosure process and sometimes eminent domain. Land may also be acquired through voluntary donations and transfers, assemblage of already publicly owned land and purchase or lease on the open market.

When establishing a land bank, cities and counties should consider the following best practices:

- Clearly state the function of the land banking initiative, whether for residential blight redevelopment, commercial and industrial economic development and/or brownfield cleanup to eliminate conflicts from competing land uses.
- Establish a land bank or an independent entity with clear control over the land banking process. The land bank may be administered by a government agency, but the creation of a nonprofit legal entity separate from city authority may provide more flexibility and leverage in redevelopment opportunities. Successful land banks initiated by the City of Atlanta, the City of Louisville, and Genesee County have

On the ground

City of Cleveland, OH

Industrial-commercial land bank

As part of their Brownfield Redevelopment Program, the City of Cleveland's industrial-commercial land bank was established in 2005 as a proactive approach to reusing properties with serious real estate obstacles, such as environmental contamination and/or economic hardships. The land bank provides the opportunity for the city to strategically assemble properties to attract businesses and create long-term economic and community investments. The city evaluates specific real estate characteristics to select properties for the land bank. Once identified, the city aggressively pursues purchase and redevelopment activities including assessments, acquisition, demolition and environmental cleanup. The results are ready-to-build land for expanding or new businesses. Due to the limited number of sales, the city is exploring ways to improve the program by more actively marketing the sites, using request for developments and assessing their residential land bank to see if consolidation of sites can result in large lots for commercial and industrial redevelopment.

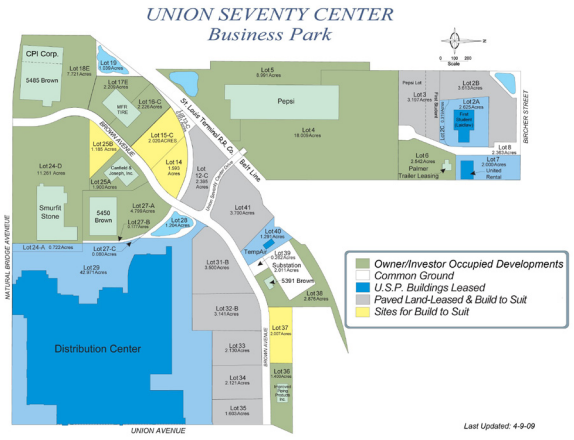
Simulations of low-rise office conversions with redevelopment and infill of adjacent buildings and streets located in the Upper Rock District in Rockville, Maryland.

independent nonprofit status, allowing them to move through some legal and real estate issues more easily and the ability to access funding from both public agencies and foundations – all the while staying in close coordination with public agencies.

- Establish an integrated management information system to find properties and streamline title, acquisition and disposition issues. A GIS database with data from various sources including Metro's Regional Land Inventory System can help identify properties and ownership, along with other pertinent information.
- Establish the authority to determine the terms and conditions for sale or other property disposition and the ability to set prices that may be below market rate.
- Use financing options that are flexible and assembled from a variety of sources. Most traditional land banks are funded through taxes assessed on the foreclosure process. Other sources include general funds, community development block grants and other state and federal funds.
- Practice close departmental coordination between legal, planning and economic development departments.
- Expedite and streamline foreclosure and/or eminent domain processes. The most successful land banks were made possible through legislation that allows eminent domain of properties that are unoccupied, uninhabitable, two years or more tax delinquent, unfit for human habitation and for which rehabilitation costs exceed market value.
- Integrate a brownfield redevelopment plan to maximize investments and revitalize existing communities.

Site-readiness analysis

Site-readiness analysis assesses the existing conditions of a property and identifies preparatory steps needed to enable its redevelopment. It removes uncertainty and risk, attracting businesses to develop in underutilized employment and industrial areas. Development barriers can include the lack of existing infrastructure or on-site contamination, existing liens and easements, topographical constraints and the presence of wetlands, endangered species and historical artifacts. While these barriers take time to overcome, the timeframe to attract developers is relatively short, as the speed to market is becoming increasingly important to companies' decisions to site facilities, especially for large scale, globally competitive companies.



Union 70 Center, St. Louis, Missouri

On the ground

Genesee County, MI

Genesee County Land Bank

Genesee County uses a creative land banking approach that integrates a brownfield redevelopment plan and a unique financing structure to redevelop underutilized land. After Michigan passed the nation's most progressive land banking law in 2003, Genesee County secured funding from the C.S. Mott Foundation and engaged The Brookings Institution, the Urban Land Institute and other partners to develop the Genesee County Land Bank, which now owns over 7,000 properties. Holding properties gives the land bank the ability to strategically plan for their reuse, rather than count on speculators and landowners.

The brownfield redevelopment plan uses a unique tax-increment financing strategy to clean up brownfield sites. The strategy pools taxes from the entire regional inventory of land to clean up tax-foreclosed property, allowing the land bank to use a diverse, stable real estate market, and taxes captured from more valuable properties to support improvements for all properties. This allows the county to target cleanup areas and makes cleanup of harder to redevelop areas and highly contaminated sites financially feasible. The success of the land bank led to the creation of the Genesee Institute in 2004, which initiates research and provides planning assistance within the community and technical assistance to other jurisdictions to develop their own land bank.

The Land Bank Center, in downtown Flint, Michigan, was vacant for almost thirty years before the Genesee County Land Bank took ownership. In November 2005, renovations were completed and the building now houses ground floor retail, office space, including the Land Bank and loft style apartments.

An abandoned lot next to Hoffman's Deco Deli & Café on Garland Street is being developed into an urban garden. An abandoned house on the lot, which is owned by the Genesee County Land Bank, will be developed into a UM-Flint Learning Center with a residential component unrelated to the University ... The property will use geothermal energy to heat and cool the house and collect solar radiation in an auxiliary building.

"Abandoned Lot to be Turned into Urban Garden," The Michigan Times accessed September 4, 2010 www.thelandbank.org/downloads/abandon_lot_to_be_turned_into_garden_mi_times_1.pdf

Site-readiness analysis measures the barriers to development for a specific site. This analysis illuminates opportunities to remove barriers and eases the burden of investigation and related financial costs for private businesses and developers. Site-readiness analysis can also be useful in public land assembly initiatives, helping inform existing property owners of the barriers to redevelopment and the possible benefits of selling the property to the local public agency.

A 45-acre light industrial lot in Forest Grove and a 113-acre lot certified for warehouse/ distribution, general manufacturing and heavy industrial uses, within the Rivergate Industrial District in North Portland, both utilized the state's Industrial Site Certification and Site-readiness program to make employment and industrial properties shovel-ready and spur job growth.

Depending on the context of the site, whether a large industrial area or a smaller employment site, site-readiness analysis will calculate a number of different development factors. The state's Industrial Site Certification and Site-readiness programs help municipalities complete site analysis for industrial sites 25 acres or larger. Although the number of large industrial areas in the region is limited, many of the same site-readiness criteria can be used to assess smaller parcels.

Site-readiness analysis can measure for the presence of:

- soil contamination through environmental site assessment
- wetlands through a local wetland inventory
- endangered plant and animal species through the Army Corps of Engineers 404 permits
- archeological artifacts and historic buildings through the State Historic Preservation Office and local tribes
- water supply and capacity including sewer capacity
- power supply and capacity including peak-load capacity and distance to the power grid and substations
- regional air quality
- transportation related issues including on-site road network, connections to major highways and interstate freeways, airports, and ports.

Several cities across the region have used similar analyses to present and package information for their economic development activities. To encourage development, these cities prepare site reports to educate developers on the existing conditions of a site and relevant findings from site-readiness analyses. Beyond the readiness factors mentioned above, site reports may also give an overview of the regulatory requirements for developing a particular parcel of land, including but not limited to the processes for public meetings, property line adjustments, consolidation of parcels, architectural review, building permits and related fees, fire and safety requirements. The report may also detail information on issues related to public utility connection, necessary street improvements and any other site-specific factors. Site reports create a transparent development process and ease regulatory barriers by making information easily accessible to potential developers.

By conducting and reviewing these analyses, local jurisdictions can identify specific steps to ease the burden of development. Understanding barriers associated with the development process illuminates potential amendments to local permitting and development application processes. This process also helps align public investments in infrastructure and economic development projects. Understanding these opportunities and barriers can help local jurisdictions prioritize properties to acquire or public-private projects to actively pursue.

On the ground

City of The Dalles

Northwest Aluminum Company

Northwest Aluminum Company is the current owner of a 280-acre site in The Dalles that once operated an aluminum smelter facility. The site is located along the Columbia River, 75 miles east of Portland, and has high voltage electricity service and rail, interstate highway, airport and deep-water port access. To attract new jobs to the community and the Pacific Northwest, the owner initiated site-readiness activities and involvement in the Oregon Certified Industrial Lands program, administered by Business Oregon. Certification was deemed a critical first step to help coordinate and align redevelopment interests. The process engaged all stakeholders, including the former property owner, the Port of The Dalles, the City of The Dalles, Business Oregon and the Oregon Department of Environmental Quality.

The industrial site was first developed in the mid-1950s to take advantage of hydropower electricity resources. It was listed as a Superfund site on the Environmental Protection Agency's National Priorities List in 1986, and after significant cleanup, delisted in 1996. Though most of the property was restored as a result of the federal Superfund cleanup process, the owner was still responsible for taking down the 50-year old smelter building complex, and thus, coordinated restoration efforts and the various stakeholders involved in the project.

Through this process, the owner identified a resource recycling market opportunity that significantly reduced costs and waste. To make the site shovel ready, 29 buildings – totaling over 3 million square feet – were recycled, producing over 65,000 tons of carbon, aluminum, steel, copper, construction materials and used equipment for reuse and avoiding their transport to the landfill. A "clean fill" determination of reusable concrete from DEQ also saved over $2 million in disposal and fill costs and kept significant amounts of solid waste out of local landfills. The owner is obtaining a No Further Action determination from DEQ. The site's size, location and access to considerable infrastructure inspired the EPA, representatives of the German government and the architecture firm of Latz and Partner to initiate a design charrette, which will engage all key federal, state and local stakeholders.

Aluminum slabs recovered from the smelting pots at the former aluminum smelter facility

Legal agreements and brownfield assessments

Legal agreements can reduce risk and liability to the prospective purchaser of a property, whether public or private, and can ensure that redevelopments move forward by clearly defining the roles and financial responsibilities of each party involved in the redevelopment process. Developers are often hesitant to purchase sites for redevelopment because of the risk of finding out after purchase that redevelopment measures will be extremely costly. This is particularly relevant for potential brownfield sites or those where previous uses might present environmental contamination issues, as purchasers may be liable for clean-up based on federal and state law. The following agreements reduce liability and risk to prospective purchasers.

Right of first refusal agreement – A right of first refusal agreement is a contract between a property owner and a potential buyer. The agreement gives the buyer, the holder of the option, the right to purchase the property according to specified terms in the agreement. The property owner cannot enter into a transaction of the property with a third party when a right of first refusal agreement is in place. If the holder of the option withdraws from the agreement, only then does the property become available for purchase by a third party. These type of agreements are sometimes known as a hold-on-sale agreement because the transaction of the property is in process but the transfer of legal title is on hold until the conditions of the contract are met. These agreements give prospective purchasers time, as allocated in the agreement, to perform proper due diligence to assess the needs of redeveloping the site.

Due diligence assessments typically consist of an environmental site assessment that determines, according to federal standards, the site's existing environmental conditions. These assessments can measure the full financial, environmental and social costs of various redevelopment opportunities, such as the feasibility of implementing high-performance infrastructure systems and 21st century design concepts, as well as any environmental clean-up necessary. The process of due diligence, sometimes lasting a full year, gives the buyer and seller flexibility to work with the local municipality to address any zoning changes that may be needed, to work through permitting issues and to find or create financial incentives to complete redevelopment.

Oregon law regarding contaminated properties:
Under Oregon law, the purchaser of property can become liable for cleaning up on-site contamination if he or she knew or should have known that contamination exists on the site. A purchaser may also become liable for contamination when a pre-acquisition environmental assessment reveals contamination. Likewise, even if purchaser had no way of knowing of contamination, they may still be liable for clean-up if they do not conduct an environmental assessment prior to purchase.

On the ground

City of St. Louis, MO

Union Seventy Center

The Union Seventy Center in St. Louis is one of the biggest multi-story industrial redevelopments in the United States and serves as a model for close public-private collaboration and adequate due diligence in adapting obsolete manufacturing plants to new industrial use. On 160 acres of land, the large 2.2 million square foot General Motors assembly plant had become obsolete by the late 1980s, as it was ill-suited for newer auto manufacturing equipment. When General Motor's decided to sell the plant, the city was faced with a complex challenge of how to redevelop the property.

The developer, Clark Properties, worked with GM and the city from step one of the process, starting with negotiating a considerable amount of time for adequate site due diligence. To do so, Clark Properties negotiated with GM to hold the sale of the property for one year. In that time Clark spent over $400,000 assessing what exactly could be done with the property. The city actively worked with Clark Properties to go over the development plans, the permitting process and the development changes necessary to expedite permitting. Clark Properties' careful assessments led to the development of an urban street grid, transition from single tenant to multi-tenant use, and the decision to convert almost 80 acres of unnecessary parking to industrial build-to-suit.

To make the project financially feasible, the city also created an enterprise zone and granted Clark a generous real estate tax abatement, helping to keep tenants' costs low. Now almost 1.4 million square feet of multi-story rehabbed space is occupied primarily with bulk warehouse tenants. The floor plates at Union Seventy Center's plant are tiered like a wedding cake, and tenants essentially rent slices of the cake, with larger users usually taking space on two or all three stories. The successful redevelopment has served as a major economic catalyst for the city, bringing in thousands of jobs and spurring further development around the area.

This is especially important in large or difficult redevelopments, such as brownfield developments. In the case of brownfield redevelopments, hold-on-sale agreements reduce risk by allowing time for full discovery of the level of contamination and the remediation efforts that will be required. These full discovery assessments can then be factored into final sale negotiations so that the level of remediation and the responsibilities of each party are clearly and adequately defined at the point of purchase (often through a Prospective Purchasers Agreement with Oregon's Department of Environmental Quality). This reduces the risk and liability of the prospective purchaser as well as the seller.

Lease-purchase and sale-purchase agreements – Lease-purchase and sale-purchase agreements between the purchaser and seller of a property can remove uncertainty and reduce risks to the purchaser. These agreements stipulate exactly what measures must be taken to sell the property and redevelop the land. They reduce uncertainty by defining the parties logistically and financially responsible for each redevelopment measure and hold the parties accountable in order to complete the sale. In the case of brownfield redevelopments, these agreements allow the prospective purchaser to withhold purchase – often leasing the property instead – until full or partial remediation measures are completed and a No Further Action letter (NFA) can be issued.

NFA letters are issued by the Oregon Department of Environmental Quality and give official documentation that the property has been cleaned up to DEQ's satisfaction based on current use or specific, outlined criteria. An NFA determination may include conditions such as long-term monitoring requirements or land-use restrictions. An NFA does not release parties outright from liability in clean-up, but provides a practical approach for addressing contamination and are often needed in order to garner financing for a project. To obtain an NFA, either the property owner or the buyer conducts clean-up. The agreement will outline specific instructions for payment of costs for completion of clean-up according to a DEQ-approved clean-up plan. Through a sale-purchase agreement, the buyer and seller may agree to set aside a portion of the sale price in an escrow account in order to use equity from the sale to cover clean-up costs. Remaining funds after clean-up are generally returned to the seller after completion of the work.

On the ground

City of Eugene

SeQuential Biofuels

Close public-private collaboration and legal agreements led to the successful redevelopment of a crime-ridden brownfield site into an eco-friendly gas station-site in the City of Eugene. SeQuential Biofuels, a biofuel service company, expressed interest in developing the station on a 0.7-acre brownfield property. The property once operated as a filling station but transferred to Lane County's ownership after foreclosure and became a magnet for criminal activity and illegal dumping. In response to the county's hesitancy to take on the perceived challenges of coordinating the clean-up work, the Oregon Department of Environmental Quality (DEQ) worked with Lane County to formulate an intergovernmental agreement. The agreement formally detailed the roles and responsibilities of the county and state in the site's redevelopment.

Under the agreement, DEQ agreed to provide staff to oversee the remediation work and used the state's orphan site program contractors to complete the clean-up activities. Lane County, in turn, directed the removal of over 400 tires, 15 drums of waste, hundreds of needles and other surface debris from the property. After removal of the debris, SeQuential signed a lease-purchase agreement with Lane County, leasing the property under the condition that ownership would be transferred to SeQuential at the end of the remediation monitoring period. DEQ then signed a prospective purchaser agreement with SeQuential, detailing roles and responsibilities through project completion.

The coordinated agreements also detailed further redevelopment work on the site beyond remediation including determining the location and design of building; installation of a new underground storage tank system, dispenser islands, and bioswales; and consideration of entrance, exits, traffic-flow patterns and utility lines. These elements were closely coordinated with the Lane County project team, the SeQuential project team and contractor, DEQ and neighboring property owners. Using an EPA brownfield cleanup grant, a $1.2 million low-interest, favorable-term redevelopment loan from the Oregon Department of Energy's Sustainable Energy Loan Program and $250,000 in business energy tax credits helped make the energy efficiency and alternative fuel components of the project possible. Today, the formerly blighted and tax-delinquent site now generates $4,000 in annual property tax revenues, and the project has created ten local jobs in the green sector.

The project shows that innovative, safe and sustainable uses for old gas stations may be their redeployment as "fueling stations of the future," and that creative financial packages are important to the success of a project.

"Lane County Sequential Biofuels Project," *Pheonix Awards: 2007 Special Recognition for Energy Innovation,"* accessed September 4, 2010 www.phoenixawards.org/fact-sheets/2007_SeQuential_Biofuels_Project.pdf

Prospective purchaser agreement – A prospective purchaser agreement (PPA) supports potential buyers of contaminated land. A PPA is an agreement between the buyer and the Oregon Department of Environmental Quality that defines and limits the buyer's potential liability for environmental clean-up of the property. A PPA includes a DEQ-approved clean-up plan and generally concludes with the property receiving a No Further Action letter. This reduces the risk for both buyer and investors in making redevelopment possible and often makes financing easier to obtain.

The PPA provides the buyer with a release from liability to the state. In return, the buyer works with an experienced environmental attorney to negotiate the performance of certain actions including a clean-up plan and other redevelopment actions, with the oversight of DEQ. PPAs address various contamination issues such as on-site soil contamination, local groundwater issues and indoor air monitoring and risk concerns. PPAs can outline the amount of remediation necessary for each contamination issue and can help buyers and sellers decide who will pay for and complete clean-up of the property. Negotiation of the sale and purchase of the property are done through other lease-purchase or sale-purchase agreements, but the responsibilities and possible costs outlined to be paid by the buyer in the prospective purchaser agreement are usually factored into the sale.

To provide liability protection, a PPA must be completed before the purchaser closes on the property. DEQ will enter into a PPA with a prospective buyer if the agreement will result in a substantial public benefit, such as substantial funding towards clean-up, clean-up actions or productive reuse of vacant property. To qualify, a purchaser of the property cannot be responsible for its contamination and their proposed use for the property cannot make contamination worse or interfere with necessary clean-up.

Intergovernmental agreements – Because redevelopment projects can be incredibly complex and often require more resources than traditional developments, cooperation between various levels of government is essential. Negotiating intergovernmental agreements can reduce barriers to redevelopment. The process can identify barriers, assess coordinated actions to move projects forward, pool funding resources and assign redevelopment responsibilities to the government agencies involved.

Prospective purchaser agreements helped lead to several successful brownfield redevelopment projects in the region, including:

- the Baer site redevelopment for the Marsee Baking facility in North Portland
- the revitalization of a former gas station to the Ava Roasteria Coffeehouse in Beaverton
- the acquisition of the former Riedel North Portland Yard by Triangle Park, LLC for marine-related and manufacturing employment uses.

On the ground

City of Bellingham, WA

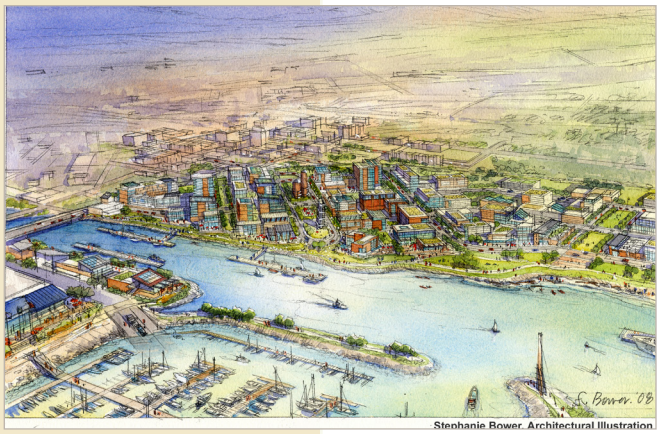
Waterfront redevelopment

A plan for the successful remediation of 137 acres of brownfield property on the waterfront of Bellingham, Washington, was made possible through the Port of Bellingham and City of Bellingham's strong leadership role in redevelopment efforts. When Georgia Pacific decided to move its pulp and paper mill operation, the community was left with the prospect of a vacant, underutilized brownfield site along the city waterfront. The Port and city appointed a community advisory committee to explore redevelopment opportunities and define the roles and responsibilities of the stakeholders in the future of the project. The adoption of an intergovernmental agreement between the Port and the city committed the city to construct public infrastructure and create a regulatory framework. The Port committed to clean-up its property, build marine infrastructure and provide the city with land for parks, public space and rights of way.

Port of Bellingham today

After in-depth environmental due diligence, the Port worked with Georgia Pacific to craft a purchase and sale agreement and an environmental clean-up cost-cap agreement and insurance policy. The purchase and sale agreement aligned different environmental and clean-up objectives of Georgia Pacific and the Port. The Port secured funding through state and federal grants and the city plans to use LIFT, a local infrastructure financing tool that issues bonds paid back through tax-increment financing to fund a portion of the infrastructure. At full build-out the redevelopment project is estimated to generate approximately $68 million from Port land sales and leases, and another $154,000 per year in state and local tax revenue.

Port of Bellingham, 20 year buildout



Port of Bellingham, full buildout

Redevelopment and reuse

The region has an extraordinary opportunity to identify the most contaminated sites and promote their restoration as community assets. Brownfield cleanup provides significant opportunities to create jobs in the region by developing industrial and mixed-use centers, as well as affordable housing, parks or open spaces.

David Bragdon,
former Metro Council
President

The success of many large redevelopments, including brownfield developments, can be attributed to intergovernmental agreements between state and local agencies that established the public investments needed to move the project forward. Through intergovernmental agreements, agencies commit to roles and responsibilities of the redevelopment process. Often this means one agency provides the public infrastructure necessary in exchange for another agency completing soil contamination clean-up, building infrastructure in another area of the redevelopment or providing services or land at no cost to the other agencies involved. Additionally, intergovernmental agreements may create a mutual economic development zone to pool resources with a shared tax base. This allows all entities to share in the costs as well as the revenues associated with improvements and/or services needed to enable business expansion and growth in the area. Sharing liability among all the contracting government agencies reduces the risk to each individual agency.

Successful intergovernmental agreements rely on:

- a shared vision, with well-defined goals
- effective leadership
- cooperation and honesty
- well-defined roles and responsibilities
- commitment to reach the agreed upon goals.

Keep in mind

Local management Local jurisdictions without significant resources can use existing funding streams, economic development programs and planning efforts to spur redevelopment and reuse investments. Actions include: integrating high-performance infrastructure and parking structures into capital improvement plans; prioritizing concept plans, code amendments and development processes in redevelopment areas; and providing site-readiness analyses and technical assistance for employment redevelopment projects.

Most jurisdictions will also find it feasible to invest in the temporary acquisition of a few strategic redevelopment sites, particularly if urban renewal, tax increment financing funds are available. Temporary acquisition of a site enables a public entity to manage environmental clean-up, assemble a larger parcel or negotiate a development agreement to offer more flexibility on-site. The resale of the property pays back the public investment, at times with a margin of profit, while generating additional revenues through redevelopment and new job growth. Land banking provides these same advantages, but takes additional, long-term resources to establish an on-going program.

Risk management Although public entities are not immune to risk, they are designed to make long-term investments that have social, economic and environmental benefits. This structure can absorb more risk than private development, which can have a more direct connection to personal assets and well-being and, given the volatility of the employment sector, often needs a shorter return on investment. Thus, there is enormous benefit in forging public-private partnerships on redevelopment projects. For brownfield properties there are more liability protections given to local governments, particularly if they acquire delinquent properties through a process such as tax foreclosure. More federal and state grant programs exist to assist public and nonprofit organizations in financing brownfield redevelopment. In any redevelopment project, it is integral to work closely and collaboratively with the Oregon Department of Environmental Quality to follow the appropriate due diligence process and manage liability accordingly.

Employment market By investing in and supporting business growth on redevelopment sites, local jurisdictions can increase their overall capacity for job growth. Market trends show an increasing interest in infill and redevelopment opportunities for infrastructure benefits and access to people and markets. This is an enormous advantage for redevelopment sites as they tend to be located close-in and along major transportation corridors. Communities can take advantage of previous infrastructure investments by reinvesting in these sites and using the economic growth to fund other investments while reducing the need to develop greenfields. With limited resources, it is important for local jurisdictions to work with the business sector to identify and invest in the most marketable redevelopment sites first.

On the ground

City of Victoria, B.C.

The decision to award Dockside Green with the Grand SAM Award was based on a variety of the project's merits including the overall design and construction, use of local products and services, relative affordability of the project, integration of the project into its setting, architectural character, environmental considerations, and common area design and amenities.

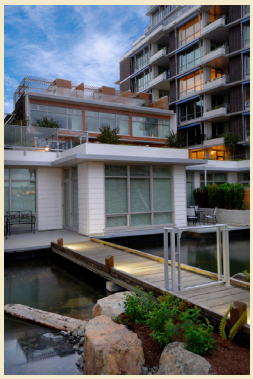
"Victoria's Dockside Green wins the 2009 CHBA American Standard Grand SAM Award," Vancity Media Relations, accessed September 4, 2010 www.docksidegreen.com/images/sam%20award%20release%20-%20mar%208-10.pdf

Dockside Green

The Dockside Green Project is a planned 15-acre LEED Platinum and LEED-ND mixed-use employment redevelopment project. The light industrial, commercial and residential development is located on a former brownfield site near Victoria. To reach the highest level of sustainable site design, the city initiated a unique process for redevelopment, relying on a financial feasibility analysis, innovative design guidelines and a master developer agreement devoted to high-performance infrastructure and 21st century design concepts.

After acquiring the brownfield site in 1989, the city was unable to sell it to developers for twelve years because there was little information on the level of soil contamination. The city eventually commissioned a financial feasibility analysis to investigate the environmental contamination, remediation options and approaches, geotechnical restraints, market demand and redevelopment options. Based on the assessment, the city created a design concept with innovative guidelines that envision a new urbanist development, encouraging activity and employment, a mix of land uses, high density, a good transition with nearby uses, innovative design and sustainability, public open space and amenities and a triple bottom line approach that achieves economic, environmental and social goals.

Although the overall project is high in density, the innovative design guidelines call for moderate density throughout much of the site, with development meeting property lot lines and a few 10-story buildings that anchor other buildings. Placing taller buildings beside a neighboring light industrial area and smaller buildings beside neighboring residential development creates appropriate transitions for the surrounding areas. Structured parking is strongly encouraged for the commercial and residential areas, along with reduced parking ratios for surface area parking in industrial areas.



To find a developer to match the design concept and guidelines, the city commissioned a design and build competition through a request for proposals. The winning team used an integrated design process to gather a team of relevant stakeholders. The team applied a systems approach to infrastructure systems, building and site designs, and created a development plan that exceeded the city's expectations.

The city entered into a master developer agreement with the winning developer, which finalized sale of the property and set contractual obligations for implementing the winning design proposal, the various phases of development and performance measurements. Under the master developer agreement, the developer committed to the strongest adherence to sustainability, using a triple bottom line approach to account for economic, environmental and social impacts of the development. Reciprocally, the city committed to working with the developer throughout the phasing of the project, assuring fast-track responses to permitting and rezoning applications.

The developer installed on-site utilities, including an on-site sewage treatment plant and a biomass cogeneration facility connected to a district energy system that turns waste wood into hot water and heating for the whole development. The developer also agreed to a transportation demand management plan that includes a car-sharing program, a mini-transit bus, bicycle racks and showers, a pedestrian promenade and connections to the nearby bicycle-pedestrian trail system. To monitor the progress of development, the developer will provide performance reports to the city. The city developed a set of 48 performance indicators that city staff and a partnering local university will use to monitor the performance of the development's economic, environmental and social goals.

An innovative approach to development is helping us to deliver not only top class homes and business spaces but also to build community.

-- Gordon Smith, Vancity project lead, Dockside Green

"Victoria's Dockside Green wins the 2009 CHBA American Standard Grand SAM Award," Vancity Media Relations, accessed September 4, 2010 www.docksidegreen.com/images/sam%20award%20release%20-%20mar%208-10.pdf

Putting it together

Local governments can spur redevelopment of employment and industrial sites through their leadership and investments. By prioritizing investments in redevelopment areas with existing infrastructure, services and populations, local governments can use limited resources more efficiently and get a higher return on their investments while reducing environmental impacts. Strategically investing in specific redevelopment projects that would not otherwise come to fruition can spur additional economic activity resulting in more jobs, income and property taxes. Recycling employment land supports community aspirations and regional goals for environmental, economic and community sustainability.

Tips for implementation

- Coordinate stakeholders for redevelopment projects; engage business, development and banking sectors, along with representatives from the local planning and economic development agencies and community members.
- Use charrettes or other engagement tools to build a vision, commitment and resources for a project.
- Use intergovernmental agreements to share the risks, resources and responsibilities to make a complex project successful. Clearly define goals, roles and responsibilities.
- Reduce risks and attract businesses by conducting site-readiness analyses and/or brownfield assessments.
- Address barriers to redevelopment as identified in site-readiness analyses.
- Work with the State's Industrial Site Certification and Site-readiness programs for redeveloping large employment and industrial sites, .
- Identify underperforming office parks, commercial strip malls, corporate and institutional campuses and environmentally contaminated properties that present key investment opportunities, particularly along major transit corridors.
- Invest in parking structures to free land for more employment uses including business expansion opportunities.
- Prioritize investments in brownfield sites (assessment, clean-up and/or redevelopment) to reuse prime employment land.
- Consider acquisition of land or temporary/intermediary ownership to:
  - take advantage of liability and financial tools, including brownfield clean-up grants, that are only available to public owners
  - ensure desired outcomes are achieved on key properties through a developer or sale agreement
  - invest in projects with long-term returns too costly or risky for a single developer.
- Consider establishing an independent entity with clearly defined goals and flexible financing options to land bank and assemble larger lots and to meet economic development and brownfield redevelopment goals.
- Work closely with the Oregon Department of Environmental Quality on brownfield sites to manage liability and gain technical and financial assistance.

Resources

For more information on the case studies, contact or visit:

Kent Station
LMN Architects
801 Second Ave., Suite 501
Seattle, WA 98104
206-682-3460
www.lmnarchitects.com
www.kentstation.com

Troutdale Reynolds Industrial Site
Port of Portland
7200 NE Airport Way
Portland, OR 97218
503-415-6000
www.portofportland.com/Reynolds_Home.aspx

Twinbrook Commons
www.twinbrookstation.com

City of Cleveland Industrial Land Bank
City of Cleveland Economic Development Department
601 Lakeside Ave., Room 210
Cleveland, OH 44114
216-664-3611
www.city.cleveland.oh.us/portal/page/portal/CityofCleveland/Home/Government/CityAgencies/EconomicDevelopment/Brownfield/Industrial-Commercial-Landbank

Genesee County Land Bank
810-257-3088
www.thelandbank.org

Northwest Aluminum industrial site
Galen May
Environmental Manager (retired)
503-993-4941
gmay@gnwaluminum.com
Ater Wynne LLP
Doug MacCourt, Legal Counsel
503-226-8672
dcm@aterywynne.com

Union Seventy Center
3901 Union Blvd.
St. Louis, MO 63115
314-389-8822
www.clark-properties.com

Resources

SeQuential Biofuels
541-515-9711
www.sqbiofuels.com

Oregon Department of Environmental Quality
750 Front St. NE
Salem, OR 97301
503-378-5044
www.deq.state.or.us/about/history/brownfields.htm

Port of Bellingham Waterfront Redevelopment
Port of Bellingham
1801 Roeder Ave.
Bellingham, WA 98225
360-676-2500
www.portofbellingham.com/content/ArchivesItem_147_1163_v

Dockside Green
The City of Victoria
Department of Sustainability
#1 Centennial Square
Victoria, BC V8W 1P6
250-361-0511
www.victoria.ca/cityhall/currentprojects_dockside.shtml
www.docksidegreen.com

For more information on brownfield assessment funds and development agreements:

Metro's Community Investment Toolkit
Volume 1: Financial Incentives
Volume 2: Innovative Design and Development Codes
Metro Planning Department
600 NE Grand Ave.
Portland, OR 97232
503-797-1839
www.oregonmetro.gov/communityinvestment

INDICES

On the ground

Index by development type

Eco-efficient employment case studies

This index organizes the on-the-ground examples, highlighted in this volume of the toolkit, by predominant type of development or employment use as highlighted in the case studies. However, many of the case studies and tools are relevant for multiple employment uses.

On the ground

Index by development type

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Index by development type

On the ground

Index by tool

Eco-efficient employment case studies

This index links on-the-ground case studies to the tools included in this volume of the toolkit. Most case studies use multiple tools.

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About Metro

Clean air and clean water do not stop at city limits or county lines. Neither does the need for jobs, a thriving economy and sustainable transportation and living choices for people and businesses in the region. Voters have asked Metro to help with the challenges and opportunities that affect the 25 cities and three counties in the Portland metropolitan area.

A regional approach simply makes sense when it comes to making decisions about how the region grows. Metro works with communities to support a resilient economy, keep nature close by and respond to a changing climate. Together, we're making a great place, now and for generations to come.

Stay in touch with news, stories and things to do.

www.oregonmetro.gov/**connect**

Metro

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