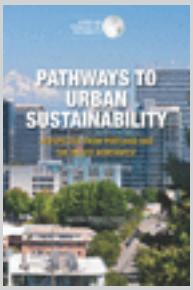


# Pathways to Urban Sustainability: Perspective from Portland and the Pacific Northwest: Summary of a Workshop

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Dominic A. Brose, Rapporteur; Committee on Regional Approaches to Urban Sustainability: A Focus on Portland; Science and Technology for Sustainability Program; Policy and Global Affairs; National Research Council

# PATHWAYS TO URBAN SUSTAINABILITY

## PERSPECTIVE FROM PORTLAND AND THE PACIFIC NORTHWEST

Summary of a Workshop

Dominic A. Brose, *Rapporteur*

Committee on Regional Approaches to Urban Sustainability:
A Focus on Portland

Science and Technology for Sustainability Program

Policy and Global Affairs

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# Preface and Acknowledgments

For more than 40 years, the Portland Metropolitan Region has been a national leader in urban policies and investments intended to revitalize the central city and adjacent neighborhoods, preserve the environment, improve equity, and make the city more economically competitive and livable. Portland has been both emulated as path breaking and discounted as overly idiosyncratic. Among the elements contributing to Portland's success have been strong public-private partnerships, a culture of planning, and a willingness to implement diverse ideas generated by federal, state, and local agencies, academics, and the private sector. Regionally, Portland benefits from its location in the middle of the progressive Cascadia Corridor, stretching from Vancouver, British Columbia, to San Francisco, California. In May 2013, the National Research Council's Science and Technology for Sustainability Program held a workshop organized by the Committee on Regional Approaches to Urban Sustainability: A Focus on Portland to examine issues relating to sustainability and human-environment interactions in the Portland metropolitan region. Topics addressed included the role of land-use restrictions on development, transportation innovations, and economic and social challenges. The speakers at the workshop used examples from Portland and the greater Pacific Northwest region to explore critical questions in finding pathways to urban sustainability.

This report has been prepared by the workshop rapporteur as a factual summary of what occurred at the workshop. The statements made are those of the rapporteur and do not necessarily represent positions of the workshop participants as a whole, the planning committee, the Science and Technology for Sustainability program, or the National Academies. This workshop summary is the result of substantial effort and collaboration among several organizations and

individuals. We wish to extend a sincere thanks to each member of the planning committee for their contributions in scoping, developing, and carrying out this project. The project would not have been possible without financial support from Portland State University and the George and Cynthia Mitchell Endowment for Sustainability Science.

This report has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the National Academies' Report Review Committee. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making its published report as sound as possible and to ensure that the report meets institutional standards for quality and objectivity. The review comments and draft manuscript remain confidential to protect the integrity of the process. We wish to thank the following individuals for their review of this report: Michael Armstrong, Portland Bureau of Planning and Sustainability; Christopher Hendrickson, Carnegie Mellon University; Douglas Kelbaugh, University of Michigan; Herminia Palacio, Robert Wood Johnson Foundation; and Amanda Pitre-Hayes, City of Vancouver. Although the reviewers listed above have provided many constructive comments and suggestions, they were not asked to endorse the content of the report, nor did they see the final draft before its release. Responsibility for the final content of this report rests entirely with the rapporteur and the institution.

Dominic A. Brose
*Rapporteur*

# Contents

# 1

# Introduction

In 2009, the National Research Council's Science and Technology for Sustainability (STS) Program hosted a public workshop to engage representatives from federal, state, and local agencies, academia, and the private sector in a discussion of emerging research on urban systems, and on how understanding human-environment interactions and the interplay among energy, water, transportation, and other systems could help decision makers address complex sustainability challenges. Recurring themes from this workshop included cities as incubators of knowledge and that bottom-up, place-based solutions are important. Also discussed was how the federal government and research community have important roles to play by facilitating urban experiments and documenting the outcomes and lessons learned. Participants discussed how integrated research that includes social scientists, natural and physical scientists, engineers, public health professionals, and planners will be needed to address complex urban systems. Following this initial workshop, STS planned three place-based urban sustainability workshops—Atlanta, GA, Houston, TX, and Portland, OR. These public workshops gathered local, state, and federal officials, academics, and key stakeholders to examine how challenges due to continued growth in the regions can be addressed within the context of sustainability.

In 2010, STS convened the first of these workshops in Atlanta, which provided a compelling case study as the region's rapid growth has had significant implications for water, land use, and transportation. In 2012, the second workshop was held in Houston, which is the nation's fourth-largest city and is home to many oil and gas industries, which helped to make it one of the fastest growing metropolitan areas in the country. But as in Atlanta, growth had deleterious effects on air pollution, public health, land-use, and natural ecosystems. Recently, Houston

has begun to promote many promising sustainability initiatives and has made advances in wind-generated power, installed a light rail system, and increased the number of Leadership in Energy and Environmental Design (LEED) certified buildings.

The third of these place-based workshops was held in Portland. For more than 40 years, the Portland Metropolitan Region has been a national leader in urban policies and investments intended to revitalize the central city and adjacent neighborhoods, preserve the environment, improve equity, and make the city more economically competitive and livable. The "Portland brand" has been both emulated as path breaking and discounted as overly idiosyncratic. Among the elements contributing to Portland's success have been strong public-private partnerships, a culture of planning, and a willingness to implement diverse ideas generated by academics, consultants, companies, and government agencies. Regionally, Portland has benefited from its location in the middle of the progressive Cascadia Corridor, stretching from Vancouver, British Columbia, to San Francisco, California.

## ORGANIZATION OF THE WORKSHOP

The workshop was convened to use examples from Portland and the Northwest U.S./S.W. Canada region to explore critical questions about the future of urban sustainability. The meeting was organized into four sessions over 2 days. Session one provided background about Portland and Cascadia, emphasizing policy innovations and lessons that are potentially transferable elsewhere. Session two focused on ways to leverage local success through partnerships with state and federal agencies, companies, and nongovernment organizations. Session three examined academic and corporate scientific and engineering research that could help cities to become more sustainable. The final session addressed the challenging question of how resource-constrained cities can become agents for achieving broader societal goals not directly linked to their operational mandates, such as climate change mitigation, energy independence, and improvement in human health, particularly in low-income communities. In developing the agenda, the planning committee chose topics that were timely and cut across the concerns of individual institutions, reflecting the interests of a variety of stakeholders. Panelists were encouraged to share their perspectives on a given topic; however, each panel was designed to provoke discussion that took advantage of the broad experience of the participants.

# 2

# Sustainability in the Region

Congressman Earl Blumenauer opened the workshop by setting the stage for how he envisions the federal government moving sustainability forward. Historically, cities had many of the elements sought in sustainable cities today. For example, electric street cars were ubiquitous in cities from Chicago to Boston, and most cities grew much of their produce locally. In 1950, Los Angeles County was the number one agricultural county in the United States. Public engagement—being involved in civic affairs and helping the community—was also more prevalent. Cities are returning back to many of these sustainability roots, and moving forward with strategies on their own initiative and not waiting for federal policies to spur action. Cities are the staging areas where many decisions are made and acted upon every day that affect social, environmental, and economic outcomes of the present and future.

Although Congressman Blumenauer urged not to give up on the federal government, he also recognized that there have been misguided federal policies in the past, including transportation and housing policies that created barriers to sustainability. He called, instead, for policies that bridge barriers and focus on the livability of communities as a fundamental way to make families safer, healthier, and more economically secure. There is often fragmentation in the federal government, with many agencies unaware of similar or related programs in other agencies. One key exception is the memorandum of understanding among the Environmental Protection Agency (EPA), Department of Housing and Urban Development (HUD), and the Department of Transportation (DOT) that

formed the Partnership for Sustainable Communities.[1] An example of where a federal agency can make a big difference in energy efficiency is the Department of Defense (DOD), which is the largest consumer of energy in the world. The DOD has come to internalize the difference energy efficiency makes in terms of military operations. At $400 a gallon to deliver fuel in Iraq and Afghanistan, the DOD understands that it is a military necessity to be energy efficient. Agriculture policy is another area with the potential to make a difference. The 2013 farm bill will be an important piece of environmental legislation that Congress will consider in the current session. Farmland protection and long-term land conservation affect water quality and quantity issues, conserve soil resources, serve as natural buffers to urban sprawl, and contribute to improving air quality. Congressman Blumenauer commented that new agencies are not needed in order to address the issue of having more sustainable communities, but rather sustainability principles need to be driven into the operation of every agency in the federal government.

Federally funded research and development, emphasized Congressman Blumenauer, is also critical in furthering our knowledge in this field. There is a challenge in quantifying urban sustainability research so that better, more cost-efficient decisions can be made; however, there is underinvestment and often political resistance to expanding the federal role in research. There also needs to be more upfront consideration in terms of planning and designing research. This will allow researchers to better take advantage of economic and research opportunities in urban sustainability research.

For communities, how issues are framed is a critical element for moving urban sustainability forward. For example, stated Congressman Blumenauer, people do not like to think about their neighborhoods being overly crowded; however, if the issue is discussed in terms of restoring historic population levels, it is easier to gain buy-in by communities. It also requires giving people more choice and more value. For example, bike use in Portland increased because it was made more convenient and "hip," and so people chose to not use their cars as often. This also resulted in businesses giving up parking spots in front of their establishments for bike parking, allowing parking for up to ten bikes where otherwise only one car could park. People need to be more engaged in reaching out to their federal representatives about what they need in their districts, and to communicate that they want sustainable communities.

Jared Blumenfeld, Region 9 Administrator for the U.S. Environmental Protection Agency (EPA), emphasized accountability and implementation in moving sustainability strategies forward. He referenced the United Nations 1992 Rio

[1] The Partnership for Sustainable Communities aims to help places around the country develop in more environmentally and economically sustainable ways using six livability principles: provide more transportation choices; promote equitable, affordable housing; enhance economic competitiveness; support existing communities; coordinate and leverage federal policies and investment; and value communities and neighborhoods (www.sustainablecommunities.gov).

Earth Summit, which involved international institutions and the heads of state for 105 countries. There were no U.S. mayors, governors, or private sector companies present, and issues were discussed at very high levels of government. Although the Rio Earth Summit was an unprecedented event, Mr. Blumenfeld noted that there is little accountability with international conventions or treaties, mainly due to the lack of mechanisms for reporting what member states are doing to further their obligations. This lack of accountability would also be true if there emerged an international agreement on climate change, and as such, many cities and states have begun efforts and are already making progress on climate mitigation and adaptation in the absence of overarching international or federal policy.

A majority of the world's population now resides in cities, which produce approximately 85 percent of total greenhouse gas emissions globally. Although there is a lot of efficiency gained by living in cities, there are also a lot of emissions directly coming from cities. Cities are not waiting for an international agreement on how to move forward, but the shift to more sustainable cities would be aided by a regulatory framework. There has been a transition since the 1992 Rio Earth Summit in that international organizations and nation states are playing less of a role in moving urban sustainability forward, mainly because of the larger role that cities and corporations are now playing. Cities are where customers are located, and corporations prefer to deal directly with cities.

Cities around the globe are very similar, Mr. Blumenfeld observed. Although the mayor of Phoenix is more conservative than the mayor of Portland, they care about the same things that any city cares about. The prime minister of India has very different concerns than the prime minister of Iceland, but the mayor of New Delhi has the same concerns as the mayor of Reykjavik, Phoenix, or Portland. For example, they all need clean water, functional streets, waste pick up, and functional street lights. These issues do not change much from city to city. The amount of similarity among cities as opposed to among nation states is striking. Cities, Mr. Blumenfeld commented, also have become brands, much the way Portland has become an important brand for many people. Brands have value: People may not be familiar with Oregon, but they know Portland well.

Mr. Blumenfeld commented that for cities addressing climate change, a priority should be to focus on adaptation and to communicate to the public the steps taken on adaptation efforts so that it is understood that climate change is real and is being addressed. The federal government is largely not involved in land-use planning, and there will not be a national adaptation strategy, so it is uniquely within the domain of cities to move planning and adaptation initiatives forward.

Climate change is a global phenomenon, but there are many actions that can be taken on a smaller, more local scale that can contribute to the solution. Transportation is a key example. Local land-use planning can make public transit and zero emission transit options more attractive to communities. Building codes are another example. Making buildings more energy efficient is a uniquely urban challenge, and building codes will always be locally dictated. Many cities have

adopted Leadership in Energy and Environmental Design (LEED) requirements for buildings. Incentives for developers are also key. Mr. Blumenfeld gave an example of providing incentives from his time as director of the San Francisco Department of the Environment. When a developer committed to LEED Gold certification, a planner would be assigned within a week, whereas the traditional time was closer to a year. Within a day of issuing this policy, there were six buildings signed up as LEED Gold certified. This example also serves as a lesson in bringing private industry into sustainability strategies. It is possible to institute nearly any sustainability measure as long as there is parity among different corporate sectors so that there is no perception that one sector receives added benefits that others do not; the playing field must be level.

Retrofits are another way to increase energy efficiency in buildings, but for small business, staying in business is the first priority. Mr. Blumenfeld said that to help 6,000 retrofits of small businesses for energy efficiency, the San Francisco Department of the Environment created a funding mechanism by bringing in banks to loan the money needed for the retrofits. Most of the small businesses did not take the loans, however, but instead ensured that the payback periods of their investments were less than a year. This demonstrates that scale, capital costs, and payback periods are key measures for these projects. Moving forward, Mr. Blumenfeld listed several ways to advance urban sustainability:

- Urban sustainability needs to be data driven, transparent, and monitored so that metrics and goals are attained.
- Procurement is important and can mitigate carbon footprints and toxic inventories by changing what a city purchases. A useful urban sustainability measure would be a national set of procurement specifications.
- Bold goals need to be set to shape local context. Goals need to be monitored so that progress can be accurately assessed.
- Implementation of sustainable strategies is everyone's responsibility. The public can have an impact on their immediate environment every day.
- Innovation trickles up and is local. Cities can capitalize on local innovation.
- Shape the dialogue so that messages are consistent and simple, and do so in a way that aggregates what is already being done in cities around the country. Efforts will be more effective if the discussion is not around isolated cities and examples but aggregated from examples from cities across the country.

Michael Armstrong, policy, research, and innovation manager with the City of Portland's Bureau of Planning and Sustainability, stated that a long timeframe, location, and interconnections are important elements when considering sustainable development. Portland, for example, has the Bull Run Watershed as

its drinking water supply and coastal resources. Portland was not always a center for sustainability, and in the 1970s the City of Portland had poor air quality due, in part, to the number of automobiles on the road. Streets were expanded to accommodate more cars, and Interstate 5 was built through downtown. Portland also faces social challenges. From 2005-2007, the working poor made up 23 percent of Multnomah County households, only 53 percent of Portland's high school students graduated in 4 years, and 23 percent of high school students dropped out of school.

**The Portland Plan's 12 Measures of Success**

1. Equity and inclusion
2. Resident satisfaction
3. Educated youth
4. Prosperous households
5. Growing businesses
6. Creating jobs
7. Transit and active transportation
8. Reduced carbon emissions
9. Complete neighborhoods
10. Healthier people
11. Safer city
12. Healthier watersheds

SOURCE: Michael Armstrong, City of Portland's Bureau of Planning and Sustainability, May 28, 2013.

The people of Portland made choices that started to change the city. Large parking lots were converted to public squares, such as Pioneer Courthouse Square. The urban growth boundary, which was passed as state legislation in the 1970s, played a major role in how Portland developed over time. Most recently, the Portland Plan presents the larger picture for development in the city.[2] One element of the plan is the 20-minute neighborhood, where residents would be able to access all their needs within 20 minutes of walking. The Portland Plan has 12 measures of success, including reducing carbon emissions. Portland had a carbon dioxide reduction strategy as early as the 1990s, which was updated in 2009. The current strategy aims for an 80 percent reduction in emissions by 2050.

Since 1990, there have been many accomplishments in reaching the 2050 carbon emission reduction goal (Figure 2-1). Per capita, household energy is down 10 percent, vehicle miles traveled is down 8 percent (since 1995), and gasoline sales are down 21 percent. Portland has the highest hybrid ownership in the United States, transit ridership has doubled, and bike commutes have increased five-fold. The challenge, however, is in understanding the drivers behind the drop in emissions. Between 1990 and 2010, there was a 26 percent increase in population, but a 9 percent decrease in energy use per person and an 18 percent reduction in carbon emissions per unit of energy used in homes. Although population overall increased by 26 percent, jobs in Portland only increased by 12 percent. Commercial and industrial energy use per job declined by 13 percent and carbon emissions per unit of energy decreased by 7 percent. Transportation and waste

[2] See www.portlandonline.com/portlandplan.

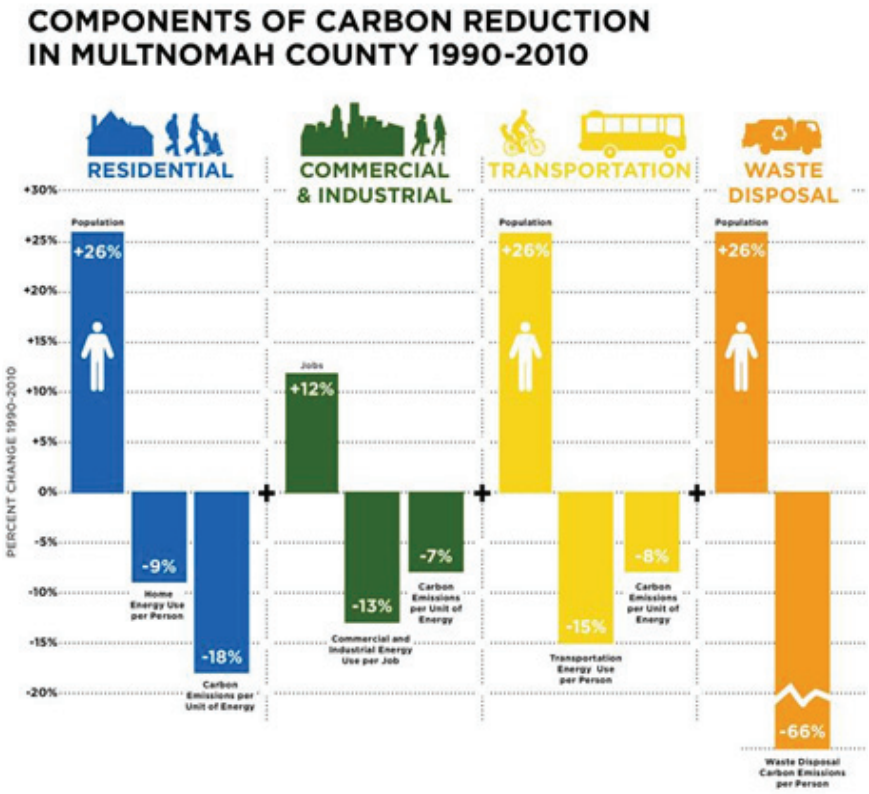


**FIGURE 2-1** Components of Carbon Reduction in Multnomah County 1990-2010. SOURCE: Michael Armstrong, presentation, May 28, 2013.

disposal were also large drivers, with transportation energy use per person down by 15 percent and waste disposal carbon emission per person down 66 percent.

Identifying the source of carbon emissions is also important for the Portland Plan. Emissions from transportation are about the same percentage as those from buildings (residential and commercial) at about 40 percent each. Another 16 percent of total carbon emissions come from industry. Because of the high percentage of emissions from buildings, there have been major efforts to target and reduce emissions from that source. Targeting energy efficiency is crucial, but so is incorporating more on-site renewable energy sources and working with utilities to shift to low-carbon energy sources. One program that targets homes is Clean Energy Works, a program that provides financing options to homeowners to help defray upfront costs of energy retrofitting. The program also provides job training

for workers who retrofitted homes, which have been traditionally low-wage jobs. The program provides better wages and career pathways for those employees, which illustrates well the social, economical, and environmental components of a sustainability initiative.

Stormwater management is crucial for Portland's resilience and adaptation. Green infrastructure (planters, green streets, ecoroofs, and basins) protects water quality and reduces peak flows and flow volume during rains; it also protects pedes—trians through improved urban design, such as curb extensions (see examples in Figure 2-2). Mr. Armstrong stated that the Portland Plan is about having a community that works for people, and takes into consideration a longer timeframe and the interconnections among many different systems of urban sustainability.

Amanda Pitre-Hayes, director of sustainability for the City of Vancouver, gave an overview of sustainability efforts in Vancouver. Vancouver has 600,000 people in the city and about 2.3 million people in the metro region, making it approximately the size of Portland. Vancouver has intentionally developed certain


**FIGURE 2-2** Examples of Portland's green infrastructure.
SOURCE: Michael Armstrong, presentation, May 28, 2013.


**FIGURE 2-3** Vancouver's Greenest City 2020 Action Plan Framework.
SOURCE: Amanda Pitre-Hayes, presentation, May 28, 2013.

parts of the city and intentionally not developed others. An effort in the 1950s to build an airport on the Spanish Banks and Jericho Beach areas of Vancouver did not succeed, for example. The South East False Creek area of Vancouver was historically a shipyard and a center of industry, Pitre-Hayes said, but after hosting the 2010 Winter Olympic Games, the area was redeveloped to have more walking paths, green space, and modern buildings. The Coal Harbor, another center historically heavy with industry, was also redeveloped. In the mid-20th century, there were plans for a major freeway to run through the city; however, with community involvement, these plans were overturned.

Vancouver is using the Greenest City Action Plan Framework to drive its sustainability goals (Figure 2-3), said Ms. Pitre-Hayes. The plan is similar to what Portland has been implementing, and was adopted in 2011 by the city council. The plan strives to meet three goals: zero carbon, zero waste, and healthy ecosystems.

Within those three goals, there are specific targets that Vancouver is working toward. Examples of these targets and progress made toward them include[3]:

- Double the number of green jobs in Vancouver by 2020.
- Double the number of companies actively engaged in greening their businesses.

[3] See http://vancouver.ca/green-vancouver/targets-and-priority-actions.aspx.

- Eliminate Vancouver's dependence on fossil fuels by 2050.
- Reduce greenhouse gas emissions (GHGs) 33 percent by 2020. Vancouver is currently at a 4 percent reduction in GHGs.
- Lead the world in green building, design, and construction, and reduce GHGs in existing buildings by 20 percent. Reduction of GHGs in existing buildings is currently at 3 percent.
- Make walking, cycling, and public transportation the preferred modes of transportation. Vancouver started with a baseline of 40 percent of trips made by foot, bicycle, or public transit. Currently, the city is up to 50 percent.
- Create zero waste—in other words, reduce total solid waste going to landfills by 50 percent over 2008 levels. Vancouver has reduced total solid waste going to landfills by 11 percent.
- Ensure that every Vancouver resident lives within a 5-minute walk of a green space and plant 150,000 additional trees in the city. Currently, 93 percent of residents are living within a 5-minute walk of a green space and over 10,000 trees have been planted since the plan was adopted in 2011.
- Become a global leader in urban food systems, which includes increasing farmers' markets, orchards, and community garden plots by a minimum of 50 percent over 2010 levels. Currently, there has been a 24 percent increase over 2010 levels.
- Ensure the most stringent water guidelines are met and reduce per capita water consumption by a third by 2020. The guidelines are currently being met, and per capita water consumption has been reduced by 16.5 percent.
- Meet the most stringent air quality guidelines. Sulfur dioxide is a continual challenge to this target due to port traffic contributing emissions and exceeding regional air quality guidelines.

In addition to these targets, Vancouver built 30 public electric vehicle charging stations, with 40 more planned by the end of 2013, said Ms. Pitre-Hayes. There is a network of separated bike lanes, and bike commuting is up by 26 percent since 2008. Vancouver created a low-carbon energy utility in the Olympic Village as a demonstration project and to make the business case for this form of a utility. The model is being franchised across the city through the private sector and replicated to deliver low-carbon energy. Vancouver created many partnerships with the private sector in moving their sustainability targets forward. For example, Vancouver is partnering with MAXIM Power, a company that captures methane from the landfill and turns it into energy, part of which is used to heat greenhouses that grow local produce. Vancouver also partnered with developers to help realize a 46 percent increase in LEED developments. The LEED Platinum Vancouver Olympic Village includes Canada's first net zero building.

Ms. Pitre-Hayes also described a major collaboration the city has with the University of British Columbia. The Greenest City Scholar Program brings postgraduate students into the city every year to conduct research and help the city reach the sustainability targets in the Greenest City Action Plan. Engaging the broader community is also a key element of the plan. The city partnered with the Vancouver foundation last year to create the Greenest City Fund, a $2 million fund that provides grants to residents who want to develop a project that will further the city's goals. For example, the Vancouver Tool Library is a lending library for power tools that people borrow instead of purchasing in order to complete home renovation projects. Another example is SHIFT, a peddle-power bicycle courier service that has grown to become its own business enterprise.

**Standards for creating vibrant, inspiring, and sustainable places:**

- Build community
- Create inviting spaces
- Minimize carbon footprint and energy dependence
- Connect people and buildings to nature
- Encourage transportation alternatives
- Craft the first 30 feet
- Inspire communities with art
- Make 20-minute living real
- Integrate schools and neighborhoods
- Preserve historical symbols that matter

SOURCE: Renee Loveland, Gerding Edlen, May 28, 2013.

One challenge faced not only by Vancouver but by all cities, she said, is that of jurisdiction and the limited influence city councils have over decisions that affect areas immediately surrounding cities. For example, there is a large presence of oil and energy extraction industries in Alberta, Canada, which export products through the Port of Vancouver. The Vancouver city council is attempting to limit the export of fossil fuels from its port; however, the port and surrounding waters fall under federal jurisdiction, limiting the city council's ability to take action. Vancouver passed a motion asking for proof of insurance against a spill for any exporter operating within the waters that surround Vancouver; however, the issue is controversial and ongoing.

Renee Loveland, sustainability manager at Gerding Edlen, described how to turn sustainability values into economic value. Sustainability is not viewed at Gerding Edlen as a stagnate point, such as achieving a LEED platinum certification, but as a continual process of improving and incorporating new knowledge. It is also important to share that knowledge with the community so they can share in that vision. A challenge exists in addressing the eventual financial outcome of an investment when developing a new, sustainable property. One tool to address this is the Livable Place Index, which evaluates performance based on "people, planet, and prosperity." The "people" component relates to connections and how well values are expressed. The "planet" component is reflected in the recertification of every project, so that energy, water, and carbon emissions are accounted for and communicated to the public. The "prosperity" component relates to an

economic development analysis conducted on every project, which assesses metrics such as jobs created and tax revenue generated. Ms. Loveland noted that there has been an increase in demand for corporate sustainability reporting, with reporting mechanisms such as the Dow Jones Sustainability Index and the Global Real Estate Sustainability Benchmark. Gerding Edlen has realized returns on investments in Portland with higher absorption and lease rates for tenants across the city, the highest rental rate building, and the highest per square foot sale on record for three parcels at the Brewery Blocks in Portland's post-industrial neighborhood known as the Pearl District.

Lew Bowers, central city division manager at the Portland Development Commission (PDC), described the PDC as Portland's economic development and redevelopment agency and a quasi-governmental entity. It is governed by five commissioners appointed by the mayor and approved by the city council. PDC's economic strategy has three components, with the first and foremost focusing on jobs (Figure 2-4). Creating jobs in sustainability is a key metric. Urban innova-

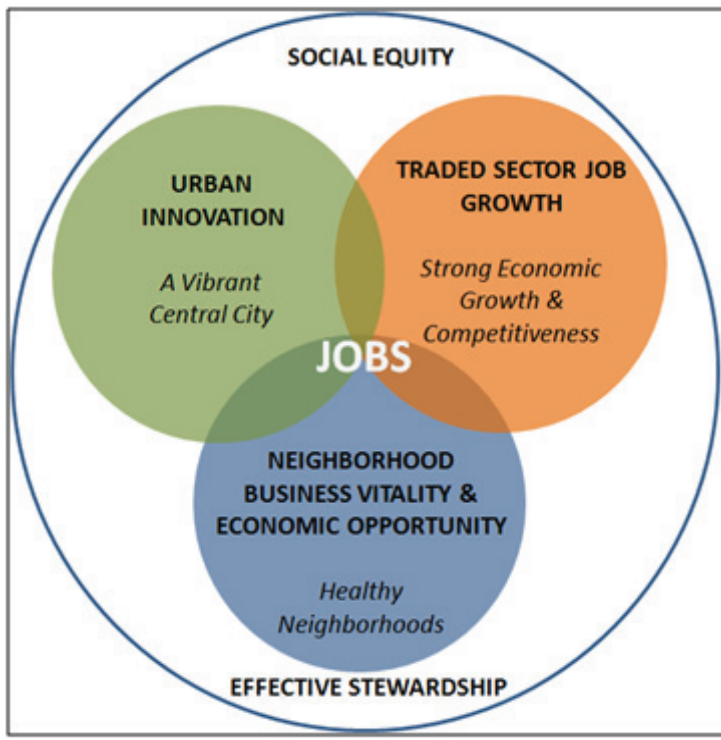


**FIGURE 2-4** The three components of the Portland Development Commission's (PDC) economic strategy.
SOURCE: Lew Bowers, presentation, May 28, 2013.

tion and social equity are the other two components. Linking sustainability and economic development to communities of color within Portland is a challenge that PDC addresses by employing social, economic, and environmental strategies. Effective stewardship is the overarching value of the strategy. There are two groups within PDC working on addressing the economic element of the strategy: the Business and Industry Team and the Central City Team. The Business and Industry Team focuses on more-traditional economic development—retention, expansion, recruitment, entrepreneurship, industry programs, and incentives—while the Central City Team focuses on implementing demonstration projects that use the central city as a living laboratory.

The PDC differentiates clean tech from other green industries by defining three foci: green development, clean energy, and energy management. Green development refers to infrastructure and companies involved in development, architecture, engineering, and planning. Clean energy refers to companies headquartered in Portland, such as Vestas, which is a major wind energy company. Energy management addresses the interface of storage and energy efficiency systems (e.g., electric vehicles and commercial battery storage). Portland fosters industries that are export oriented, offer family-wage jobs, and have growth potential and a competitive advantage. The clean tech industry is an example, but others include advanced manufacturing, software development, and outdoor clothing design, such as Nike and Columbia. Based on Clean Edge's *U.S. Clean Tech Leadership Index*, which ranks the 50 largest cities in the United States, Portland ranked third, due largely to a high score attributed to the many LEED-certified buildings in the city.[4] PDC helped provide incentives to developers to build LEED-certified buildings, and the market has returned a demand for these buildings that is now the driving force for new green buildings.[5]

Portland has also developed as a center for entrepreneurship and start-up companies, stated Mr. Bowers. A $1 million Portland Venture Fund was created by the city, which was matched three times by private funds to create local investments. There is also a group of firms known as Portland 100 that work with PDC to provide mentorship from more advanced firms. To further these efforts and build an entrepreneurial ecosystem, PDC will bring delegations to Silicon Valley to meet with venture capitalists and in turn have venture capitalists travel up to Portland. Capital is not necessarily the largest constraint in creating this ecosystem. Many successful companies have started in Portland, but they quickly

[4] The Metro Index of the U.S. Clean Tech Leadership Index tracks and analyzes clean-tech activities of the 50 largest U.S. metro regions using two dozen indicators within the categories of Green Buildings, Advanced Transportation, Clean Electricity and Carbon Management, and Clean Tech Investment, Innovation, and Workforce (www.cleanedge.com).

[5] LEED standards are one of several green building standards in use. For a thorough review of green building standards, see National Research Council. 2013. Energy-Efficiency Standards and Green Building Certification Systems Used by the Department of Defense for Military Construction and Major Renovations. Washington, DC: National Academies Press.

move to the San Francisco region due to challenges in recruiting executive-level personnel. PDC is addressing this challenge by increasing Portland's visibility in the entrepreneur world to better attract and retain that level of talent. One element that contributes to the success of the smaller start-up companies is early adopter culture—a culture of collaboration and risk taking. Mr. Bowers stated that people moving to Portland tend to be more open to taking risks on new initiatives, such as reinstating the streetcar, which also translates to more political will in elected officials to take bolder actions on public initiatives.

Policy innovations over the past 40 years in Portland and Oregon, such as the urban growth boundary, have had a dynamic relationship with economic activity in the region. The policy goals created an environment for economic activity, and the economic activity has iteratively shaped policy goals. Green jobs have been added and car sharing and bike commuting have increased, resulting in less driving, which translates into more disposable income for residents. Expertise in green policies and LEED-certified buildings was fostered, which allowed this knowledge to be exported to other cities. One example is We Build Green Cities, a collaborative program between private firms and the public sector to bundle services to offer to other cities.[6] It is a branding and export mechanism that enables customers to buy a variety of integrated systems that Portland developed. An example is building ecodistricts, a process that overlays water, transportation, and energy systems in a given geographic area. There are five pilot ecodistricts in Portland, with one located on Portland State University's campus.

Alisa Kane, manager of the Green Building and Development Program for the City of Portland, discussed the role the city plays in supporting different initiatives from the planning department, PDC, and the private sector in Portland. For example, an ecodistrict encompasses all of these actors and is a community-led initiative that brings sustainability to a scale beyond only buildings. It is a place-based business-development strategy. An ecodistrict is not just about what happens in a building but rather what happens between buildings, and is a model for creating better, more livable communities. Many projects in Portland are done as a partnership—Clean Energy Works Oregon was a collaborative program with the Bureau of Planning and Sustainability, PDC, and others to deploy energy efficiency retrofits to residents. Another program, Kilowatt Crackdown, engaged building owners in benchmarking energy use through scoping studies and in improving energy efficiency with capital improvement projects. Approximately 40 percent of the electricity in Portland is produced from hydroelectric plants; however, another 40 percent is derived from coal-fired power plants. This results in low energy costs, which poses a challenge to energy efficiency programs.

Like other cities, Portland struggles with social equity issues and with how best to deploy resources to ensure that all residents have the same level of livability, connectivity, access to food, and green space. There are many barriers to

[6] See www.webuildgreencities.com.

sustainability, however; as one participant expressed, they are often not technical or economic but due to rigidity from institutionalization, such as narrow job descriptions, performance evaluation criteria, codes of practice, professional standards, and regulatory requirements. Ms. Loveland addressed the issue of institutional barriers by describing the Oregon Built Environment and Sustainable Technologies Center (BEST), which connects Oregon industry to university research teams to help enhance the competitiveness of Oregon-based firms, boost state revenues, grow and improve university research, and help Oregon recruit new clean tech companies. This level of partnership across different sectors breaks down many institutional barriers and helps clean tech technologies to make it to market sooner. The increase in research capability also translates into an increased knowledge base and expertise for other markets.

Jon Belmont, program lead for energy conservation at the Oregon Department of Energy, gave an overview of some of the activities at the state level on energy efficiency. The Northwest Power and Planning Council Sixth Power Plan aims to have enough cost effective conservation measures available to meet approximately 85 percent of the region's energy load growth for the next 20 years. The plan calls for meeting all of the need for growth through energy efficiency and conservation efforts. Since approximately 1980, the region has been a leader in energy efficiency, but has only met a little more than half of new load increase for electricity with energy efficiency savings. It will be critical for Oregon to meet these goals, because energy efficiency remains the most cost-effective way to meet new consumer demand for electricity. Maximizing energy efficiency and conservation will allow Oregon to maintain competitive, low-energy costs for new and existing businesses.

Governor John Kitzhaber in 2012 released a 10-year Energy Action Plan that provides a comprehensive energy strategy to meet Oregon's carbon reduction, energy conservation, and renewable energy goals while also trying to balance complex needs such as affordability and reliability, Mr. Belmont continued. Conserving energy is important, but for sustainability, it is also important to ensure that social needs are met by making energy affordable to everyone. Commercial buildings are a challenge to achieving these energy efficiency gains. Publicly owned utilities and the Energy Trust of Oregon, an independent nonprofit organization, are assisting customers to retrofit thousands of buildings every year; however, opportunities remain for more comprehensive integrated retrofits in older buildings.

The Oregon Department of Energy (ODOE) is the lead agency in an initiative called the State Building Innovation Lab.[7] This initiative is designed to advance understanding of how to pursue deep energy efficiency and conservation retrofits in the public sector while developing a replicable model for the commercial sector that can be adopted by local and regional governments to help save money,

[7] See www.oregon.gov/energy/Pages/Ten_Year/Ten_Year_Energy_Plan.aspx.

reduce energy consumption, create local jobs, and strengthen local communities. Over the next 10 years, the State Building Innovation Lab will establish a baseline level of use and conduct energy audits to identify cost-effective retrofits for every occupied building owned by the state.

Although energy is relatively inexpensive in the region, there is still opportunity for reducing energy and saving money. ODOE establishes a baseline for building performance and demonstrates efficiency and sustainability measures that can be taken to decrease the cost of energy—steps that will help show the value of energy efficiency and conservation to the private sector. ODOE is also exploring public-private partnerships and other funding mechanisms such as Energy Efficiency Power Purchase Agreements to help finance energy efficiency improvements.[8] One example of a public-private partnership is the Oregon Cool Schools Program, which is a 4-year pilot program to help Oregon schools identify and implement energy saving opportunities. These programs have allowed schools to save money while providing children with a better-lit and more comfortable environment more conducive to learning, said Mr. Belmont. However, the state agency faces challenges, and one of the most challenging is the immediate demand for time and results. ODOE strives to provide the best information and programs available, but like any state agency is under constant public scrutiny. Ensuring that the programs across the state are successful requires trust from and listening to stakeholders. This results in their buy-in and a willingness to take a chance on new programs.

Dave Porter with the Seattle Regional Office of the Economic Development Administration (EDA) at the U.S. Department of Commerce considers economic development as taking the long-term view and building capacity in the community. The Economic Development Administration leads economic development by promoting innovation and competitiveness and by preparing U.S. communities and regions for growth and success in the global economy. The agency's investment policy guidelines are designed to establish foundations for sustainable job growth and the building of durable regional economies throughout the United States. EDA has several investment priorities focusing on environmentally sensitive development—investments that promote job creation and economic prosper-

[8] These agreements are a financial mechanism for energy efficiency improvements to buildings. A baseline for a building's power usage is established. Since a utility charges a business based on how much electricity is used, this baseline projection estimates what energy use would be without any improvements. An outside investor then pays a business a monthly rate to upgrade equipment and make other energy efficiency improvements, giving the business a flat, fixed benefit, regardless of their energy usage. The utility then pays the investor based on how much less electricity the business used than was projected by the baseline reading. This gives the investor incentive to minimize the client's energy use in order to maximize its own return. Also, payments are coming from a stable and reliable source—the utility. The utility receives higher up-front payments from businesses in order to maintain their own grids, and also gains access to energy savings as a form of alternative energy generation.

ity through projects that enhance environmental quality and implement green products, green places, green buildings, and energy efficient technology.[9]

Mr. Porter described the challenges in investing in economic development projects. The first is that the problem being addressed is often not accurately or succinctly identified. Second, there is no reliable system or protocol in place that links emerging economic development capital with emerging economical projects; it is a challenge to identify the best projects. Third, severe budget cuts have resulted in a loss of economic development professionals at the local and federal levels, a loss of expert staff that makes it more difficult to do substantive economic development. A final challenge is people's tendency to be anxious about new risks and to hold onto old ideas. In terms of outcome and performance issues, Mr. Porter said, and it is important to be willing to be surprised but also focus on long-term outcomes. One online tool that aims to measure the economic vitality, natural resource stewardship, and community wellbeing of a project is the Triple Bottom Line Tool.[10] This tool aims to optimize investments for economic, environmental, and social impact, commonly referred to as the triple bottom line.

Robert Liberty, director of the Urban Sustainability Accelerator at Portland State University, described the elements contributing to Portland's success in having strong public-private partnerships. One component is a willingness to implement diverse ideas generated by academics, consultants, companies, and government agencies. An example was the rejection of proposal to build the Mount Hood Freeway in the 1970s and its replacement with investment in light rail transit and a modest widening of Interstate 84. The alternate proposal was driven not by governmental agencies but by individuals, such as Jim Howell of the organization Sensible Transportation Option for People. Finding solutions to transportation other than widening or building new roads will change the form of communities. When communities travel by different modes of transit, then development will also build along those new modes of transit. Communities can then take advantage of new transit investments to implement better land management. This approach has proven to be cost effective, reduce congestion, and improve air quality. Portland has a diverse set of nonprofit advocacy organizations that serve as generators of ideas. They play important roles in advancing urban sustainability by innovating, educating, and engaging the public, monitoring and evaluating implementation, ensuring compliance and enforcement, and spurring and promoting the private sector to action through awards, standards, and other measures.

The transfer of ideas is also important, said Mr. Liberty, and the Urban Sustainability Accelerator is a pilot program based on the idea that knowledge in Portland can be transferred to other small to midsize communities. The cohort of cities includes: Elk Grove, CA; Rancho Cordova, CA; El Paso, TX; Waco, TX;

[9] See www.eda.gov/eddirectory/states/or.htm.

[10] See www.tbltool.org.

Wichita, KS; Louisville, KY; and Portland, ME. Teams from each city are comprised of people from the private sector, public sector, nonprofit organizations, and universities. The cities are focusing on core themes, such as transportation, green infrastructure, and green buildings. Research on urban sustainability challenges would benefit these communities and help illustrate lessons learned, such as research on regional and state growth management programs. For example, Charlotte, NC, and Portland, OR, grew at approximately the same rate during the 1990s but with dramatically different urban forms. These changes in urban form need to be better understood. For Portland, they have involved reduced travel, reduced construction materials, and greater access to jobs and housing. The urban growth boundary and other land-use laws have been central to the pattern of urban development in the Portland region, resulting in lower farmland consumption, more concentrated employment, and communities with more housing choices and less racial and economic segregation. Keeping diverse neighborhoods is challenging, however, and some neighborhoods in Portland have started losing that diversity. This is attributed to the redevelopment of inner neighborhoods, which ultimately displaces some residents who lived there prior to redevelopment. These residents move to outer neighborhoods, which often have less-frequent transit service and more-crowded schools. Mr. Liberty stated that equity issues need to be built around the discussions on urban revitalization. Dynamic housing models have been an important element of research in the region, and further integrating housing models into transportation modeling capacity drives understanding of where people live, how they travel, and associated costs. One challenge is an undersupply of certain kinds of housing, such as rental housing and single-family homes. Changes to land-use policies could address some of this undersupply.

Lorie Wigle, vice president of the McAfee Security Fabric Program at Intel, stated that although Intel is headquartered in California, the company has been in Oregon since 1974, invested over $25 billion in capital, and is building a 2 million square-foot manufacturing facility in Hillsboro, OR. Intel is also Oregon's largest private employer, with approximately 17,000 employees, and for every job generated at Intel, 3.1 jobs are created in the community, the company estimates. Intel considers its community relationship as part of its sustainability efforts and strives to invest in the communities where the company operates. Companies often move through stages as they move toward sustainability, Ms. Wigle said. In referencing Joel Makower from GreenBiz, she stated that the first stage for companies is initially about doing no harm—in other words, ensuring that their operations are not a detriment to the local environment. Then, a company moves to doing well by doing good and by trying to profit from incorporating sustainability principles into their practices. Finally, and more challenging, is the stage where a company seeks to generate new revenue by tackling sustainability challenges.

Green energy is a major focus for Intel, and according to the EPA, the company has been the number one purchaser of green energy in the United States

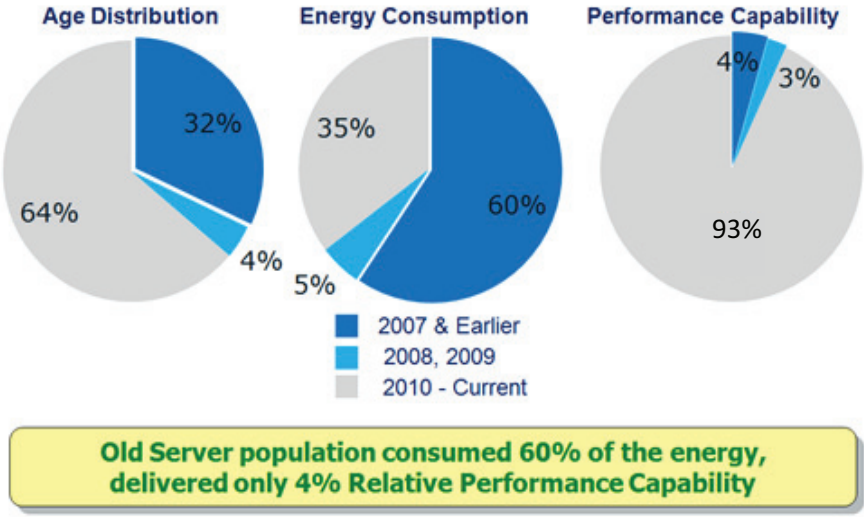


**FIGURE 2-5** Data center energy consumption in a Fortune 100 company.
SOURCE: Lorie Wigle, presentation, May 28, 2013.

since 2008.[11] Improvement in technology and performance at Intel has resulted in energy savings. Relative to the first one billion personal computers built by 2007, the next two billion personal computers built by 2014 will use half the amount of energy while delivering 17 times the computing capacity. This is true for data centers as well, said Ms. Wigle. In looking at a single Fortune 100 company, Intel found that older servers accounted for approximately 60 percent of the energy use while providing only 4 percent of the performance capability (Figure 2-5). Newer servers and processing technology are able to provide much more performance capability while consuming less energy. Energy efficiency can also be improved by applying technology to make the electrical grid smarter and more energy efficient by focusing on connectivity, intelligence, and security.

Charles Kelley, associate partner at ZGF Architects, gave a practitioner's perspective on sustainable urban development. Mr. Kelley stated that ZGF has been exporting ecodistricts, which they view as the intersection of form and what a successful neighborhood would offer the community it serves. The ecodistrict is about how a place is organized in the public realm, integrated with adjacent buildings, and designed for multiple uses, transportation, and leisure activities. There is a lot of attraction around plants, and water is also a key element. For example, water is systematically treated and used to support

[11] See www.epa.gov/greenpower/partners/partners/intelcorporation.htm.

plants and shade, thus creating the comfort and character residents want in a neighborhood.

These issues can be addressed at multiple scales—at the district, block, region, or mega-city scale, said Mr. Kelley. The mega-city scale, such as a recent project in Tokyo, Japan, provided an abundance of resources, in terms of water, venture capital, and population density. This allows for cost sharing of investments with a larger population, giving mega-cities the ability to pay for larger scale projects. The challenges and research needs for these larger systems is to try to move to more natural, vegetative designs and make the urban area act more like a natural system. Although Portland has led sustainable development in the region, Philadelphia, Washington, D.C., and New York City are mega-cities that, like Tokyo, are going to be able to do redevelopment on a scale and magnitude that can make large-scale contributions to sustainable urban development. It is important not to rely on regulation in the Portland region to advance water system development, he said, and to move to collective action across all watersheds in the region. Water project developers often must acquire a permit for one project in one location and then acquire the same permit again for another location within the same watershed. When possible, there needs to be connectivity among projects to reduce regulatory barriers, said Mr. Kelley. There are challenges when trying to integrate systems within just one building; for example, the ZGF Architects building is the largest mixed-use LEED Platinum building in the United States, one with a sophisticated water system. Although they are able to capture rainwater to flush toilets, there is considerably more water on site processed daily that could be used, but regulations do not allow it. Policies need to catch up with technology as it evolves, said Mr. Kelley; the technology available to manage water today is steeped in the policies of the 19th century.

ZGF is involved in the preliminary plans for an ecodistrict for the National Capital Planning Commission in Washington, D.C., which includes many stakeholders and mostly federal buildings. The district of interest has ample streets and buildings, and because the density of potential subscribers is high, the water utility will likely be cost effective. Questions remain about a micro-scaled utility district being situated inside a regional-utility district, such as what advantages this might provide in terms of resiliency and water management. This district would be important because of how Washington, D.C., regulates storm water. The city provides a credit for every gallon of water treated for which the landowner is not directly responsible. The entire water district can be financed by the credits aggregated across the district. This is a good urban renewal technique, said Mr. Kelly. A 1.3 million gallon tank capturing rainwater is estimated to provide all of the water needed to meet all development needs throughout a year. Adding vegetation to the landscape will pre-treat all water before it moves into any mechanical treatment or filter device. No irrigation will be needed, because the ecodistrict is organized to provide water to all green areas before the water soaks into the ground.

Tim Smith, principal at SERA Architects, defined an ecodistrict as a geographically defined neighborhood where the community members, buildings, and common infrastructure are fully integrated and are established to support a network of sustainable social, ecological, and economic systems. Optimizing at the block, district, or town scale improves efficiencies. Conventionally, every single building is given its own mechanical, electrical, or plumbing system, but when instead these systems are put in at the district level, they can be better optimized and become more efficient. The social element is incorporated into these systems as well.

SERA held a Civic Ecology Visioning Session that brought together 125 people to think about their ecodistrict not just as an engineering problem but as a cultural and economic problem. This work has led to the Civic Ecology Approach, which involves citizens as well as engineers in the decision-making process around ecodistricts. The idea is captured by the concept of the software of a community, Mr. Smith explained; the physical capital, such as green buildings, green streets, and bioswales are the hardware, but the flows of energy, water, waste, nutrients, and money are the software. These resource flows cannot be seen directly in many circumstances, but hardware can be designed and built around them to channel them.

SERA tested the idea that citizens could be completely capable of designing resource flow systems for their own community. SERA hosted a Civic Ecology Resource Flow Mapping exercise in the community of Damascus, which has individuals from across the political spectrum, to focus on what the community should look like in the future. They developed a diagram tying together a food system, a water system, an algae farm, and a project called Purple Bucket—a communitywide composting program envisioned as an economic development project to create jobs. This mapping exercise led to the creation of a Civic Public-Private Partnership (CP3), which has set up a nonprofit to implement all civic ecology projects in the community. The aim is to invigorate democracy and sustainability together by going through the resource flow mapping exercise. One challenge, however, is that there are no community-based institutions for sustainability. Setting up a civic, public-private partnership serves this role of implementing holistic, systems-based approaches to community planning and design.

# 3

# Research to Inform Sustainable Urban Regions

Wim Wiewel, president of Portland State University (PSU), discussed the challenges of trying to embed sustainability into an organization, stressing that there is always room for growth and opportunities to find new ways and places to make substantive differences. In academia, this could be a research project answering an important question or an educational tool to better inform people about sustainability issues. One example at PSU is that all graduating seniors must complete a partnership project: a capstone course in which students work as a team with a business, community organization, or unit of government. Many of these projects revolve around sustainability issues. Dr. Wiewel is also chair of the Coalition of Urban Serving Universities, and he emphasized the potential for advancing urban sustainability through partnerships with urban universities. These universities have a vast reservoir of faculty research and students as well as the capacity to make significant impacts on sustainability through their operations, administration, and land use and transportation options.

PSU has realized some of these impacts through work done nearly 30 years ago on the urban growth boundary legislation, and with capital investments made on the streetcar and in light rail. PSU was part of the local match for those funds, and as a result they now have streetcar and light rail stops on campus. This was essential, as these initial lines served as the nexus for every new line that has been built since; they also played a key role in driving down private automobile use. PSU is not a large residential campus, so most of the faculty and students commute from elsewhere in the city, yet less than 25 percent use private automobiles to commute. PSU also engages in the cluster industries that the Portland Development Commission identified as key to economic development in the region. These include computer electronics and software, clean technology and

renewable energy, and sustainable manufacturing and metal companies. PSU also has a partnership with Portland General Electric (PGE) that is experimenting with six different charging stations on campus. This partnership also includes research on the implications of shifting to new forms of biomass as fuel sources.

PSU is a signatory on the American College and University Presidents' Climate Commitment (ACUPCC), which Mr. Wiewel described as a large grassroots effort. Over 600 universities agreed to prepare climate action plans, which required an inventory of greenhouse gasses of all university buildings and financial obligations in the millions of dollars. After the inventories were completed, universities then drafted plans to address major emissions sources. Mr. Wiewel noted that these plans were done by universities without a government directive, and they have put over 600 universities on the path to being carbon neutral. PSU has a goal to be carbon neutral by 2040, and all new buildings will be either Leadership in Energy and Environmental Design (LEED) certified Gold or Platinum. PSU was recently recognized by the Center for Green Schools of the U.S. Green Building Council and received a Climate Leadership Award from Second Nature and ACUPCC.

Charlie Hales, mayor of the City of Portland, discussed the city's efforts to develop partnerships to address sustainability challenges. In particular, Mr. Hales highlighted the relationship the city has with local universities, including PSU and Oregon Health Sciences University. These relationships have evolved from an opportunistic partnership to one that focuses on developing shared strategies and a synergy between how the city and universities can address key sustainability issues. These synergies require the involvement of all levels, ranging from leaders to students. Students have been a major driver; for example, hundreds of students at PSU are engaged in research and academic training that will prepare them to become practice leaders in the fields of sustainability, urban planning, energy, and business. Students, faculty, and researchers at PSU are developing sustainability best practices that will ultimately be implemented in partnership with other universities and the city. The results of this partnership are evident throughout the city, including in several transportation initiatives.

The city continues to face several significant sustainability challenges. One in particular is a Superfund site located on the Willamette River. This poses a significant challenge as engineering and environmental management solutions must be affordable and effective while ensuring business continuity. Homelessness is another significant challenge in Portland, despite efforts to develop partnerships, programs, and facilities that serve the homeless. Another issue is the overlapping responsibilities of city and county government; universities can also play a role in informing and advising local government on how to better accomplish its goals.

Portland has increased the amount of affordable housing in the city. For urban renewal districts, 30 percent of the tax revenue is set aside for affordable housing, which is managed by the Portland Housing Bureau. Some development agreements require as much as 25 percent of the housing in a given district to be

affordable housing. Ultimately, these agreements over performed and more than 25 percent of the housing in some districts was affordable housing. Portland has also used a mixed-use zone in neighborhoods and zoned for higher density along main streets. There is an ongoing debate in Portland regarding how much parking should accompany mixed use zoning.

Mr. Hales commented that one thing Portland has embraced is to live in the present day and improvise when needed on new projects. The streetcar project for Portland serves as an example of how the city pushes forward to make progress. As the city was moving forward with the project, it was being financed with tax increment financing, assessments from local property owners, parking revenue, and any other way the city could find funds. Even once all the capital costs were financed, the operating costs were still unfinanced as the project was progressing. The goal was to keep the project moving and have confidence it would come together, which it did successfully.

The city will continue to demonstrate leadership in making Portland a model of planning and sustainability, said Mr. Hales. The city-university partnership is a successful one that develops solutions to these sustainability challenges, and it can serve as a model for other cities. The city may be better able to solve difficult urban problems because of the strength, quality, and depth of this partnership.

## INTEGRATING RESEARCH INTO URBAN SUSTAINABILITY STRATEGIES

Colin Harrison, distinguished engineer emeritus from IBM, discussed IBM's Smarter Cities program and how research and technology contribute to urban sustainability initiatives. In the mid-2000s, there was a realization that the world was becoming instrumented—a very large number of devices were being deployed and connected to networks to serve as indicators of different events. Sometimes these were direct sensors, such as those that sense environmental phenomenon, but often they were indirect, such as those that aggregate usage numbers from cell towers. This awareness led Dr. Harrison to lead a study called Life on an Instrumented Planet, which investigated what it would be like to live on a planet with so much information available, in terms of big data and the aggregation of terabytes of data. This data could also be applied to improve the operational efficiency of urban systems. This well-known systems approach was applied to urban systems and sustainability goals, such as reducing greenhouse gas emissions, waste, and energy consumption, as well as improving transportation, etc. A city is comprised of many systems that interact, and it was necessary to try to integrate these systems. Resilience and social behavior also became areas where IBM could apply information technology, and the idea of a Science of Cities emerged (Figure 3-1).

Telecommunications and data networks, continued Dr. Harrison, were being built to run cities or large corporations without much consideration of how they

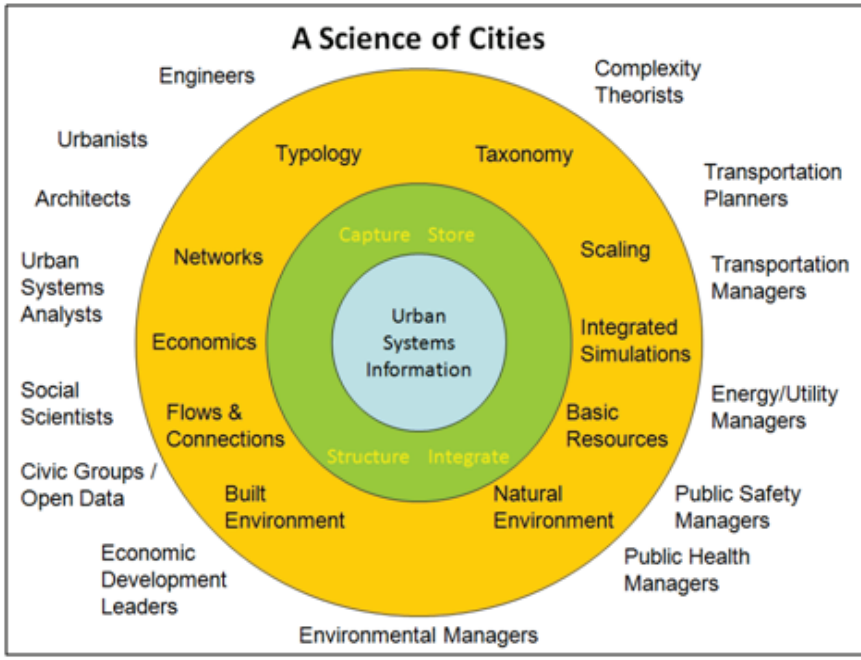


**FIGURE 3-1** A Science of Cities.
SOURCE: Colin Harrison, presentation, May 29, 2013

would perform under adverse conditions like earthquakes or tsunamis. The rise of the global economy has introduced risk into these systems—for example, by connecting industries in North America to manufacturers in the northern part of Japan. Although this opens up many options for supply chain managers, natural disasters pose risks all around the globe, and the more extensive the network, the higher the risk of disruption. The frequency of natural disasters that cause major perturbations is rising as well; since 1960, the amount of damage due to natural disasters has increased significantly, reaching the hundreds of billions of dollars. Cyberattacks also pose a threat to global information networks, including electrical utilities and smart grids. All of these elements are integrated into the system of systems that comprise sustainable and resilient urban centers. Technology can play a role in the solution as well. The "cloud," for example, allows for a technology platform that is inherently resilient because it is geographically dispersed; operational loads can be moved across regional and country boundaries.

While much attention is given to the physical infrastructure of cities, ultimately it is people that make up the city, said Dr. Harrison. Research is needed on how people live in the city and how they interact with city services. The city

provides capabilities to people, and the public is using those capabilities, resulting in a need to synergize two complex systems. The idea behind Smarter Cities is to build the information interface between these two systems. Much research is being done on urban systems, looking at scaling issues, policies, and innovation in new technologies. However, Dr. Harrison noted, this is analogous to trying to understand human physiology by studying public health statistics: Although one would learn a great deal, one would never learn how the human body actually works. Understanding how the city actually works in relation to the composition of these two complex systems is the thrust behind the research with Smarter Cities.

Joseph Danko, managing director of urban programs at CH2M HILL, discussed different approaches to integrating research into urban sustainability, including rapidly deploying research and the power of social networking in creating sustainable cities. In the rapid deployment of research, technology development has a valley of death: a gap between the science behind the technology and commercial success. Partnerships are critical in overcoming this valley of death, with universities and national labs playing a key role in the initial investigation and feasibility. Scaling up technologies from the pilot phase to commercial viability requires an understanding from technologists on the practitioner level; there is a need to simultaneously develop technologies and conduct real pilot testing in the field. There are important linkages among city and state partners, infrastructure engineering, technologists, and university partners to develop a community of practice to test new ideas (Figure 3-2).

Social networking also can be key to creating sustainable cities because it enables communities to participate and share ideas about solutions, such as

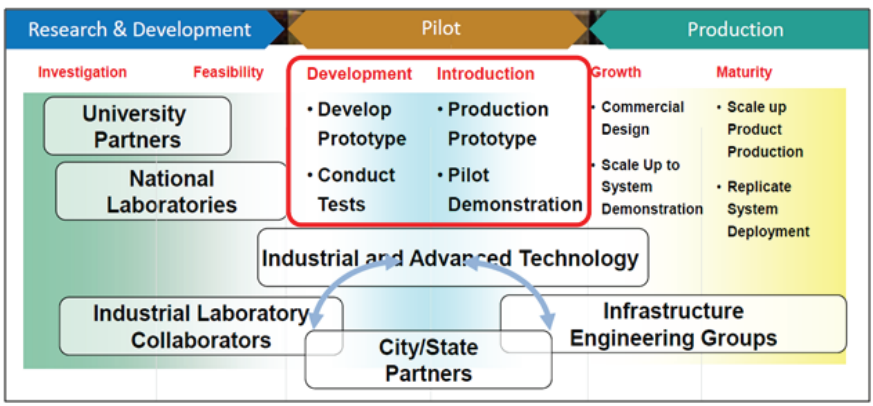


**FIGURE 3-2** Linkages between city and state partners and others to develop a community of practice to test new ideas.
SOURCE: Joseph Danko, presentation, May 29, 2013.

renewable energy, stormwater management, and waste reduction. By making a public portal available, a city enables residents and businesses to understand the city's goals, make better informed choices, and provide feedback into the system. The Urban EcoMap from San Francisco and GreenUp DC are examples of portals that can relay information from the city to businesses and residents.

Lawrence Baker, research professor in the Ecological Engineering Group of the Department of Bioproducts and Biosystems Engineering at the University of Minnesota, discussed the importance of data. Years of research has generated a lot of data that is never analyzed or used for meta-data analysis, Dr. Baker said; this is the case not only with universities, but also with cities. In 2011, his group acquired a stormwater database for a watershed district in St. Paul, MN. The district had been using it only to calculate manual loading from nutrients, but by further analyzing the data, Dr. Baker was able to reveal much more information about how pollutants were moving through the ecosystem. A challenge with data management is retaining databases that can be accessed by the public, an area where universities could play a role. Cities could also partner with universities in order to better utilize these datasets.

The city-university partnership would offer benefits for the city as well as the university. For the city, these could include:

- Solving problems by moving outside bureaucratic silos
- Utilizing cutting-edge science and technology
- Improving the efficiency and effectiveness of programs
- Cultivating students as future employees
- Cultivating an early adopter model

For the university, benefits of this partnership would include:

- Sharpening theories and having opportunities to solve real-world problems
- Utilizing the resources of cities, such as case study sites, databases, and expertise of practitioners
- Leveraging research funding
- Exporting products (e.g., models)
- Repurposing the extension mission of land-grant universities

As an example of how such partnerships work, Dr. Baker explained his own partnership's efforts on street sweeping in St. Paul, MN, which required the collection of data for 4,600 trees. His group found that leaf litter can compose about half of the total phosphorous yield in an urban watershed. Every tree and hard surface in St. Paul was mapped out using NASA's LIDAR satellite data, and when one layer was overlaid on the other, it was possible to determine which street sweeping regimes would be most effective at reducing nutrient flow into the watershed. This has led to more work looking at the path of nutrients through

urban systems, focusing on mapping sources where flows can be interrupted to protect water quality. This work is most effective when the university and the city share information and data; it is the needed connection between the theory and practice.

One challenge Dr. Harrison encountered in his work with the Smarter Cities program at IBM was being able to acquire data from municipal agencies. He recommends external integration: Instead of working with municipal agencies to integrate among themselves, encourage them to publish their data so that others can build the integration on the outside. This use of open data could be applied to integrating systems at local and federal levels, and it could be done more quickly and more efficiently than if these agencies were to do it themselves.

Jonathan Fink, vice president for research and strategic partnerships at Portland State University, discussed the challenge of translating the science of cities in a way that makes sense to practitioners in cities. There can be a translational gap between the areas the National Science Foundation may fund academic research to investigate and the information a practitioner in a city needs to make better-informed decisions. There needs to be a way to bring these two disparities together. There are four main sectors involved in different aspects of this research: government, nongovernmental organizations (NGOs), universities, and corporations (Figure 3-3).


**FIGURE 3-3** The four main sectors in urban research.
SOURCE: Jonathan Fink, presentation, May 29, 2013.

Each of these sectors approaches research on urban systems differently:

- The government sector, including federal, state, and local agencies, funds basic research and applied research. These agencies also set policies that would dictate how such research would be incorporated into practice.
- Universities conduct both basic and applied research using funding from a variety of sources, which can serve to inform public policies. The university itself can also serve as a laboratory for trying out new policies or new research ideas.
- NGOs are generally not primarily funding agencies but conduct applied research and disseminate results through advocacy activities.
- Corporations fund applied research that often is directly applicable to cities or, could be brought into urban practice. Much innovation and technology that comes out of the private sector results in applications in cities. The private sector can also create new markets, which feeds back into research and new technologies.

Much research is conducted across these different sectors, and it can be challenging for a city manager to integrate a lot of this into their work. An exchange program could be helpful, where someone from industry would work with the city for a given amount of time, and then vice-versa, so that there is an exchange of information.

Universities can play a unique role in bringing together these varied entities to cut across different domains, such as transportation, water, and land-use issues, which would otherwise be a part of several federal and local agency missions and affect multiple companies in the private sector. There have been successful collaborations at the federal level, such as the Partnership for Sustainable Communities, a collaborative effort of the Environmental Protection Agency (EPA), Department of Housing and Urban Development (HUD), and the Department of Transportation (DOT); however, in practice, this partnership has faced limitations in how funding information has been shared among the agencies. Dr. Fink offered another way to organize federal agencies working on urban systems by drawing an analogy to the human genome project. Twenty years ago there was a major research initiative to map the human genome with the ultimate goal of trying to help cure human diseases by understanding this common system that operates in all humans. Similarly, there are many different components in an urban system, different funding mechanisms, and different groups asking research questions about how to integrate these systems. Using this analogy could help address these urban issues by using cities as a vehicle to integrate the currently ongoing but disparate research across the government, university, corporate, and NGO sectors. The appropriate organizational structure—whether it is a federal agency or a collaboration of universities—remains unclear, but there is a need to bring cohesion to these different systems and research efforts.

## FEDERAL EFFORTS IN PROMOTING URBAN POLICY AND RESEARCH INNOVATIONS

Jim Lester, president of the Houston Advanced Research Center, described Houston as an interesting laboratory because the city manufactures approximately one-third of the refined products and over half of the petrochemical products used by the United States. Houston's size and coastal location results in air quality, water quality, and human health challenges to sustainability. Also contributing to Houston's uniqueness is that it is the largest city with no zoning. Culturally, the region is very business driven and tends to be anti-regulation. One of the success stories Dr. Lester noted was about Houston's air quality; business leaders realized that to attract talented new employees they wanted, Houston needed to be as desirable a place to live as possible. To do that, air quality had to be improved and green spaces and parks added around the city.

A lot of work is being done with free markets in Houston, including mixed use development and smart growth, which allows for development and walkable streets in a way that does not require new regulations, said Dr. Lester. There is also a drive to reduce risk, especially in terms of flooding, due to proximity to the Gulf of Mexico and hurricanes. Houston now purchases 50 megawatts of wind energy annually; harnessing wind energy has also been a rural development strategy, allowing farmers to maintain their livelihoods. Also related to energy, Houston is installing distributed generation with combined heat and power systems, and it has recently implemented electric car charging stations and a bike share program. All of these programs have been helped financially by federal funding. Federal regulation, such as the Clean Water Act and the Air Quality Act, have also been instrumental in moving many of these initiatives forward. Funding for research on and demonstration of best practices that move technologies and policies forward to get adopted is key.

Ann Bartuska, deputy under secretary of research, education, and economics (REE) at the U.S. Department of Agriculture (USDA), discussed lessons learned at USDA in building capacity and trying to connect across agencies and organizations. The agency has increasingly recognized its importance in urban environments, because in building urban infrastructure there is a critical role for agriculture and natural resources. For example, the Urban and Community Forestry Program in the Forest Service, part of USDA, supports projects and research related to an array of urban and community forestry issues.[1]

The Baltimore Long-term Ecological Research (LTER) Site is also an example of how USDA has been conducting research in an urban environment, said Dr. Bartuska. The Baltimore LTER, initially an integrated ecosystem watershed project, was transplanted to the urban environment with a defined watershed. The research began by looking at the hydrology, but soon the community's social fab-

[1] See www.fs.fed.us/ucf.

ric became relevant to the research as well. Baltimore has a city regulation stating that any house that has been abandoned for more than 1 year is to be torn down. These resulting vacant lots appearing in the center core of the city presented an opportunity to take a fully integrated approach, knitting together the ecological and social aspects of the research in a meaningful way.

One study that came out of the Baltimore LTER led to a better understanding of urban soils. Because urban agriculture is increasing, knowledge about urban soils is increasingly important for cultivating crops and siting community gardens. Agricultural systems are being re-evaluated, and because front yard and community gardens are on the rise, there is a reframing and restructuring of urban infrastructure around these urban agriculture systems. Stormwater runoff is also part of understanding these systems and can be mitigated by increasing permeable surfaces. Urban systems are now being viewed as large watersheds, and the biogeochemistry, ecology, and hydrology that have been applied to traditional watersheds are now being applied to understanding these urban ecosystems. Tools to help address manage these urban systems are available as well; the i-Tree tool, for example, started as a fairly simple aid for decision making about the quantity and types of trees to plant, but it has grown to incorporate much more information, such as water patterns, energy patterns, and the amount of $CO_2$ captured.[2]

Partnerships are important, Dr. Bartuska stressed. For example, USDA has been working with New York City on their MillionTreesNYC initiative, which is changing the fabric of the city; this partnership has led to the establishment of a USDA office and research site in the city and to other city initiatives such as urban agriculture. USDA is also partnering with EPA on the Urban Waters Federal Partnership.[3] In addition, USDA is involved in a partnership focusing on the Green-Duwamish watershed near Seattle. The project—a collaboration among the EPA, Forest Service, and the Natural Resources Conservation Service—is working with local communities and tribes to restore the watershed's ecosystem and help salmon populations recover.

Danielle Arigoni, deputy director of the Sustainable Communities Program at EPA, also spoke about partnerships and about EPA's work with HUD and DOT as part of the Sustainable Communities Partnership. The partnership focuses on six livability principles developed in 2009 that set clear policy objectives for all three agencies to follow. There is a strong commitment to this partnership at the EPA, and that commitment is starting to filter down through the agency. Ms. Arigoni commented that culture change is slow in federal agencies, but they are seeing more now than before. One key effort from HUD is the Sustainable Community Regional Planning Grant; before HUD issued the notice of funding availability, the agency went to communities and held listening sessions to receive feedback. A recurring theme was the need to include nontraditional partners and community

[2] See www.itreetools.org.

[3] See www.urbanwaters.gov.

organizations and to make the consortia more representative of stakeholders. The Sustainable Communities Partnership has also worked to de-silo regional government efforts at EPA, HUD, and DOT; these agencies are working together in the regions in a way that they historically had not operated, because the agencies' staff are engaged and on the ground making connections.

There are challenges to the partnership, such as budget cuts across agencies, as well as outdated policies that focus too closely on just one domain and do not facilitate the cross-sectoral work that the partnership tries to achieve. To work across these sectors and de-silo the efforts of the agencies, staff must spend a lot of time and energy coordinating meetings and keeping initiatives moving. Over time, however, there has been trust and commitment built up among the agencies and slowly those barriers are coming down. One step that has made efforts easier was the use of common language in requests for proposals and notices of funding availability. Such steps help signal to communities that there is consistency across different agency programs about the importance of the livability principles, regional planning, and community engagement in project implementation.

Sustainability and environmental protection have economic benefits, Ms. Arigoni noted, and EPA recognizes that sustainability does not resonate unless there is an argument for its economic benefits. The Sustainable Communities program works directly with communities to recraft growth opportunities and to make investments that deliver multiple benefits rather than just one. One example would be to create an ecodistrict that re-uses captured stormwater and enhances the pedestrian experience rather than just re-directing flow into sewers. Land use is also being analyzed more, and there are relevant trends to consider, such as population per square mile decreasing over time and home sizes increasing. Additionally, the building sector's energy usage is growing, and greenhouse gas emissions from transportation are still increasing, largely due to growth in vehicle miles traveled nationally. There are ways to reduce these trends by looking comprehensively at land-use design, population density, and proximity to amenities, which are addressed in EPA's 2013 report *Our Built and Natural Environments: A Technical Review of the Interactions Among Land Use, Transportation, and Environmental Quality*.[4] Changing building and zoning codes at the local, regional, and state level can also address land-use issues. Engaging with standard setting organizations, such as the International Code Council, helps to build more sustainable practices into these codes and have them adopted at the local level.

Jay Williams, director of the Office of Recovery for Auto Communities and Workers at the Department of Labor, experienced working for communities firsthand as mayor of Youngstown, OH. Currently, the Office of Recovery for

[4] U.S. Environmental Protection Agency. 2013. *Our Built and Natural Environments: A Technical Review of the Interactions Among Land Use, Transportation, and Environmental Quality.* EPA 231-K-13-001. Washington, DC: EPA Office of Sustainable Communities.

Auto Communities and Workers is working with dozens of communities across the country that are transitioning from a post-industrial state to the next stages of the restructuring of the auto industry. Youngstown is one of these communities, having experienced both economic and social challenges. During the past 5 years, Youngstown experienced a loss of over 35,000 jobs, a precipitous drop in population, and an increase in vacant homes and fallow land. The community needed a new understanding of how it defined its role in the regional and global economy. They began to shift from being a city that is surviving to being one that is sustainable. At the same time, there has been growing consensus among mid-level cities in the United States that there needs to be a multi-faceted, multi-dimensional approach to addressing sustainability in these communities, and including a better understanding of the role cities play in the regional economy. Federal agencies have had a strong role in this by engaging directly with mayors, local elected officials, and other stakeholders.

The Office of Recovery for Auto Communities and Workers, created in 2010, is one example of how the federal perspective has changed and is seeking to rebuild the manufacturing communities that were at the core of automotive manufacturing. Although the industry saw a near-collapse, it has resuscitated and the companies are profitable again; however, many communities are still struggling and were left with the shell of the auto manufacturing facilities. There is still a need for federal investment to help bring back these communities and put them on a pathway to sustainability. One federal program doing this is the Strong Cities, Strong Communities (SC2) initiative from the Department of Commerce. This program, first announced in 2011, seeks to strengthen neighborhoods, towns, cities, and regions by enhancing the capacity of local governments to develop and execute economic visions and strategies, providing technical assistance and access to federal agency expertise, and creating new public and private-sector partnerships. There were seven pilot cities in the program: Chester, PA; Cleveland, OH; Detroit, MI; Fresno, CA; Memphis, TN; Youngstown, OH; and New Orleans, LA. The program has made an impact in these communities by ensuring that urban development has encompassed economic development and sustainability principles. There has been a new entrepreneurial spirit in many of these historically manufacturing cities that has driven new economic development.

André Pettigrew, executive director of the Climate Prosperity Project, Inc., discussed how mitigating climate change could become an economic opportunity. Over the past 10 years, there has been tremendous growth in innovation, job creation, and business efficiency around climate change mitigation. Mr. Pettigrew's theory of change is that climate action plans need to be translated into economic development plans. Economic development in communities affects quality of life issues, and economic development and long-term thinking need to incorporate climate change mitigation in order for real progress to be made. There is an opportunity to cross political boundaries in discussing sustainability. There is a need for cities to work at the regional level, which is important for mitigat-

ing environmental degradation, but also for industry and economic development. There are challenges, however, with politicians and economic developers unaccustomed to working across these political boundaries.

Mr. Pettigrew noted that Climate Prosperity Project, Inc., recently issued a publication compiling lessons learned from four communities pursuing a low carbon economy.[5] One key lesson was that when energy efficiency is aggregated across larger scales, there is a stronger business case to developers for including technologies such as solar panels on homes. Another important example is the portfolio of energy that the Denver metropolitan region has developed, which had considerable support from the former governor Bill Ritter, who is now director of the Center for the New Energy Economy at Colorado State University. The diversity of energy options, such as solar, wind, natural gas, and coal, has garnered political support and brought a diversity of groups together to address the state's needs. The approach has been more pragmatic, in that there has been support from the coal and oil refineries to help develop wind, solar, and biofuel capacity.

**Outstanding Challenges to Urban Development**

- Connect regional sustainability planning efforts to low-income communities,
- Community capacity building that empowers residents to be more active participants in sustainability,
- Effectively align and leverage traditional community economic development resources to catalyze private sector investment,
- Generate business opportunities for small, women, and minority-owned businesses,
- Connect job seekers and employers through effective Workforce Development strategies, and
- Develop affordable housing and transit options connected to jobs in the region.

SOURCE: André Pettigrew, Climate Prosperity Project, Inc., May 29, 2013.

Federal support is also important, and the American Recovery and Reinvestment Act (ARRA) was important in connecting economic recovery, climate change, and clean energy.[6] The federal money ARRA provided was able to support ideas and empower programs that mayors and local government had, but had no way of funding. These programs help sustain clean tech markets. Mr. Pettigrew noted that this is a dynamic business landscape, and there are core green and adaptive green activities. Core green is defined as the clean tech market that has been developed over the years, while adaptive green companies

[5] Climate Prosperity Project. 2011. Towards a New Prosperity. How Business and Regions are Creating a Prosperous Low-Carbon Economy through Energy Savings, Economic Opportunities and Job Creation. [Available online: http://cleaneconomysolutions.org/site/wp-content/uploads/2013/02/TowardsANewProsperity_2011.pdf]

[6] In response to the economic crisis, Congress passed the American Recovery and Reinvestment Act of 2009—commonly referred to as the "stimulus" or the "stimulus package" (www.recovery.gov).

apply the tools and technologies from the core green companies, such as the construction companies that have adopted the green technologies. It is important for these industries to build the demand, grow the market, and support the base. For an economic developer, public policies such as renewable portfolio standards can help drive this growth, but the initial investments, such as those made under ARRA were important for starting the momentum.

# 4

# Advancing Sustainable Communities

Elizabeth Willmott, project manager at Climate Solutions' New Energy Cities program, discussed efforts at the city level to address climate change mitigation, focusing on a case study from Issaquah, WA. New Energy Cities targets cities with populations under 250,000 to meet aggressive goals for reducing greenhouse gases by accelerating climate solutions in a variety of sectors. Cities of this size want to do something on climate change and clean energy but do not have the capacity to implement many programs, she said. In a report issued last year examining innovation in 34 cities, New Energy Cities found that many cities were implementing clean energy goals for reasons that focused on the economic value and not sustainability principles. Incentives were varied; some were prompted by federal funding and others by self-financing efforts.

New Energy Cities has evolved from focusing on community visioning workshops to a longer view and deeper-level approach focusing on fewer cities. The program only works with cities that already have aggressive greenhouse gas reduction goals or are on the cusp of adopting them. This ensures that the cities will actually achieve reductions and will contribute to the reductions needed on a planetary level. The approach is focused on greenhouse gas accounting and creating sustainable energy strategies based on this accounting that complement local plans. New Energy Cities worked with Issaquah to meet the city's goal of reducing greenhouse gas emissions by 80 percent. To do this, an energy map was created that depicts the complex systems of energy production, consumption, and greenhouse gas emissions flowing through Issaquah (Figure 4-1). The sources of energy are found on the left side of the diagram, and the lines flowing through represent the amount of energy generation from each source. This diagram helps to visually represent energy sources. Even though hydroelectric power is a major

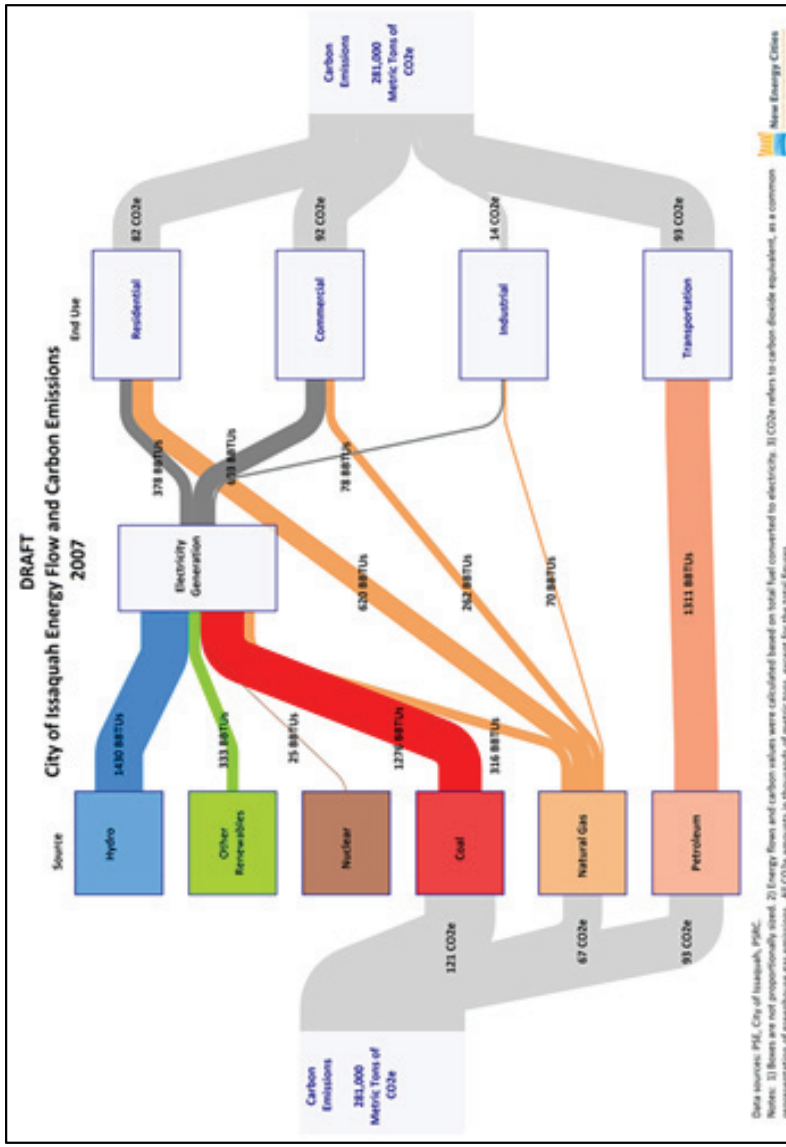


**FIGURE 4-1** Energy map for Issaquah, WA.
SOURCE: Elizabeth Willmott, presentation, May 29, 2013.

source of electricity for the city, coal-powered electricity from Puget Sound Energy is also a major contributor. Petroleum is mainly used for transportation and is a major source of carbon emissions, as is natural gas, which is mainly used for heating in residential, commercial, and industrial buildings. The graphic is not designed to be precise, but rather to show the order- of-magnitude difference between energy sources, uses, and carbon emissions.

The next step after mapping the energy sources, flows, and carbon emissions was to address how Issaquah would be able to reduce emissions to meet the 80 percent reduction goal. Under a business-as-usual scenario, as Issaquah's population grows, their GHG emissions will also grow. Reaching their reduction goals would require multiple strategies, but some existing laws would help, such as the Corporate Average Fuel Economy (CAFE) standard and renewable portfolio standards.[1] Other initiatives that would contribute to meeting the reduction goal include replacing all coal with renewable energy and implementing the state's policy goal of reducing vehicle miles traveled 50 percent by 2050. It would also be necessary to address the existing built environment, specifically with the use of natural gas for heating purposes. Collaborating with other cities in the region could help provide a more unified dialogue with the regional utility and political entities to further practices and policies that could help these cities meet their GHG reduction goals.

John Robinson, associate provost for Sustainability at the University of British Columbia (UBC) discussed universities and cities as living laboratories. One UBC project that is addressing climate change and research is the Meeting the Climate Change Challenge (MC3).[2] The MC3 project brings together researchers, practitioners, and policy makers from non-governmental organizations, provincial ministries, and three of British Columbia's universities to identify emerging best practices and innovations in community climate change responses and to develop strategies to share policy innovations and facilitate peer-to-peer learning exchanges. The project aims to stimulate the widespread knowledge mobilization needed to move communities beyond the changes required by current legislation and policies.

The province of British Columbia in 2008 implemented a carbon tax of $10 per tonne of carbon dioxide equivalent (CO2e) emissions, which increased to $30 per tonne in 2012.[3] The unique aspect of this carbon tax was that it was revenue neutral by reducing corporate and income taxes at an equivalent rate. Although there was much debate about using revenues for green investments, by making the carbon tax revenue neutral it became politically invulnerable,

[1] The purpose of CAFE standards is to reduce energy consumption by increasing the fuel economy of cars and light trucks (www.nhtsa.gov/fuel-economy). A renewable portfolio standard (RPS) is a regulatory mandate to increase production of energy from renewable energy sources, such as wind or solar (www.nrel.gov/tech_deployment/state_local_activities/basics_portfolio_standards.html).

[2] See www.mc-3.ca/whos-involved.

[3] A tonne is also known as a metric ton and is a unit of mass equaling 1,000 kilograms (2,204 pounds).

since removing it would essentially be equivalent to raising taxes. The carbon tax clearly targeted reducing carbon-using behaviors, and it ultimately saves the average British Columbian citizen money, said Dr. Robinson.

British Columbia also has a community charter where the province challenges municipalities to be carbon neutral in order to avoid paying the tax. Most of the municipalities signed the charter and are committed to being carbon neutral; however, there is no clear path for these municipalities. Eleven communities were identified because they exhibited best practices that could inform other communities, and a peer-to-peer learning network was set up. Learning between cities is a very powerful way to extend activities, and setting up this network in order to share best practices was important. There were several key finding that resulted from these efforts:

- The Province was an important driver by creating new programs or helping to accelerate existing ones.
- Reporting requirements generated new metrics and allowed municipalities to institute a set of processes for recording and reporting these metrics.
- Framing climate change policies in a broader context of sustainability allowed municipalities to do more within the policies.
- The underlying drivers of consumption need to be changed in order to reach climate goals through climate policy.
- Partnerships with senior levels of government and the private sector are important, because many decisions are far reaching and beyond the jurisdiction of a municipality.
- Giving target setting capability to an external advisory group pushes the envelope on what is possible and results in stronger goals.

One role the university can play is to engage citizens in thinking about the future of their region and about sustainability, continued Dr. Robinson. UBC set up the Greenest City Conversations (GCC) Project (Figure 4-2). The technology now exists to engage citizens online and by different media. The unique advantage this technology allows is that hundreds of thousands of citizens could be actively engaging in thinking about the future of their city. Outcomes from the GCC Project include:

- Desire to engage online is higher than desire for individual privacy.
- Designing for emergent dialogue promotes peer-to-peer interaction.
- Inter-institutional collaboration is critically important but has many barriers (e.g., different cultures, expectations, and timeframes).

Universities are also able to leverage the planning process. The Regenerative Neighborhood Project at UBC addresses redevelopment more holistically and aims to develop actual tools that the university can use in its own planning

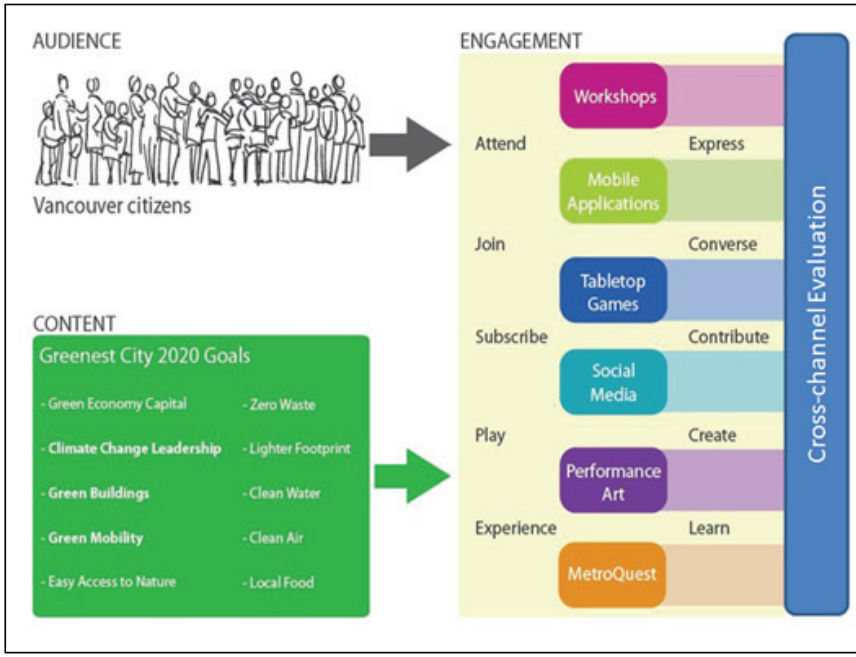


**FIGURE 4-2** Vancouver's Greenest City Conversation Project.
SOURCE: John Robinson, presentation, May 29, 2013.

and development. One example is to take a map of the development process and then incorporate sustainability into the process (Figure 4-3). The challenge is to start adding capability to the process so that sustainability is automatically incorporated and built into standard operating procedure—what is referred to as the lens and the gradient. The lens refers to the additional tools, such as mandated integrated design into university buildings and mandated sustainability targets at the front end of the process. The gradient refers to how the standard operating procedure has changed in a way that these tools and practices are not able to be reversed but instead are done automatically. The concept of the lens and the gradient is the idea of continuous improvement: every project is automatically more sustainable.

The challenge moving forward is to develop a suite of tools and processes that can be applied more generally to other organizations and cities, said Dr. Robinson. Universities can play a role in this by using the campus as a test bed. Universities have unique characteristics. First, they are single-owner occupiers of significant capital stock. Also, universities can accept a longer payback. If the investment has academic value, then a 15-year payback is acceptable. Last, universities both conduct research and teach. The whole campus is able to be turned into a labora-

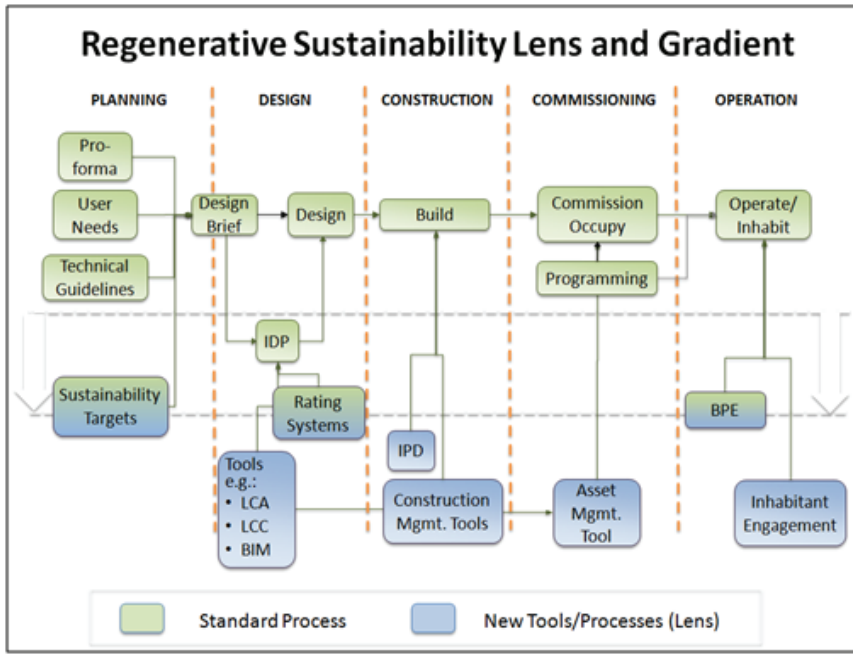


**FIGURE 4-3** Incorporating sustainability into development processes—the Lens and Gradient.
SOURCE: John Robinson, presentation, May 29, 2013.

tory for every sustainability decision made that affects the campus. The university is also capable of taking on risks and testing new innovative technologies because they are able to absorb failures, learn from them, and publish the results to educate others. UBC liberalized the intellectual property process and lets the private sector take the technology for commercialization. The university does not do any of the commercializing itself and works closely with the private sector in order to ensure that it is applied. The university benefits from this because it gives them a unique recruiting advantage for attracting talented students. These partnerships with the private sector are important, but partnerships with other entities, such as cities, are also key to incorporating sustainable solutions. For example, UBC has a memorandum of understanding with the city of Vancouver to work on district energy and the challenges involved in implementing it, such as low electricity prices, waste disposal, and transportation issues. This allows the university to engage the students and faculty on these issues, which solves real challenges and provides opportunities for learning.

Mike Hoglund, director of the Metro Research Center (Metro), discussed the role the Portland Metropolitan Region has played in mitigating and adapting

to climate change. Portland historically has been known for its planning, starting in the 1970s with the adoption of Oregon's Senate Bill 100, which required comprehensive plans and the involvement of stakeholders in planning. In the early 1990s, Metro realized that the region was going to reach the limits of the urban growth boundary and that land needed to be used more efficiently. Work then began on the Regional Vision: The 2040 Growth Concept, which took the city's comprehensive plan and expanded it to a regional scale.[4] The plan had a regulatory component, and Metro had the regional authority to implement the plan, unlike many regional governments.

Presently, there are six regional outcomes that take a triple-bottom-line approach and are the driving principles in the 2040 plan: vibrant communities, equity, economic prosperity, transportation choices, clean air and water, and climate leadership. Regarding climate change, four main focus areas are being addressed: greenhouse gas planning from light-duty vehicles, analytical tools and methods development, a climate prosperity approach for jobs in the region, and climate preparedness and adaptation. To accomplish these objectives, Metro aggregates on a neighborhood scale high-density and mixed-use land use around housing, walkable communities, and alternative modes of transportation, such as walking and bicycling, and then connects neighborhoods with high capacity light rail and street car transportation.

One key result has been a decline in vehicle miles driven and an increase in bicycle traffic, Mr. Hoglund said. Since 1991, bicycle traffic has increased by six to sevenfold in the region. Residents in the Portland metropolitan area travel about 19 vehicle miles per day per capita, which is lower than the national average of about 23.5 vehicle miles per day. It has been estimated that driving four miles less per person per day yields a savings of about $1 billion per year for the region. Driving less also results in lower greenhouse gases. Metro has also been conducting greenhouse gas inventories to help establish a baseline and track progress toward targets. Because conventional sector-based inventories did not capture the dynamics of the Portland region, a consumption-based inventory was used instead. It includes energy consumed within the region, transportation emissions, and materials and goods consumed and processed for recovery or waste management in the region. Contributions from consumption were important to Metro from a policy standpoint, and they indicate where to concentrate efforts.

Strategic public investment has also been important for addressing climate change in Portland communities. Almost all funding has gone toward the 2040 plan, with investments in high capacity transit, multi-modal boulevards, and other travel options to reduce the impact of vehicle miles traveled. It has also been important to invest in adaptation, and over the last 15 years Metro has purchased 12,000 acres to protect open space and ensure they are militating against landslides, flooding, and development associated challenges. Targeted regulations

[4] See www.oregonmetro.gov/index.cfm/go/by.web/id=29882.

are used for housing density, stream protection, parking management, street design standards, street connectivity, and multi-modal mobility corridors. In all of these efforts, the private sector and universities provide leadership and partnerships. Partnering among these entities offers expertise, governance, and research opportunities.

Lillian Shirley, director of the Multnomah County Health Department, discussed opportunities for local government to address climate change and create the conditions to improve health outcomes. The health community sees itself as a key element in sustainability; the community has been changing its language to avoid health jargon and instead to discuss co-benefits and working across multi-sector partnerships. Co-benefits include reducing the urban heat island effect, resiliency against climate change, and preventing chronic diseases. There needs to be more work on making sure that sustainability includes vulnerable communities, and one way the county health department has tried to engage these communities is by inviting community-based environmental groups, public health equity groups, and culturally specific organizations that represent ethnic and linguistic minorities to come to the table and join discussions around these issues.

The Health Department worked with the city of Portland to develop a health equity lens, which has been applied to a Safe Routes to School program and decision making around prioritizing resources to high need areas. Supporting school districts to secure transportation resources has been an element of this program. One school district that was experiencing poor health outcomes received $169,000 from the Oregon Department of Transportation, a grant that helped address the environmental and place-based issues that need to be supported for better health in the school community. Another middle school was awarded funds to construct crosswalks and covered biking structures. These projects were picked by asking the communities what they wanted. Another school installed water fountains that filtered water and took all soft drinks out of the school. Middle school is a key place to influence life-long behavioral decisions, and these programs help to set positive trends in the lives of children.

Food is also an important focus area, and the Health Department has a goal to increase access to healthy and local food and to improve healthy eating, said Ms. Shirley. This is done by identifying food sources that school commercial kitchens need and can source locally, and by teaching children where their food comes from, how to decrease carbon footprints around food, and how to pick fruits and vegetables that are in season. They also are working to ensure that Women, Infants, and Children (WIC) coupons are available at farmers' markets so that these communities can have access to fresh fruits and vegetables. Community gardens are also important in providing these benefits to more vulnerable communities.

Health impact assessments and outcomes are important to track and can inform decision making. For example, the Health Department tracked and mapped the Portland region's urban heat island effect and found that it occurred mostly

downtown, along major roads, and around industrial areas; it was also found along communities with low-income housing. Reducing this effect would not only help address climate resiliency but also improve the health and welfare of the communities along these high-traffic corridors. Helping families feel that they and their communities are healthy increases their engagement, and continuing to engage citizens' groups in discussion will increase the likelihood that policies will be implemented.

## BEST PRACTICES FOR SUSTAINABLE COMMUNITIES

John Cleveland, president of the Innovation Network for Communities, discussed research funded by the Kresge Foundation and the Urban Sustainability Directors Network (USDN) on cities working to achieve carbon neutrality.[5] This research, conducted in partnership with O-H Community Partners, determined the building blocks and developmental pathway toward carbon neutrality in urban environments. The study included an overview of power sources and their carbon levels. Carbon wedge analyses were reviewed, along with an inventory of 180 research projects on carbon neutrality. An 80 percent reduction in total emissions by 2050 was used as a proxy for carbon neutrality. Most cities have set interim carbon neutrality goals, and a relatively small number of cities have set long-term goals. Cities with populations of more than 500,000 that have the goal of reducing carbon 80 percent by 2050 only account for about 8.7 percent of the total U.S. population, demonstrating that solving the entire carbon problem in the United States by focusing on cities will not be successful. Some cities have developed fairly highly standardized sets of strategies and targets for addressing carbon neutrality, the study indicated. However, there continues to be a need for standardization, particularly for cities involved in developing these efforts.

Systems involved in meeting carbon-reduction goals include those for transportation, energy, and water, and all need to be redesigned, Mr. Cleveland said. This requires the owners of these systems to internalize carbon-reduction goals. Sustainability directors in cities can contribute to this process by motivating transportation systems, waste systems, electric utilities, and others to internalize these goals. Another challenge is that cities often omit consumption-based greenhouse gas emissions when developing targets for carbon neutrality. For example, the city of Boston does not assess emissions related to air travel into and out of Logan Airport. Cities do not adopt targets addressing these types of emissions because they are related to traded-good sectors that they either believe they cannot control or do not want to address because they may be related to economic development. Carbon neutrality goals will not be reached by relying on cities alone, but cities can serve as laboratories for innovation to drive state policy and inform federal policy.

[5] See www.carbonneutral.in4c.net.

Melanie Nutter, director of the San Francisco Department of the Environment, provided background on best practices to advance urban sustainability in San Francisco. San Francisco is setting ambitious targets for reducing greenhouse gas emissions. Similar to a number of other cities, San Francisco has a goal of reducing carbon by 25 percent below 1990 levels by 2025 and 80 percent below 1990 levels by 2050. The city also has a goal of reaching 100 percent renewable energy by 2030 and zero waste by 2020. To achieve zero waste, the city has embraced several innovative policies, including a mandatory composting and recycling ordinance and a construction and demolition ordinance required for any commercial construction facility that diverts 65 percent or more of its waste from the construction site. In the transportation sector, the city's goals include becoming the electric vehicle capital of the United States and seeing a mode shift of 50 percent to public transit, walking, and biking by 2020.

San Francisco developed financial incentives to motivate action, said Ms. Nutter. For example, GoSolarSF is a program that provides rebates to individuals who put solar panels on their homes, and this financial incentive has helped spur interest in renewable energy in San Francisco. Technology tools are key to making information accessible, and CH2M Hill developed an energy map in conjunction with the GoSolarSF program to better inform residents about the program. Citizen and community engagement is a critical component of sustainability, and the city is undertaking robust outreach and education campaigns to ensure it can meet its ambitious targets, Ms. Nutter said. In addition, a green jobs program that the Department of the Environment created four years ago called Environment Now is designed to hire underemployed residents from underserved communities, train them in eco-literacy, and employ them to work on behalf of the Department of the Environment.

Networks also serve as a venue for disseminating information, and the city of San Francisco works with three key networks: Green Cities California, which brings together sustainability directors from Californian cities to share best practices; the Urban Sustainability Directors Network (USDN), a network of over 100 sustainability directors who share best practices; and C40, an international network of the 40 largest carbon-emitting cities around the world. San Francisco also created the Business Council on Climate Change, a public-private partnership that provides an opportunity for the Department of the Environment to engage with the business community.

There are opportunities for cross-sector collaboration among federal, state, and local government, academia, and NGOs and the private sector, Ms. Nutter said. Cities struggle with engaging the private sector, and this is an area where cities could improve in order to advance their sustainability goals. Another opportunity is adaptation planning, which in San Francisco has been a way to engage cross-sector partners because of the many co-benefits offered by adaptation planning. Also, sustainable economic development is an area where collaboration would be helpful in better understanding how to merge the interests of economic

development and sustainability. The silos in city agencies are a microcosm of what exists at the federal level, and challenges remain in breaking down those silos and encouraging city agencies to work together. Cities are very interested in working with researchers and academics on turning theory into practice at the local level, but finding the right research questions to help extract the best definition of problems and barriers at the local level is also a challenge. Although the Sustainable Communities Partnership among the EPA, DOT, and HUD provides an excellent example of joint funding that encourages effective collaboration around sustainability, Ms. Nutter noted that sustainability directors do not have a large role in this program. It will be important for these agencies to engage cities when designing requests for proposals to ensure that the broadest constituency of local city officials and municipal employees can participate in the grant opportunity.

Susan Anderson, director of the Bureau of Planning and Sustainability with the City of Portland, discussed the city's effort to address sustainability issues, including breaking down traditional silos. To encourage collaboration, Portland has merged the traditional land-use planning department with the sustainability office. Technology, behavior change, and urban design will be key to reaching sustainability goals. While technology is crucial to the transition, behavior change is the most essential element and poses the most challenges. With continued population growth in urban areas, additional tools are being developed to encourage a movement toward sustainability. For example, financial incentives have been effective at motivating change. "Normalizing" certain behavior that is consistent with sustainability principles is another approach to making such changes. For example, taking public transit, recycling, riding bikes, and purchasing green energy are now all normal activities in Portland. Federal and state governments can contribute to behavioral change by setting standards that encourage these activities, which will start to normalize them in every city. The city of Portland is working to make it easy for a sustainable lifestyle to be "normal."

Framing sustainability issues in terms of the potential for economic growth has also been important to the city of Portland. For example, jobs have been created as a result of the demand for green building services; the industry has created a class of architects, engineers, and designers who specialize in green design. Urban design is important, particularly when making communities more walkable. It will not be possible to reach sustainability goals through technological development alone, Ms. Anderson reiterated; it will also require behavior change in the public.

Julia Parzen, coordinator of the Urban Sustainability Directors Network (USDN), explained that the USDN allows municipal government sustainability professionals to exchange information and collaborate on best practices related to urban sustainability. This exchange is needed as cities continue to bring in many partners to develop sustainability strategies. There are four stages in developing a network. The first is the conceptual framing and identification of practice

examples. The second includes networking of innovators and proliferation of practices. The third focuses on the maturation of practices, including convergence around common methods and tools, integration of previously differentiated practices, and development of a professional implementation support network. The fourth and final stage includes the standardization of practices which are incorporated into formal training; as part of this stage, a reward system is developed to reinforce desired behaviors.

The USDN develops investment and dissemination mechanisms to encourage sharing with other cities, said Ms. Parzen. The network also includes a local sustainability matching fund to assist USDN members and their partners in collaborating to create, develop, test, and spread high-impact solutions for advancing urban sustainability. By 2018, the goal of the fund is to have accelerated the on-the-ground impact of key practice fields, attracted a large amount of public, private, and philanthropic investment in key innovations, and positioned the United States and Canadian local governments as "go to" sources for innovation. Foundations have demonstrated that they can be strong partners for sustainable development, she added. The USDN has partnered with the Funders Network for Smart Growth and Livable Communities to create a local sustainability matching fund. The USDN is also developing an "innovation survey" to track the status of best practices and their stage of development. The survey information will help the USDN focus its efforts. As ideas percolate, USDN tracks early adopters and how they use tools. To formalize these efforts, the USDN is creating an innovation advisory committee of outside experts in key communities of practice, said Ms. Parzen. This approach will encourage collaboration across federal agencies, universities, corporations, NGOs, and cities.

John Cleveland commented that urban sustainability is analogous to the story about the jet engine. All the technology needed to build the jet engine was in existence for 8 years before the jet engine was ultimately put together. It did not require a fundamental new technology, but rather just the right person to take the parts and put them together in a different way. Currently, many pieces exist, such as IBM's Smarter Cities and the EPA-HUD-DOT Partnership for Sustainable Communities, all of which may be parts of a national system for innovation development around urban sustainability. There may be an opportunity for them to all fit together in a different way.

Susan Anderson from Portland's Bureau of Planning and Sustainability commented that often the research questions are known, but there are not enough resources to pursue them. There is a need to fund the exchange of information, because there is great value in being able to meet and discuss best practices with other cities. Federal money is given to states, but that money tends to be given to smaller cities rather than larger ones, because there is a perception that larger cities can be more self-reliant. There is often much knowledge in these cities, but not the resources—whether human capital or financial—to be able to access that data and come up with results that can be shared with others.

Participants discussed the value in bridging resources and pools of knowledge, whether it be from private industry or academia. One example given is that in manufacturing there are institutions set up to do the translation from research to commercialization—entities like the National Center for Manufacturing Sciences, which is a member-based consortium that aims to increase the global competitiveness of North American manufacturers through collaboration, innovation, and advanced technologies. Such organizations are intermediaries that help researchers bridge that knowledge directly with practitioners. There are few results coming forth at the federal level, some participants commented, but the local level has been very effective at making progress despite fewer dollars and resources by connecting communities, universities, and the private sector.

Jill Fuglister, program officer at Meyer Memorial Trust, discussed the philanthropic role in moving sustainable communities forward. Philanthropy in Portland has not focused exclusively on sustainability but also on different aspects of sustainable and equitable development in the Portland metro region. Part of this work has been through partnerships with Portland State University that apply research in order to help inform and support advocacy work in communities. Philanthropy is a capital provider and also a convener; foundations are able to bring together multi-sectoral organizations to discuss and address issues. A critical next step is aligning and integrating existing community-based infrastructure and connecting to other sectors involved in this work.

Meyer Memorial Trust reviews hundreds of grant applications from organizations all across Oregon, and a recurring theme is that organizations are collaborating more in networks and coalitions, said Ms. Fuglister; however, there is still much fragmentation among groups, and a need for better alignment. Part of this is the need to better understand what the landscape looks like and what organizations already exist before carving out space for new ideas. Fitting new ideas into current agendas and helping shape those agendas would better align many organizations. There are research opportunities to map out this landscape, identifying existing collaborations and gaps that need to be filled. Better understanding is also needed of the infrastructure of our civic organizations and the public, as well as of ways to optimize energy, water, and waste management systems and scaling issues around these systems. This understanding of these systems and scaling issues then needs to be matched with the civic organizations involved in public infrastructure. This would really help inform decision making moving forward, said Ms. Fuglister.

There is an ongoing perception that sustainability is a middle class issue, and social equity needs to be better integrated into sustainability discussions, she continued. It is important to reach out to marginalized communities and integrate their needs with the broader efforts around these issues. Often these communities do not have the resources or opportunity to participate in shaping these discussions, and there needs to be a better effort to reach out. As a capital provider, one instrument Meyer Memorial Trust uses are program-related invest-

ments, which are low-interest loans. These are an effective way to get resources into these communities. Another instrument are mission-related investments, which are more direct investments in mission-aligned opportunities. Although the majority of the trust's funding is in more traditional financial investments, about 15 percent of the funding goes to socially responsible investment opportunities. Meyer Memorial Trust is looking at investments through the lens of the triple bottom line—social, economic, and environmental. One example where the trust is engaging these communities and working toward alignment of issues with civic organizations is Oregon Unlimited, a free online project management platform that allows Oregonians to raise issues, identify needs, and exchange information. The goal is to collectively take action, come up with solutions, and move those solutions out into communities.

# Appendix A

# Workshop Agenda

**REGIONAL APPROACHES TO URBAN SUSTAINABILITY:**
**A FOCUS ON PORTLAND**
**A NATIONAL ACADEMIES WORKSHOP**

May 28-29, 2013
Ecotrust Natural Capital Center
The Billy Frank Jr. Conference Center
721 NW 9th Avenue
Portland, OR

***Tuesday, May 28, 2013***

10:00 AM **Welcome and Introduction**
*Rob Bennett, Executive Director, EcoDistricts and Chair, Workshop Planning Committee*

**Morning Keynotes: Urban Sustainability—A National Imperative**

10:10 AM *Representative Earl Blumenauer, 3rd Congressional District of Oregon*

10:40 AM *Jared Blumenfeld, EPA Regional Administrator, Region 9*

**Session I: Update and Lessons from Portland Region's Sustainability Activities**

Objectives: (1) To provide a common understanding for all workshop participants of the substance and current status of Portland and Cascadia sustainability activities, and (2) to develop a summary of "lessons learned" that could be productively transferred to other communities.

11:10 AM **The History and Lessons of Portland—What Has Worked and What Has Not**
*Michael Armstrong, Policy, Research and Innovation Manager, Bureau of Planning and Sustainability, City of Portland*

11:40 AM **Balancing Development and Urban Sustainability in Vancouver, Cascadia, and Beyond**
*Amanda Pitre-Hayes, Director of Sustainability, City of Vancouver*

12:10 PM LUNCH BREAK

1:00 PM **Sustainable Development in the Region**
*Moderator: Gil Kelley, Practitioner-in-Residence, Urban Studies & Planning—Urban & Public Affairs, Portland State University*

*Renee Loveland, Sustainability Manager, Gerding Edlen*

*Lew Bowers, Central City Division Manager, Portland Development Commission*

*Alisa Kane, Green Building Program Manager, Bureau of Planning and Sustainability, City of Portland*

**Session II: Leveraging the Effectiveness of Portland Area Sustainability Activities**

Objectives: (1) Building upon the morning session, with input from both local and national participants, explore ways, both organizational and financial, to make ongoing efforts in Portland and the rest of Cascadia more effective and relevant through partnerships with state and federal agencies, companies, and associations of cities; and (2) envision how regionally-based urban sustainability initiatives could be leveraged through creation of a multi-agency, multi-sector, National Urban Sustainability Laboratory.

2:15 PM **Leveraging the Effectiveness of Portland Area Sustainability Activities: Perspectives from the Public Sector**
*Moderator: Loren Lutzenhiser, Professor, Urban Studies and Planning, Portland State University*

*Robert Liberty, Director, Urban Sustainability Accelerator, Portland State University*

*Dave Porter, Economic Development Agency, U.S. Department of Commerce*

*Jon Belmont, Program Lead, Energy Conservation, Oregon Department of Energy*

3:30 PM BREAK

3:45 PM **Leveraging the Effectiveness of Portland Area Sustainability Activities: Perspectives from the Private Sector**
*Moderator: Tim Smith, Principal, SERA*

*John Southgate, Director of Business Development, Hillsboro Chamber of Commerce*

*Lorie Wigle, General Manager, Eco-Technology Office, Intel*

*Charles Kelley, Associate Partner, ZGF Architects*

5:30 PM ADJOURN

***Wednesday, May 29, 2013***

8:20 AM *Wim Wiewel, President of Portland State University*

8:30 AM *Charlie Hales, Mayor, City of Portland*

**Session III: Can Scientific and Engineering Research Usefully Inform Sustainable Urban Policy?**
Objectives: To assess ways that scientific research on cities carried out by universities, federal agencies, and the private sector can be translated into forms that are useful and relevant to urban practitioners while still being close enough to the cutting edge of science to interest the most creative thinkers and obtain competitive peer-review funding.

9:00 AM **Multi-Sector Urban System Initiatives**
*Colin Harrison, Distinguished Engineer Emeritus, IBM Corporate Strategy*

9:15 AM **Integrating Research into Urban Sustainability Strategies**
*Moderator: Lawrence Baker, Research Professor, Ecological Engineering Group, Department of Bioproducts and Biosystems Engineering, University of Minnesota*

*Jonathan Fink, Vice President for Research and Strategic Partnerships, Portland State University*

*Colin Harrison, Distinguished Engineer Emeritus, IBM Corporate Strategy*

*Joseph Danko, Managing Director, Urban Programs, CH2M HILL*

10:30 AM BREAK

10:45 AM **The Role of Federal Agencies in Promoting Urban Policy and Research Innovations**
*Moderator: Jim Lester, President, Houston Advanced Research Center*

*Ann Bartuska, Deputy Under Secretary, Research, Education, and Economics (REE), U.S. Department of Agriculture*

*Danielle Arigoni, Deputy Director, Sustainable Communities, U.S. Environmental Protection Agency*

*Jay Williams, Director, Office of Recovery for Auto Communities and Workers, Department of Labor*

*André N. Pettigrew, Executive Director, Climate Prosperity Project, Inc., Clean Economy Solutions*

12:00 PM LUNCH BREAK

**Session IV: How Can Cities Advance Society's Larger Goals?**
Commentators, political scientists, and academics have recently begun making the case that sustainable cities offer the solution to many of society's most vexing problems, from climate change to energy shortages to poverty alleviation to natural disaster resilience to aging with dignity. But in most cases, the officials who

run the cities have more immediate budgetary and political issues that consume their time and energy. Can private foundations and other funding institutions help fill gaps by supporting initiatives that simultaneously advance a city's local agenda while also contributing to the larger societal goals?

1:00 PM **The Role of Cities in Climate Change Mitigation and Adaptation**
*Moderator: Jennifer Allen, Associate Professor of Public Administration and Director of the Institute for Sustainable Solutions, Portland State University*

*Elizabeth Willmott, Project Manager, New Energy Cities, Climate Solutions*

*John Robinson, Associate Provost, Sustainability, University of British Columbia*

*Mike Hoglund, Director, Metro Research Center*

*Lillian Shirley, Director, Multnomah County Health Department, Oregon*

2:30 PM BREAK

2:45 PM **Moving Best Practices Forward for Sustainable Communities**
*Moderator: John Cleveland, President, Innovation Network for Communities*

*Melanie Nutter, Director, San Francisco Department of the Environment*

*Jill Fuglister, Program Officer, Meyer Memorial Trust*

*Susan Anderson, Director, Bureau of Planning and Sustainability, City of Portland*

*Julia Parzen, Coordinator, Urban Sustainability Directors Network*

4:15 PM **Workshop Conclusion**
*Rob Bennett, Executive Director, EcoDistricts and Chair, Workshop Planning Committee*

4:30 PM ADJOURN

# Appendix B

# Registered Participants

**Lisa Abuaf**
Portland Development Commission

**Guy Allee**
Intel

**Jennifer Allen**
Portland State University

**Susan Anderson**
Portland Bureau of Planning & Sustainability

**Danielle Arigoni**
U.S. Environmental Protection Agency

**Michael Armstrong**
Portland Bureau of Planning and Sustainability

**Lawrence Baker**
University of Minnesota

**Ann Bartuska**
U.S. Department of Agriculture

**Adam Beck**
EcoDistricts

**John Belmont**
Oregon Department of Energy

**Rob Bennett**
EcoDistricts

**Earl Blumenauer**
U.S. Representative, Oregon's 3rd District

**Jared Blumenfeld**
U.S. Environmental Protection Agency

**Lew Bowers**
Portland Development Commission

**Mark Brady**
Business Oregon

**Dominic Brose**
The National Academies

**Dan Brown**
U.S. Environmental Protection Agency

**John Cleveland**
Innovation Network for Communities

**Amy Cortese**
New Buildings Institute

**Stan Curtis**
Open Commons

**Jeremy Dalton**
Portland State University

**Joseph Danko**
CH2M HILL

**Ellen Dorsey**
Portland State University

**Jennifer Downing**
Garfield Foundation

**Jonathan Fink**
Portland State University

**Erin Flynn**
Portland State University

**Dan Forbes**
Author

**Jill Fuglister**
Meyer Memorial Trust

**Linda George**
National Science Foundation

**Andy Giegerich**
Sustainable Business Oregon

**Charlie Hales**
Mayor of Portland

**Colin Harrison**
IBM (ret.)

**Ashley Henry**
Climate Solutions

**Mike Hoglund**
Metro Research Center

**Alisa Kane**
Portland Bureau of Planning & Sustainability

**Charles Kelley**
ZGF Architects

**Gil Kelley**
Portland State University

**Tom Kelley**
U.S. Department of Labor

**Chris Knowland**
British Consulate-General San Francisco

**Roy Koch**
Portland State University

**Andrew Lemer**
Transportation Research Board

**Jim Lester**
Houston Advanced Research Center

**Robert Liberty**
Portland State University

**Renee Loveland**
Gerdling Edlen Development

**Loren Lutzenhiser**
Portland State University

**Michelle McCrackin**
NRC RAP

**Connor McDonnell**
U.S. Department of Housing and Urban Development

**Bree McLean**
U.S. Department of Housing and Urban Development

**Thaddeus Miller**
Portland State University

**Ardra Morgan**
U.S. Environmental Protection Agency

**Marina Moses**
The National Academies

**Steve Mullinax**
SW Neighborhoods Inc.

**Melanie Nutter**
San Francisco Department of the Environment

**Julia Parzen**
Urban Sustainability Directors Network

**Trista Patterson**
U.S. Department of Agriculture

**Andre Pettigrew**
Clean Economy Solutions

**Amanda Pitre-Hayes**
City of Vancouver

**David Porter**
U.S. Department of Commerce

**Larry Pryor**
University of Southern California

**Dylan Richmond**
The National Academies

**John Robinson**
University of British Columbia

**Joel Salter**
U.S. Environmental Protection Agency

**Angela Schmiede**
Earth Advantage Institute

**Joel Schoening**
Community Investment Initiative

**Roy Scholl**
U.S. Department of Housing and Urban Development

**Ethan Seltzer**
Portland State University

**Lillian Shirley**
Multnomah County Health Department

**Howard Silverman**
Pattern Labs

**Shweta Singh**
U.S. Environmental Protection Agency

**Tim Smith**
SERA

**Steph Stoppenhagen**
CH2M HILL

**Tara Sulzen**
Portland State University

**Mark Sytsma**
Portland State University

**Eric Vines**
Gray Family Foundation

**Wim Wiewel**
Portland State University

**Lorie Wigle**
Intel

**R. Peter Wilcox**
New Buildings Institute

**Christina Williams**
Portland State University

**Jay Williams**
U.S. Department of Labor

**Elizabeth Willmott**
Climate Solutions

**Kathleen Wolf**
University of Washington

# Appendix C

# Biographies of Planning Committee, Speakers, and Staff

**ROB BENNETT** (*Chair, Planning Committee*) is the founding executive director of EcoDistricts. Mr. Bennett is recognized as a leader in the sustainable cities movement, with 12 years of experience shaping municipal sustainable development projects and policy while working for the Clinton Foundation and the cities of Portland, OR and Vancouver, BC. His work focuses on the intersection of city planning, real estate development, economic development, and environmental policy. His projects include the founding of Portland's award-winning green building program (G/Rated); helping shape the green building and infrastructure strategies for catalytic development projects, including the Brewery Blocks (Portland, OR), South Waterfront (Portland, OR), and 2010 Olympic Village (Vancouver BC); creating the EcoDistricts Initiative: and leading the development of a clean economy roadmap (Climate Prosperity Greenprint) for the Portland metro area. He was a founding board member of the Cascadia Green Building Council and sat on other nonprofit boards, including REACH Community Development, one of the Pacific NW's largest and most innovative nonprofit affordable housing providers. He has lectured throughout the United States and abroad on topics ranging from green economic development, sustainable municipal innovation, and green building policy. Mr. Bennett is a graduate of the University of Massachusetts-Amherst School of Landscape Architecture and Regional Planning.

**JENNIFER H. ALLEN** is an associate professor of public administration and director of the Institute for Sustainable Solutions at Portland State University. Her areas of research encompass environmental and natural resource policy and administration and sustainable economic development, with a particular focus on

green buildings and rural-urban market connections. Prior to September 2009 she served as interim director of the Center for Sustainable Processes and Practices, now named the Institute for Sustainable Solutions, where she supported the development of sustainability-related research and curricula across campus, as well as fostering partnerships between PSU and other institutions in the region and internationally. Dr. Allen has previously worked at the World Bank, Ecotrust, and the Oregon Economic and Community Development Department. She currently serves on the boards of Oregon Forest Resources Institute and Illahee and is a member of the Multnomah County Advisory Committee on Sustainability and Innovation. She previously served on the boards of Shorebank Pacific, Portland Energy Conservation Inc., the Portland Sustainability Institute and the Food Alliance. Dr. Allen holds degrees from Yale University, Yale School of Forestry and Environmental Studies, and George Mason University.

**SUSAN ANDERSON** (*Planning Committee*), director of Portland's Bureau of Planning and Sustainability, leads urban design, planning and code development for Portland, and builds partnerships to advance energy efficiency, solar, green building, clean energy technologies, waste reduction, composting and recycling, toxics reduction, sustainable food, and historic preservation citywide. In the early 90s, she led the development of the first local government Climate Action Plan in the United States. Susan has presented at over 100 venues nationally and internationally on sustainable urban development. She has held director-level positions in the public and private sector, and has a B.A. in economics, B.A. in environmental science, and a master's degree in urban and regional planning. Ms. Anderson was honored as a Distinguished Alumnus of the University of Oregon and as an Outstanding Alumnus of UC-Santa Barbara.

**DANIELLE ARIGONI,** AICP, is a senior policy analyst in EPA's Smart Growth office. Her work there focuses on the affordability and environmental benefits of more-compact green housing and redevelopment. Ms. Arigoni represents EPA on the Affordability subgroup of the HUD-DOT-EPA Partnership for Sustainable Communities; she is the principal author of "Affordable Housing and Smart Growth: Making the Connection" and co-author of "Getting to Smart Growth: 100 Policies for Implementation" and "Smart Growth for Coastal and Waterfront Communities."

**MICHAEL ARMSTRONG** is the policy, research, and innovation manager for the City of Portland Bureau of Planning and Sustainability. His responsibilities include policy and programs addressing climate change, energy efficiency, renewable energy, waste prevention and recycling, sustainable food systems, green building, historic resources, and asset management. Mr. Armstrong coordinated the public processes that led to Portland and Multnomah County's 2001 Local

Action Plan on Global Warming and 2009 Climate Action Plan and tracks the implementation of local carbon-reduction efforts. He has staffed Portland's involvement in Oregon Public Utility Commission proceedings, the citizen Peak Oil Task Force, and the city's sale of carbon offsets to private purchasers. Mr. Armstrong cochairs the Policy Committee for the Urban Sustainability Directors Network and serves on the network's Planning Committee. He received an M.P.A. from Indiana University's School of Public and Environmental Affairs and a B.A. from Cornell University, and he attended Deep Springs College.

**LAWRENCE BAKER** is research professor in the Department of Bioproducts and Biosystems Engineering at the University of Minnesota. The broad goal of Dr. Baker's research and consulting is to develop novel approaches for reducing pollution that are more effective, cheaper, and fairer than conventional approaches. Much of his research in the past 10 years has focused on urban ecosystems, often focusing on mass flow analysis of nutrients, salts, and water at scales from households to urban and agricultural regions. He co-leads the Twin Cities Urban Sustainability Forum, which has the goal of bringing together academics and practitioners to improve the science of urban sustainability, and is a principal investigator in the Twin Cities Household Ecosystem Project. He has also served as chair of an award-winning citizen watershed group, Friends of the Sunrise River, from 2008-2010, as well as on the Citizens League Water Policy Study Committee. Dr. Baker received his Ph.D. in environmental engineering sciences from the University of Florida.

**ANN BARTUSKA** is deputy under secretary for research, education, and economics (REE) in the U.S. Department of Agriculture (USDA). Previously, she was deputy chief for research and development for the USDA Forest Service, a position she held since January 2004. She recently served as acting USDA deputy undersecretary for natural resources and environment from January-October of 2009 and was the executive director of the Invasive Species Initiative in the Nature Conservancy. Prior to this, Dr. Bartuska was the director of the forest and rangelands staff in the Forest Service in Washington, DC. She is an ecosystem ecologist with degrees from Wilkes College (B.S.), Ohio University (M.S.), and West Virginia University (Ph.D.). She has cochaired the National Academies Roundtable on Science and Technology for Sustainability since 2010. She currently cochairs the Ecological Systems subcommittee of the Committee on Environment and Natural Resources of the White House National Science and Technology Council. Dr. Bartuska is active in the Ecological Society of America, serving as vice president for public affairs from 1996-1999 and as president from 2002-2003. She has served on the board of the Council of Science Society Presidents and is a member of AAAS and of the Society of American Foresters.

**JON BELMONT,** program lead for energy conservation at the Oregon Department of Energy, leads the Cool Schools Program, a 4-year pilot program intended to create energy savings projects at public schools in the state. Dr. Belmont has led and developed multiple energy efficiency and conservation programs and projects for the Oregon Department of Energy including the Governor's School Audit Initiative, SB 1149 Schools Program and the Cool Schools Program. He is responsible for developing strategies, initiatives, and programs to promote energy efficiency in public K-12 schools throughout Oregon. Dr. Belmont holds a B.S. in biological aspects of conservation, masters degrees in environmental science and natural resource management and environmental policy, and a Ph.D. in environmental science.

**EARL BLUMENAUER,** U.S. representative for Oregon's 3rd Congressional District, has devoted his entire career to public service. While still a student at Lewis and Clark College, he spearheaded the effort to lower the voting age both in Oregon and at the national level. He was elected to the Oregon Legislature in 1972, where he served three terms and chaired the House Education and Revenue Committee in 1977-1978. In 1978, he was elected to the Multnomah County Commission, where he served for 8 years before being elected to the Portland City Council in 1986. There, his 10-year tenure as the commissioner of public works demonstrated his leadership on the innovative accomplishments in transportation, planning, environmental programs, and public participation that have helped Portland earn an international reputation as one of America's most livable cities. Elected to the U.S. House of Representatives in 1996, Mr. Blumenauer has created a unique role as Congress' chief spokesperson for Livable Communities: places where people are safe, healthy, and economically secure. From 1996 to 2007, he served on the Transportation and Infrastructure Committee, where he was a strong advocate for federal policies that address transportation alternatives, provide housing choices, support sustainable economies and improve the environment. He was a member of the Foreign Affairs Committee from 2001 to 2007, and vice-chair of the Select Committee on Energy Independence and Global Warming from 2007 to 2010. He is currently a member of the Budget Committee and Ways and Means Committee and the subcommittees on Health and Trade. Congressman Blumenauer's academic training includes undergraduate and law degrees from Lewis and Clark College in Portland.

**JARED BLUMENFELD** was appointed by President Barack Obama and former Administrator Lisa P. Jackson to serve as EPA Regional Administrator for the Pacific Southwest in November 2009. Region 9 is home to more than 48 million people in California, Arizona, Hawaii, Nevada, the Pacific Islands, and 147 tribal nations. Mr. Blumenfeld has spent nearly two decades on the front lines of protecting the environment both at home and internationally. His priorities at EPA include strong enforcement; environmental justice; protecting and restoring our

air, land, and waters; building strong federal, state, local, and tribal partnerships; and taking action on climate change. During his tenure at EPA, Mr. Blumenfeld has taken a number of significant actions including: designating the Los Angeles River as "protected" under the Clean Water Act; stewarding a comprehensive judicial settlement to improve water quality for Honolulu; protecting over 5,000 square miles of California's coastal waters by proposing to ban discharge of sewage from cargo vessels and cruise ships; bringing together diverse stakeholders throughout the San Joaquin Valley to develop solutions to some of the nation's worst air quality problems; and leading innovative efforts and building partnerships to support the economy, environmental justice communities, and air quality in the Goods Movement sectors (ports, rail, truck). Before becoming Regional Administrator, Mr. Blumenfeld was the director of the San Francisco Department of the Environment, where he spent 8 years as the primary environmental decision maker for the city. Mr. Blumenfeld helped to initiate many landmark environmental laws that became part of the municipal Environment Code. These included San Francisco's ban of plastic bags, a 2020 zero waste goal, LEED Gold building standards, and an overarching precautionary principle framework. Mr. Blumenfeld's environmental leadership includes chairing the first United Nations World Environment Day hosted by the United States-Green Cities: Where the Future Lives (2005), overseeing the Treasure Island Redevelopment Authority, directing international initiatives to protect eight million acres of wildlife habitat, and editing an annual report on international environmental case law at Cambridge University. He is a founder of the Business Council on Climate Change, an organization that unites businesses around the challenge of climate change. Mr. Blumenfeld has worked for the Natural Resources Defense Council (NRDC), the Sierra Club Legal Defense Fund, and the International Fund for Animal Welfare. Mr. Blumenfeld received his law degrees at the University of London and the University of California, Berkeley.

**LEW BOWERS** is the central city division manager for the Portland Development Commission (PDC). Mr. Bowers is responsible for translating Portland's comprehensive and central city plans into reality, using the tools of both urban renewal and economic development. As the economic and employment core of the region, Portland's Central City vibrancy depends on the work of Mr. Bowers and his team in promoting job creation, urban innovation, and the role of the Central City as a regional asset. Core functions of the division include redevelopment plans and strategies, predevelopment work and client assistance, development and public infrastructure projects, and urban renewal area management and coordination. Mr. Bowers has a history of crafting successful public/private partnerships to achieve city goals. He has more than 30 years experience in urban redevelopment and worked previously for both the cities of Eugene, Oregon, and New Haven, Connecticut. He has a master's degree in public and private management from Yale School of Management and a Bachelor of Arts

from Yale College. He also teaches a course on downtown development for Portland State University.

**DOMINIC A. BROSE** (*Staff*) is a program officer for the Science and Technology for Sustainability Program (STS) at the National Academies where he leads the urban sustainability workshop series. Prior to STS, Dr. Brose was with the Institute of Medicine (IOM) of the National Academies where he collaborated on science policy reports addressing the potential for adverse health effects from exposure of select military personnel to environmental contaminants. Previously, he was an environmental scientist at ToxServices LLC, where he evaluated client product formulations against human health and environmental screening criteria for EPA's Design for the Environment (DfE) program. Dr. Brose received his B.S. in environmental science from Purdue University, and his M.S. and Ph.D. in soil chemistry from the University of Maryland.

**JOHN CLEVELAND** (*Planning Committee*) is vice president and a founder of the Innovation Network for Communities, a national nonprofit that develops and spreads scalable innovations that transform the performance of community systems. John has more than 30 years of experience spanning the public, education, nonprofit, and private sectors. He has done extensive work across the country in human, social, and natural capital formation strategies, including work in sustainable development, green building design, organizational learning, socially responsible businesses, school reform, and economic development. Prior to founding the Innovation Network for Communities with Pete Plastrik, Mr. Cleveland was a partner in Integral Assets Consulting, a for-profit consulting company that specializes in large-scale systems change projects, with a focus on the intersection between private markets and public good. He has written extensively on a broad range of subjects, including systems theory, learning theory, organizational change, sustainable development, innovation, continuous improvement, and world class manufacturing strategy. John has also served on numerous private and public boards, including the West Michigan Land Conservancy, Crystal Flash, and University Prep Academy. He is currently on the boards of New Urban Learning, the Center for Neighborhood Technology in Chicago, I-GO, Sacoma International, CK Technologies and Progressive Architecture and Engineering. John graduated Magna Cum Laude with a degree in city planning from Yale University.

**GLEN T. DAIGGER** (*Planning Committee*) (NAE) is senior vice president with CH2M HILL in Englewood, Colorado. He serves as chief wastewater process engineer and is responsible for wastewater process engineering on both municipal and industrial wastewater treatment projects on a firmwide basis. Dr. Daigger is the first technical fellow for the firm, an honor which recognizes the leadership he provides for CH2M HILL and for the profession in development and implemen-

tation of new wastewater treatment technology. He is also the chief technology officer for the firm's Civil Infrastructure Client Group, which includes the firm's water, transportation, and operations businesses. From 1994 to 1996, Dr. Daigger served as Professor and Chair of the Department of Environmental Systems Engineering at Clemson University. Dr. Daigger is a registered professional engineer in the states of Indiana and Arizona and a board certified environmental engineer. Dr. Daigger received his B.Sc.E. degree, his M.S.C.E. degree, and his Ph.D. degree, all in environmental engineering, from Purdue University.

**JOSEPH DANKO,** managing director for urban programs at CH2M HILL, brings more than 25 years of experience to his role overseeing urban development programs and strategic master planning for cities and communities around the world. He has participated in sustainable projects from master planning and financing through design, construction, and operations, including development of environmental management systems, sustainable communities and agriculture, renewable energy applications, climate change assessment, and waste-to-energy systems. Mr. Danko's extensive experience includes creating a Nondestructive Evaluation/Nondestructive Testing company with Bristol Bay Native Corporation in Alaska; providing senior leadership for our total water management business in Alberta, Canada; serving as project director of an $800 million infrastructure utilities project; and leading an industrial "zero waste" initiative.

**JONATHAN FINK** (*Planning Committee*), a national leader in the development of interdisciplinary research initiatives, is now at Portland State University in the newly created position of vice president for research and strategic partnerships. Fink comes from Arizona State University (ASU) where, as vice president for research, he oversaw the tripling of external funding, the launching of internationally recognized institutes in sustainability and biodesign, and stronger ties between academic research and regional economic development. Dr. Fink was Foundation Professor in the School of Sustainability and School of Earth and Space Exploration and director of the Center for Sustainability Science Applications. He served as director of ASU's Global Institute of Sustainability and its first university sustainability officer from 2007-2009. Dr. Fink served for a decade as the university's senior research officer (1997-2002 as vice provost for research and 2002-2007 as vice president for research and economic affairs). He was also chairman of the geology department (now part of the School of Earth and Space Exploration) from 2005-2007. Dr. Fink is a volcano specialist who studies eruptions on Earth and other planets. His current research and policy interests include urban sustainability, conservation biology, and renewable energy. He is a fellow of the Geological Society of America and the American Association for the Advancement of Science, a trustee of the Arizona Chapter of the Nature Conservancy, a member of the board of advisors of the Smithsonian Institution's National Museum of Natural History, and a member of the National Board of KB Homes.

**JILL FUGLISTER** is a program officer for the Meyer Memorial Trust, where she learns about the great work of nonprofits in the region the Trust services and presents the information to the Trustees, who determine what grants the Trust makes. Prior to joining Meyer, for 12 years, she had the privilege of leading Coalition for a Livable Future, where she worked to connect the dots between a broad array of organizations' efforts aimed at creating sustainable communities in greater Portland. She received a B.A. in government from the University of Notre Dame and an M.S. in environmental studies from the University of Oregon.

**CHARLIE HALES** is mayor of the City of Portland, Oregon, having assumed office on January 1, 2013. Prior to his election as mayor, Mr. Hales served as senior vice president for transit planning at HDR, Inc., where he instituted and managed projects in Cincinnati, Dallas, Los Angeles, Miami, Sacramento, Salt Lake City, and Scottsdale. He has also served on the Portland City Council, where he championed light rail expansion, streetcar development, and safe bicycle routes to reduce traffic congestion and improve the environment. While on the Council, he also inspired the first successful bond measure in half a century for the Parks Bureau, then leveraged the funds to raise enough additional money to build or renovate 110 parks in every area of the city. A decrepit community center in Mount Scott was repaired and outfitted with a swimming pool, the Peninsula Park Center in North Portland was restored, and new community centers rose in East Portland and Southwest Portland. He earned his degree in political theory from an honors program at the University of Virginia. Mr. Hales is on the boards of Friends of Trees and the Portland Parks Foundation. He has been a SMART reader, volunteered at Meals on Wheels and served on the Portland Public Market Committee. His work has been honored by the Bruner Foundation for Urban Excellence, the American Society of Landscape Architects, the Oregon Chapter of the American Planning Association, the League of Oregon Cities, and the Portland Bicycle Transportation Alliance.

**COLIN HARRISON** retired in January 2013 from IBM. He is an IBM Distinguished Engineer Emeritus and was the inventor of IBM's Smarter City technical programme. Dr. Harrison was previously director of strategic innovation in IBM Europe and director of global services research. He is an IBM Master Inventor and a member of the IBM Academy of Technology. His current activities are focused on applying systems methods to resilience solutions for cities and regions. He spent 1972-1977 at CERN developing the SPS accelerator and its distributed, real-time control system. In 1977, at EMI Central Research Laboratories, he led development of the first clinical MRI system. At IBM since 1979, he worked on micromagnetics, medical imaging, parallel computing, mobile computing, intelligent agents, telecommunications, knowledge management, and Smarter Cities. In 2011 he spent several months working in Tohoku, Japan, on plans for the region's recovery from the 3/11 earthquake and tsunami, and he has

increasingly focused on resilient cities. He studied at Imperial College, London and the University of Munich, earning a Ph.D. in materials science. He is fellow of the Institution of Engineering and Technology, life member of the Institution of Electronic and Electrical Engineers, and founder member of the Society for Magnetic Resonance in Medicine. He is an expert advisor to the Swiss Academy of Technical Sciences and has been a visiting scientist at MIT, Harvard Medical School, and Lawrence Berkeley National Laboratory. Dr. Harrison has published some 60 articles and has been awarded some 30 patents.

**MIKE HOGLUND** is director, Metro Research Center, Portland. Mr. Hoglund is responsible for leading a team of over 30 professionals that provide regional mapping, GIS, and forecasting and modeling services. He has 30 years of experience in urban and regional transportation and land-use planning, solid waste management and recycling systems, performance measurement, and sustainable practices. Mr. Hoglund was appointed by the governor of Oregon to serve on the Metropolitan Greenhouse Gas Emission Task Force and has chaired the Oregon Global Warming Commission's Transportation/Land Use Year 2020 Roadmap subcommittee. He is also a member of the Advisory Board for the Oregon Transportation Research and Education Consortium, the University Transportation Center headquartered at Portland State University.

**ALISA KANE** is the green building and development manager for the City of Portland Bureau of Planning and Sustainability. There she works on green capital improvement projects, ecodistricts, district energy, policy initiatives, and partnerships. She has a master's degree in urban planning and has spent the last 18 years working in the fields of green building, community development, and recycling. Ms. Kane is a published writer, a regular speaker at green building events, and an active community volunteer.

**CHARLES KELLEY** is a senior urban designer and architect with more than 27 years of experience. He has had a primary role in redevelopment projects in a variety of types, scales, and contexts, nationally and internationally. He uses design to crystallize community consensus around district systems decisions for institutions and municipalities. He is an expert advisor on the interconnection of district scaled improvements through community engagement in building, mobility, watershed, energy, and open space systems for ZGF Architects. In this role, he is currently working on the Southwest EcoDistrict in Washington, DC, and is a current member of the city's 1 Percent for Green Committee, a past member of the City of Portland Watershed Advisory Group, Stormwater Advisory Committee, and PoSI EcoDistrict Technical Advisory Committee for Water and Vital Communities.

**GIL KELLEY** is an urban and strategic planning consultant based in Portland, Oregon. He advises city, county, and regional governments on strategies for

addressing climate change, sustainable urban development, and organizational aspects of local planning and development functions. Prior to starting his own firm in February of this year, Mr. Kelley served as director of planning for the City of Portland for 9 years and as director of planning and development for the City of Berkeley, California for 10 years. He has also been a planning consultant in California and Oregon for both public and private sector clients. He speaks nationally and internationally on planning and climate change and sits on a number of advisory boards for organizations concerned with public health, climate change, and sustainable urban development. Mr. Kelley is a senior research fellow at the Institute for Metropolitan Studies at Portland State University and is at work on a publication entitled *The Intentional City.* He teaches a Master Class each fall at the University of Amsterdam, NL, for senior-level European planning professionals. Mr. Kelley is a member of the American Planning Association and is active in APA's efforts to educate professional planners.

**JIM LESTER** (*Planning Committee*) holds a Ph.D. in zoology from the University of Texas at Austin and is currently the president of the Houston Advanced Research Center (HARC). Previously, he served as vice president and chief operating officer of HARC. He joined HARC in 2002 as the director of HARC's Environment Group. Dr. Lester is responsible for strategic direction of HARC's programs, which are designed to make more sustainable our management of water, air, and natural resources. From 1975 to 2002, he was a faculty member and administrator in the University of Houston System where he held administrative positions at the University of Houston-Clear Lake as a dean, associate vice president, and director of the Environmental Institute of Houston. During his tenure at HARC, Dr. Lester has been engaged in projects that analyze compilations of datasets from multiple sources to obtain new insights for watershed or landscape management. He also has served in a leadership capacity for the HARC program on air quality science. Dr. Lester serves in an advisory capacity to a variety of organizations. He serves as the chair of the Monitoring and Research Committee of the Galveston Bay Estuary Program, vice chair of the Trinity San Jacinto Basin and Bay Expert Science Team on environmental flows, and on advisory committees for the Texas Sea Grant Program, Texas A&M University College of Geosciences, and the Texas Environmental Research Consortium.

**ROBERT LIBERTY,** director of the Urban Sustainability Accelerator at Portland State University, has worked in many roles and at all levels of government to promote livable and sustainable cities and regions. Liberty was staff attorney and then executive director of 1000 Friends of Oregon, a nonprofit organization dedicated to the implementation, defense, and improvement of Oregon's comprehensive land-use planning program. He worked as a land-use hearings officer, a planning consultant, and a speaker on planning topics in the United States and other countries. He served as senior counsel to Congressman Earl Blumenauer of

Oregon, assisting him with federal policy issues concerning livable communities. In 2004 he was elected to the Metro Council, the metropolitan government in the Portland, Oregon, region and was re-elected in 2008. On the Metro Council he chaired and cochaired committees considering rail transit investments, regional housing policy, and other matters. In his career in higher education Liberty has helped establish relationships with sustainable city planning and design efforts in China and participated in one of U.S. HUD's sustainable communities regional planning grants, helping to develop triple-bottom-line evaluation frameworks for transportation investments. Liberty became director of the Urban Sustainability Accelerator in October 2012. He received his B.A. in political science from the University of Oregon Honors College, a master's degree in modern history from Oxford University, and his J.D. degree from Harvard Law School. During the 2002-2003 academic year, he was a Loeb Fellow at the Harvard Graduate School of Design.

**RENEE LOVELAND,** sustainability manager at Gerdling Edlen Development, has over 15 years of experience in real estate development focused on all aspects of green building. In her role at Gerdling Edlin, she manages the LEED certification efforts across the firm's portfolio. Much of her time is spent working early on with the various design and construction teams in different markets to integrate meaningful energy and water efficiency strategies into buildings. She's worked on over 50 LEED projects, including commercial office (both new construction and renovations), multi-family (both low and mid-rise) and commercial interiors. Ms. Loveland is also a project manager within Gerding Edlen Sustainable Solutions, where she works with public and private real estate portfolio owners to provide tailored retrofit development services as well as master planning consulting services around district-scale infrastructure. She served a 3-year term on the City of Portland's Development Review Advisory Committee (DRAC), is on the board of the Center for Innovative School Facilities, an Innovation Partnership project and is currently president of Toastmasters Club #2265, Essayons. Ms. Loveland graduated from the American University in Paris in 1991 with a B.A. in international relations and minors in both international economics and French and is a LEED AP BD+C accredited professional.

**LOREN LUTZENHISER,** professor of urban studies and planning at Portland State University, explores the ways that cities and people use energy in ordinary and exceptional circumstances. He is interested in how lifestyles shape energy demands and environmental impacts, as well as how policies and social movements affect lifestyles. His research and findings strive to inform energy conservation policy and programs as the world grapples with a changing climate. Dr. Lutzenhiser teaches graduate-level courses in energy and society, sustainable development practices, and research design for the Toulan School of Urban Studies and Planning. He also acts as research associate with the Center for Urban Studies, the research

center of the school. As senior fellow with the Institute for Sustainable Solutions, Dr. Lutzenhiser also considers new ways Portland State University can advance the state-of-the-art in an already innovative local-regional energy efficiency and renewable energy industry. Prior to joining PSU faculty in 2002, Dr. Lutzenhiser was an associate professor of sociology at Washington State University. Living for many years in Montana, he worked as an executive director for a human resources council and as a state community affairs field representative. The desire for social change at the state, regional, and local level led him to doctoral studies. Dr. Lutzenhiser recently contributed to the National Academy of Sciences panel report *America's Climate Choices: Limiting the Magnitude of Climate Change* (2010) and co-edited the book *Comfort in a Lower Carbon Society* (2009). He has authored and co-authored a number of articles in scientific journals including *Social Problems, Energy, Energy Policy*, the *Annual Review of Energy and the Environment*, *The American Behavioral Scientist, Environmental Forum,* and *The International Encyclopedia of Economic Sociology.*

**MARINA S. MOSES** (*Staff*) serves as the director for the Science and Technology for Sustainability Program (STS) in the Policy and Global Affairs Division of the National Academies. In this capacity, she directs the Roundtable on Science and Technology for Sustainability. Under her leadership, the STS Program issued the consensus report, *Sustainability and the U.S. EPA*, and has recently released a multi-sponsored study, *Sustainability for the Nation*. Prior to joining the Academies, Dr. Moses served on the faculty of the George Washington University School of Public Health and Health Services in the Department of Environmental and Occupational Health. Previously, Dr. Moses held senior scientific positions in the Environmental Management Division of the U.S. Department of Energy and the New York City office of the U.S. Environmental Protection Agency's Superfund Program. Dr. Moses received her Bachelor's (Chemistry) and Master of Science (Environmental Health Sciences) degrees from Case Western Reserve University. She received her Doctorate of Public Health (Environmental Health Sciences) from Columbia University School of Public Health.

**MELANIE NUTTER** leads the San Francisco Department of Environment, which helps all San Francisco residents and businesses take an active role in protecting and enhancing the urban environment, produces and publicizes information on sustainable practices, and develops innovative and practical environmental programs for all residents. She was appointed to this position by Mayor Gavin Newsom in July 2010. Beginning in 2005, Nutter served as deputy district director for the U.S. House of Representatives Speaker Nancy Pelosi, where she managed the speaker's district office by supervising staff, addressing constituent concerns, and advising on local policy issues. Ms. Nutter functioned as the district policy liaison to Speaker Pelosi's policy advisors on issues including the environment, energy, transportation, environmental health, women's issues,

and food policy. Ms. Nutter has over 18 years experience in fundraising, events management, grassroots organizing, and media relations. In 2002, she worked as the canvass director for the San Francisco Democratic Party's SF Vote Project and oversaw 2 assistant directors and 80 paid staff on Election Day. Ms. Nutter founded and chairs the Energy and Environment Circle for the Full Circle Fund with the help of Vice President Al Gore and green jobs advocate Van Jones. She has also been a grassroots environmental organizer with Greenbelt Alliance, the Public Interest Research Groups (PIRG), and Green Corps. Ms. Nutter holds a Bachelor of Science degree from Northwestern University in communications and environmental studies.

**JULIA PARZEN** is the coordinator for the Urban Sustainability Directors Network, a network formed to enable public sector sustainability leaders to learn from each other and accelerate achievement of ambitious city sustainability goals. Previously, she has been a foundation program officer for conservation and employment (The Joyce Foundation), a triple bottom line entrepreneur (co-founder and chief executive officer, Working Assets Money Fund), and a leader in state government energy financing (deputy director of the Office of Policy, Planning, and Research, Department of Business and Economic Development, State of California) and federal government economic assistance programs (acting branch chief of industrial analysis, U.S. Environmental Protection Agency). Ms. Parzen is the author of *Credit Where It is Due: Development Banking for Communities* (Temple University Press, 1990). She also co-edited *Enterprising Women* with Sara Gould (OECD, 1990) and co-authored *Financing Transit Oriented Development* with Abby Siegel, a chapter in *The New Transit Town: Best Practices in Transit-Oriented Development*, edited by Hank Dittmar and Gloria Ohland (Island Press, 2004). She has served as the board chair of Working Assets, Muir Investment Trust, Center for Neighborhood Technology, Newberger Hillel Center at the University of Chicago, Akiba-Schechter Jewish Day School, and I-Go Car Sharing. She also has been a board member for Sand County Venture Fund and Anawim Fund of the Midwest. Ms. Parzen has an M.B.A. in finance from the University of Chicago and a B.A. in chinese economics from the University of Illinois at Urbana-Champaign. She graduated Summa Cum Laude, with Highest Honors, Bronze Tablet, and Phi Beta Kappa.

**DAVID PORTER** is a regional economic development representative with the U.S. Department of Commerce–Economic Development Administration. His office is in the World Trade Center in downtown Portland, Oregon, and his service territory includes the entire state of Oregon and 15 southern-tier counties in Washington State from Clark County to the Palouse. He joined EDA in March 2008. Mr. Porter works principally with communities and regions experiencing substantial and persistent economic distress. He helps them identify and leverage opportunities to invest in critical infrastructure and economic development

capacity building in order to attract private-sector capital and higher skilled, higher wage employment. Mr. Porter draws on 30 years of business and organizational management experience acquired in such venues as hospitality marketing, soft goods retailing, educational program sales, and training administration. His background includes 22 years of management-level experience in five different economic development organizations: director of marketing, Economic Development Council of Snohomish County, Everett, Washington; director of economic development, Roanoke County Virginia; marketing manager, Fairfax County Economic Development Authority, Vienna, Virginia; executive director, Kitsap Economic Development Council, Bremerton, Washington; and business development manager for the Washington State Department of Community, Trade and Economic Development in Seattle, Washington. After completing college in North Carolina and military service, he earned a master's degree in Public Administration from the University of Washington and more recently completed an Organization Development certification program at Georgetown University in Washington, D.C.

**ANDRE N. PETTIGREW** is the executive director of Clean Economy Solutions, a nonprofit clean-economy accelerator for metro regions, helping them maximize their existing clean economy opportunity, envision how it could grow, and chart a roadmap for getting there. Mr. Pettigrew is responsible for the strategic management and development of the organization. Mr. Pettigrew was formerly the executive director of the Office of Economic Development for the city and county of Denver under former Mayor John Hickenlooper (now Governor of Colorado). During his tenure the City launched the "Greener Denver Business" program, an economic development strategy in support of Denver Mayor John Hickenlooper's "Greenprint Denver" climate action program. Under Mr. Pettigrew's leadership OED played a major role in supporting renewable energy companies interested in expanding to Denver. He also played a role in recruiting two world class German manufacturing companies—SMA Solar and Repower—which opened major facilities in Denver creating over 700 manufacturing jobs. He is a member of the U.S. Chamber's Environmental Innovation Network. Pettigrew serves on the national sustainability advisory board for KB Home, a national home builder and the technical advisory committee for the U.S. Green Building Council's STAR Community Index. He is currently a fellow at Massachusetts' Institute of Technology's Department of Urban Studies and Planning. Mr. Pettigrew received his bachelor's degree in economics from the University of California at Los Angeles and graduated from the State and Local Government Senior Executive Program at Harvard University's Kennedy School of Government.

**AMANDA PITRE-HAYES** is the director of sustainability for the city of Vancouver. There, she leads a team of 16 to achieve the Council directive to become the world's greenest city by 2020. She has 19 years of experience in

leadership roles at Vancity, the Pembina Institute, Accenture, and The Body Shop Canada. At Vancity, Ms. Pitre-Hayes managed the organization's climate change strategy and led its successful effort to be the first carbon neutral financial institution in North America. As director of climate change consulting with the Pembina Institute, Ms. Pitre-Hayes worked with organizations, such as TD Bank, to become greener by measuring and managing carbon dioxide emissions. As a manager at Accenture, she managed major projects for North American government, energy, telecom, and financial services organizations. At The Body Shop Canada, Ms. Pitre-Hayes served as assistant to the president, supporting the organization with a variety of sustainability initiatives. Ms. Pitre-Hayes is an alumnus of Harvard University's Global Change Agent program and holds an M.B.A. from the University of California, Berkeley.

**DYLAN RICHMOND** (*Staff*) is a research assistant for the Science and Technology for Sustainability Program (STS) at the National Academies. Before joining the Academies the fall of 2010, he attended Georgetown University and graduated with a B.A. in economics in May 2010. While at Georgetown, Mr. Richmond was an editor for *The Georgetown Voice.* He is currently pursuing his M.S. in applied economics from Johns Hopkins University.

**JOHN ROBINSON** is the associate provost for sustainability at the University of British Columbia (UBC) and is a professor with UBC's Institute for Resources, Environment & Sustainability and Department of Geography. Dr. Robinson is responsible for leading the integration of academic and operational sustainability on UBC's Vancouver campus. In that capacity, he directs the UBC Sustainability Initiative (USI) and provides leadership for UBC's academic, research, and operational activities and programs in sustainability. He also represents UBC's sustainability activities to the broader local and international community. Dr. Robinson's research focuses on the intersection of climate change mitigation, adaptation, and sustainability; sustainable buildings and urban design; the use of visualization, modeling, and citizen engagement to explore sustainable futures; creating partnerships for sustainability with the private, public, non-governmental, and research sectors; and, generally, the intersection of sustainability, social, and technological change, behaviour change, and community engagement processes. Previously a fellow of the Trudeau Foundation, he has been a lead author in the last three reports of the Intergovernmental Panel on Climate Change, which won the Nobel Peace Prize with Al Gore in 2007. In 2012, Canadian Geographic magazine named Professor Robinson Canada's Environmental Scientist of the Year, and he received the Metro Vancouver Architecture Canada Architecture Advocacy Award for 2012.

**LILLIAN SHIRLEY** (*Planning Committee*), B.S.N., M.P.H., M.P.A., director of the Multnomah County Health Department, provides public health leadership in

collaboration with community partners to address the county's health needs, and offers health policy leadership on both a county and state level. Her department is the largest provider of safety-net services in the state of Oregon. Ms. Shirley is the appointed vice-chair of the Oregon Health Policy Board charged with implementing health reform in Oregon and is immediate-past president of the National Association of County and City Health Officials (NACCHO). Prior to coming to Oregon, Ms. Shirley was director of public health in Boston and was responsible for all preventive and community-based health services. After participating in the merger of Boston's public hospital with Boston University's medical center, Ms. Shirley served as the first executive director of the newly formed Boston Public Health Commission. In this role, she had executive responsibility for the establishment, design, and organization of the new public health authority in Boston. Ms. Shirley received a master's degree in public health from Boston University and a master's degree in public administration at the John F. Kennedy School of Government at Harvard University. Ms. Shirley served for 9 years as a board member of CareOregon, the state's largest Medicaid insurer. She also is vice president of the Public Health Foundation, a member of the board of Oregon Public Health Institute, the Portland Sustainable Development Commission, an adjunct faculty member in the OHSU School of Medicine Dept of Community Medicine, and a board member of North by Northeast Community Health Center.

**TIM SMITH** founded SERA's Urban Design and Planning Studio when he joined the firm in 2001 and serves as principal at the firm. He has over three decades of experience in architecture, urban design, city and regional planning, campus planning, and transit-oriented development. Lately he has been focused on the interplay between EcoDistricts (neighborhoods or districts dedicated to localized sustainability) and Civic Ecology (the inter-related network of resources flows and human systems that animate communities). Mr. Smith has bachelor's and master's degrees in architecture from the University of Michigan, and master's degrees in both urban design and city planning from the University of Pennsylvania. He has served as vice president of the Portland Planning Commission, on the Portland Chapter AIA Urban Design Committee, and on the Mayor's Central City Roundtable.

**JOHN SOUTHGATE,** director of business development for the Hillsboro Chamber of Commerce, provides consulting services primarily focused on public-private redevelopment projects. While with the City of Hillsboro, Mr. Southgate led the City's efforts to revitalize its downtown, which is the historic heart of the community and which is also served by light rail—it is the western terminus of the Portland region's Westside MAX line which opened in 1998. His key achievements included the formation of an urban renewal area in downtown; amendments to the City's arcane development code which make it more conducive to medium density mixed-use development; as well as the City's manager of "4th/Main," the

first true TOD project in Hillsboro. He also managed the City's role in the "Health & Education District," a partnership with Tuality Hospital and Pacific University's Health Professions Campus which has resulted in approximately $100M of transit supportive institutional development. Before coming to the City of Hillsboro, Mr. Southgate worked with the Portland Development Commission, where he managed the Interstate and Lents Urban Renewal Plans and also worked in the Pearl District and Old Town/Chinatown. In each of these areas he managed TOD projects, while also promoting the revitalization of older commercial districts. Prior to his work with PDC, John worked with the Portland Bureau of Planning, where he ran the City's Historic Landmarks program amongst other duties. He also worked briefly with the City of Gresham as a Senior Planner and Economic Development Manager. A lifelong Oregonian, Mr. Southgate is a graduate of the University of Oregon.

**WIM WIEWEL** assumed the presidency of Portland State University in August 2008. Under his leadership, the university has developed five guiding themes: provide civic leadership through partnerships, improve student success, achieve global excellence, enhance educational opportunity, and expand resources and improve effectiveness. This has brought a renewed focus on expanding the university's civic partnerships in the region and achieving a new degree of excellence through strategic investments. Prior to coming to PSU, Dr. Wiewel was the provost and senior vice president of academic affairs at the University of Baltimore. From 1979 to 2004, Dr. Wiewel was with the University of Illinois at Chicago (UIC), where he most recently served as dean of the College of Business Administration. He also directed UIC's Center for Urban Economic Development. He holds degrees in sociology and urban planning from the University of Amsterdam in the Netherlands, and a Ph.D. in sociology from Northwestern University. Dr. Wiewel has authored or edited 9 books and more than 65 articles and chapters that have appeared in publications and journals, including *Economic Development Quarterly, Economic Geography,* and the *Journal of the American Planning Association*. His most recent books are *Global Universities and Urban Development, The University as Urban Developer,* and *Suburban Sprawl.*

**LORIE WIGLE** leads Intel's Eco-Technology effort, which is focused on the sustainable manufacturing and usage of Intel's products. This corporate-wide function drives Intel's market position across energy efficient performance and design for the environment. In this capacity Ms. Wigle also drives external programs related to client, server, and data center efforts, including Intel's participation in Green Grid and the Climate Savers Computing Initiative. Prior to this position, She was the director of server technology and initiatives marketing for Intel. In that role, she and her team were responsible for Intel Virtualization Technology offerings as well as Intel Dynamic Power Technology and other advanced platform capabilities. Her organization also drove industry engage-

ment on memory and I/O for server platforms. Ms. Wigle has been with Intel for 24 years in a wide variety of marketing and product planning roles and was the general manager of Intel's Internet Imaging Services group. She has an M.B.A. from Portland State University and a B.A. degree from the University of Oregon.

**JAY WILLIAMS** is the executive director of the Office of Recovery for Auto Communities and Workers. ORACW works directly with state and local stakeholders in areas affected by the changing American automotive industry to ensure that they receive the federal support necessary that, when in conjunction with state and local efforts, will help these communities return to a better economic condition. Williams served as the mayor of Youngstown, Ohio from 2006 to August 1, 2011. During his tenure as mayor of Youngstown, Mr. Williams led efforts that have a direct impact on improving the quality of life for the citizens of Youngstown. Mr. Williams is the recipient of the 2007 John F. Kennedy New Frontier Award. Prior to being elected, he spent 5 years as the director of community development for the city. Before transitioning into public service, Mr. Williams enjoyed a distinguished career in banking, which included stints at the Federal Reserve Bank of Cleveland and First Place Bank, as a vice president. He was born and raised in Youngstown. He graduated from Youngstown State University with a B.S./B.A., majoring in finance.

**ELIZABETH WILLMOTT** is the project manager for Climate Solutions' New Energy Cities Program, working with cities to help them meet their carbon reduction goals through innovative programs and policies. She most recently co-authored Powering the New Energy Future from the Ground Up, a July 2012 report on small and medium-sized cities around the United States that are demonstrating leadership in local clean energy innovation. Ms. Willmott was lead author of the World Bank's 2011 climate change adaptation guide for cities in developing countries, co-author of King County's 2007 adaptation guidebook with ICLEI and the University of Washington, climate change aide to former King County Executive Ron Sims, and project manager of the first King County Climate Plan in 2007. She also served as Recovery Act performance and accountability lead for the U.S. Department of Housing and Urban Development, overseeing the results of $13.6 billion in grants to cities and communities around the U.S. She holds a double degree in biology and Chinese language from Williams College and a master's degree in public policy from Harvard Kennedy School.