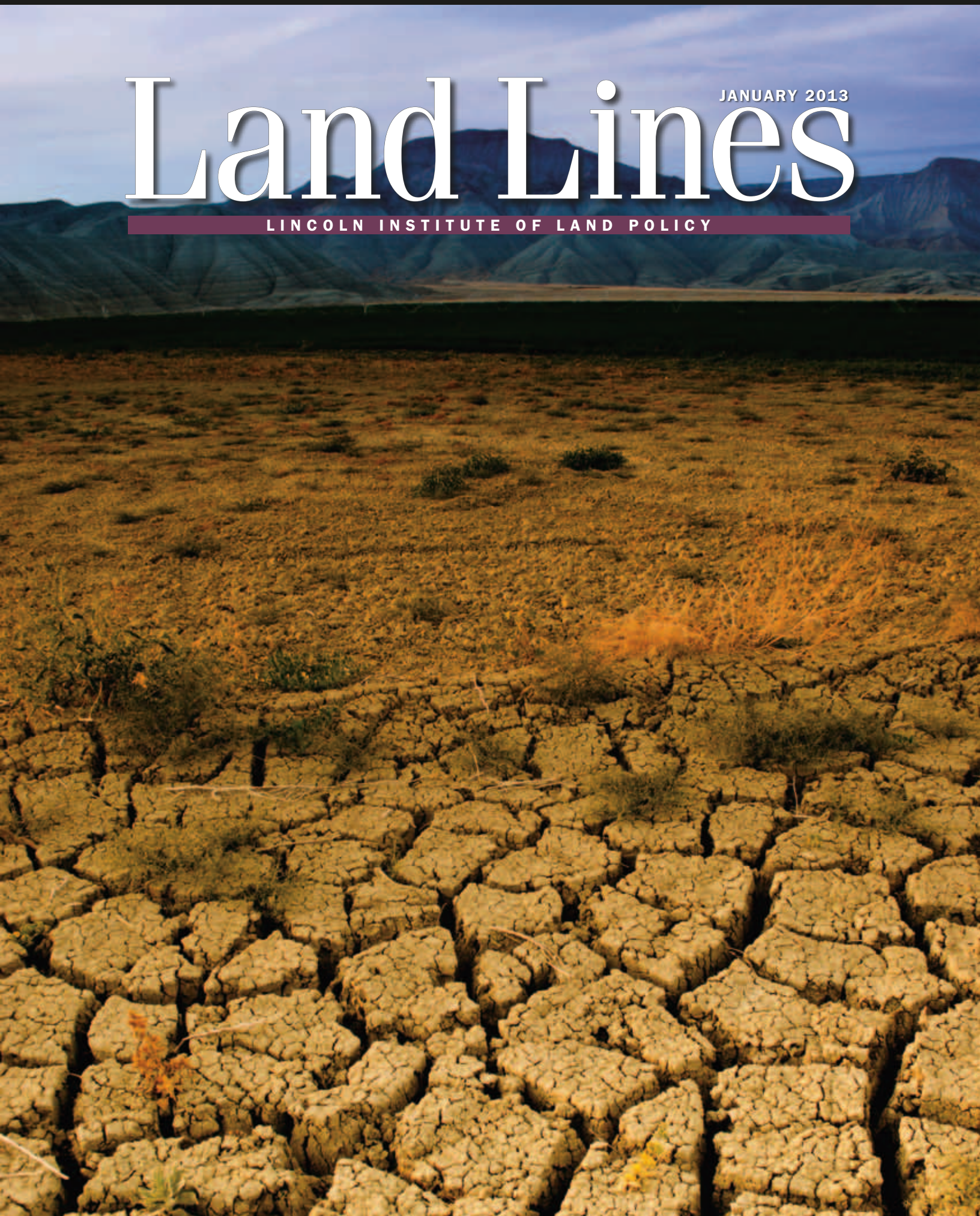
PILOTs in Boston | Climate Change in the West | Bus Rapid Transit in Latin America | Publications | Fellowships

Land Lines

JANUARY 2013

LINCOLN INSTITUTE OF LAND POLICY



Land Lines

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EDITOR
Ann LeRoyer

PRESIDENT & CEO
Gregory K. Ingram

CHAIR & CHIEF INVESTMENT OFFICER
Kathryn J. Lincoln

PUBLICATIONS COORDINATOR
Susan Pace

DESIGN & PRODUCTION
David Gerratt
www.NonprofitDesign.com

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Lincoln Institute of Land Policy
113 Brattle Street
Cambridge, MA 02138-3400 USA

Tel: 617-661-3016 or 1-800-526-3873
Fax: 617-661-7235 or 1-800-526-3944

E-mail: *annleroyer@lincolninst.edu* (editorial content)
help@lincolninst.edu (information services)

Web: *www.lincolninst.edu*

LINCOLN INSTITUTE OF LAND POLICY

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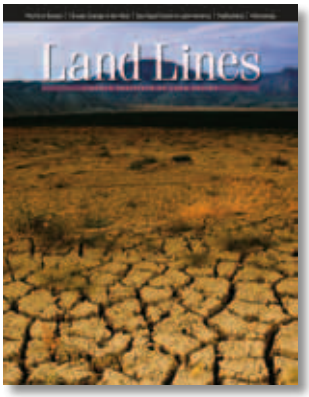

Impacts of climate change on the West

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Energy Efficiency and Cities

Gregory K. Ingram

A large share of national energy consumption takes place in cities—in the United States about three-quarters of energy use is in or related to urban areas. Accordingly, cities offer significant opportunities for energy savings from increased efficiency, but important issues remain: Will market forces produce efficiency gains when appropriate, or will market failures such as imperfect information, unavailable financing, or misunderstood risks impede market solutions? How much do people value energy savings, and how sensitive are they to changes in energy prices? The Lincoln Institute hosted a conference on energy efficiency and cities in October 2012 to address these and related issues, and a few highlights follow.

Valuing Energy Efficiency

Consumers should be willing to pay more for built space that uses less energy. Evidence indicates that users of commercial space value energy efficiency and are willing to pay more for it, and many studies indicate that LEED-certified office and commercial space sells or rents at a premium over traditional space. There is much less evidence of such preferences for residences, in part because it is difficult for most homebuyers to determine the energy efficiency of a dwelling, especially a new one with no operating record.

Some residential developments are now being classified using procedures similar to LEED certification or to the Energy Star ratings such as those used for major appliances. Dwellings in California that have the highest energy efficiency ratings sell at a premium of about 9 percent above units with average energy efficiency. Similar price premiums have been observed in the Netherlands for houses certified at the highest efficiency level using a European certification procedure. Some of these premiums may reflect the improved comfort levels that these buildings provide in addition to energy savings. It also seems likely that the energy efficiency premium observed in California is up to three times greater than the incremental cost of the higher efficiency of these dwellings.

Determining Cost

The cost of integrating energy efficiency into new buildings is less than the cost of improving the efficiency of older buildings. A home built since 2000 uses about 25 percent less energy per square foot than one built in the 1960s or earlier. The technical potential for improved energy efficiency in older homes seems evident, but homeowners face two challenges: to determine which improvements have the highest payoff per dollar spent, and to obtain a contractor and financing for the work.

While many diagnostic tools are available to assess existing dwellings, their accuracy varies widely and depends critically on detailed inputs about both the dwelling's attributes and the household's living style. Obtaining a contractor and financing can involve high transaction costs for households in effort, time, and money. Many utility companies are offering both technical and financial support for energy retrofitting, but progress has been slow.

Changing Energy Consumption

It may be easier to change residential living styles than to retrofit old buildings, and many utilities are experimenting with schemes to modify household behavior. The most common program involves "nudging" households toward more efficient habits by providing periodic home energy reports that compare their recent energy use with that of their neighbors. Analysis indicates that these reports have both a short-term impact on household energy consumption and a longer-term cumulative impact that continues after the reports end. The energy savings from these programs are small, ranging from a half to one kilowatt hour per day for a household, but the program's low cost makes the results as cost-effective as many other policies.

Recognizing John Quigley

This conference was designed with John Quigley, economics professor at the University of California at Berkeley, who passed away before the conference took place. In addition to the original papers on energy and cities, papers on urban economics were presented by some of his former students, colleagues, and coauthors. All of the papers will be submitted for a forthcoming special edition of *Regional Science and Urban Economics*, which will recognize his contributions over a long and distinguished career.

Payments in Lieu of Taxes
THE BOSTON EXPERIENCE

Boston is home to many hospitals, universities, and other tax-exempt organizations.

Ronald W. Rakow

Historically communities with high concentrations of nonprofit institutions such as hospitals, colleges, and museums have struggled with the reduced tax base associated with these tax-exempt properties. For Boston, Massachusetts, the preponderance of tax-exempt property, combined with a high reliance on the property tax for local revenue, has made this impact particularly acute. Beginning in the early 1970s, Boston began seeking payments from its nonprofit organizations as a way of offsetting the loss of revenue and the increase in public service demands associated with the institutions it hosts.

Although these payments in lieu of taxes (PILOTs) expanded over time, the City of Boston remained dissatisfied with its PILOT program. The revenue from PILOTs represented a small fraction of the city's overall budget, and the size of contributions from nonprofit institutions varied widely. Since 2008 Boston has developed and implemented a new approach to PILOTs that has received considerable national attention. This article examines the conditions that led to the development of Boston's new PILOT program, describes its approach, and reports on the city's experience in its first full year.

Constraints on Boston's Tax Base

Boston traditionally has been at the center of any discussion regarding PILOTs. The confluence of several political, fiscal, and demographic forces has created a volatile mix for the city and its nonprofit institutions. Boston is the economic and cultural center of New England and is home to some of the world's most renowned hospitals and universities. As the state capital of Massachusetts, Boston also hosts a large number of government office buildings and facilities. Among its more unusual challenges is the city's small geographic size in relation to its metropolitan area. Boston is the 22nd largest city by population, but it represents the 10th

largest metropolitan area. As a result, exempt institutions that service the entire metropolitan area are concentrated within the city's relatively small boundaries. In fact, over 50 percent of Boston's land area is exempt from taxation (figure 1).

Boston also has a revenue structure that is unique among its large-city peers, primarily because it has no income, payroll, sales, or other significant source of tax revenue. Instead, Boston relies heavily on the property tax, which represents two-thirds of all city revenue (figure 2). While New York or Chicago also have large amounts of institutional property exempt from the property tax, those cities are able to tax the incomes, sales, and other economic activity which the universities, hospitals, and other large nonprofit institutions generate. In contrast, Boston receives no direct compensating revenue associated with the economic activity that is generated by its vibrant nonprofit sector.

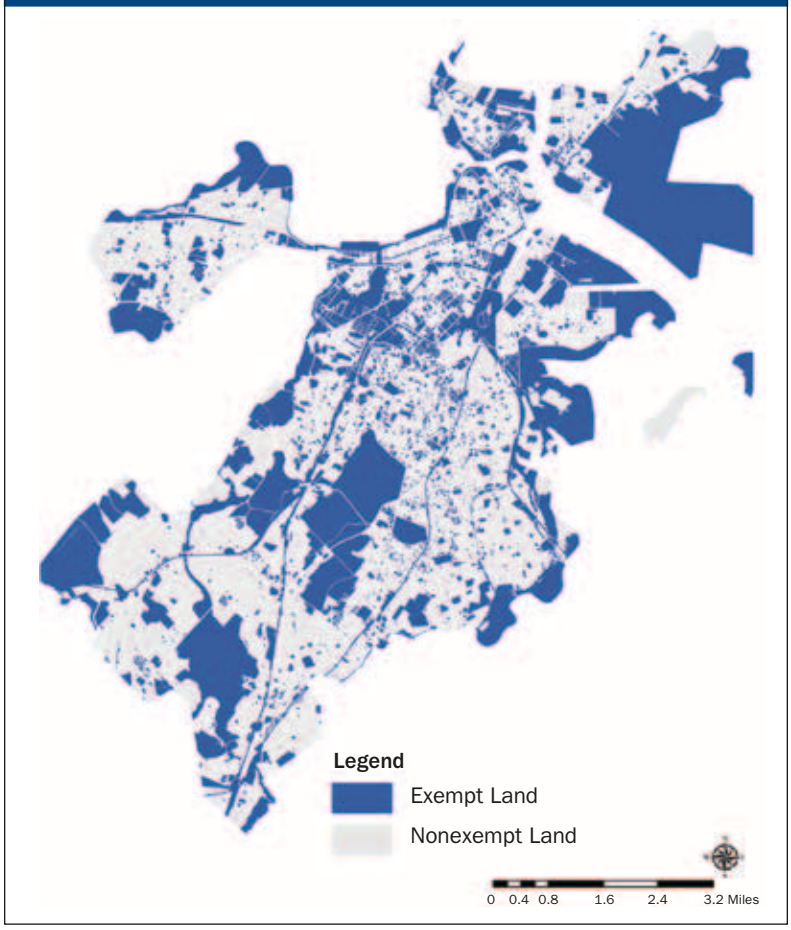
Further, the growth of the property tax in Boston is constrained by Proposition 2½, a statutory limit on the level of property taxes. The most significant limitation is that the property tax levy for existing properties can increase by only 2.5 percent per year. Proposition 2½'s other primary limitation is a cap on the overall effective tax rate of 2.5 percent. As Boston is well below this limit at 1.8 percent, the impact of exempt property is not a factor for this provision as it is in other Massachusetts communities. The combined impact of the concentration of exempt property, the high reliance on the property tax, and the limits placed on property tax growth by Proposition 2½ result in a more profound fiscal impact of exempt property in Boston than in most major cities.

Reconciling the Benefits and Costs of Nonprofit Institutions

Despite these fiscal impacts, Boston is fortunate to have a vibrant nonprofit sector. The city hosts some of the world's most prestigious hospitals and universities that provide exceptional health care, research, and education to their clients. In addition to fulfilling their charitable missions, these large institutions are significant economic generators that form the backbone of Boston's knowledge-based economy. The health care industry alone accounts for 125,000 jobs in Boston.

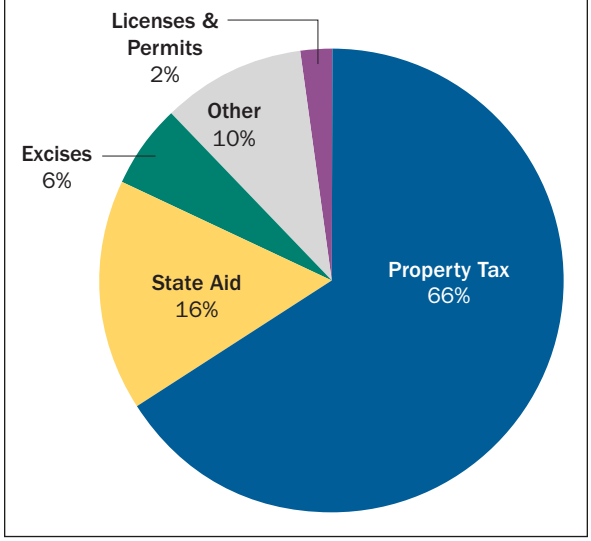
There is an economic disconnect, however, between the benefits of nonprofit institutions and the costs of providing their properties with tax

FIGURE 1
Tax-Exempt Property in the City of Boston, FY2012



Source: Courtesy of City of Boston Assessing Department.

FIGURE 2
Revenue Sources for the City of Boston, FY2013



Source: City of Boston Office of Budget Management (2012).

exemptions. The benefits of Boston's nonprofits do not stop at the city's borders; the educational, scientific, and cultural benefits of Boston's institutions accrue to the region, state, country and, in many cases, the entire world. Yet the cost of providing public services to these institutions and the loss in revenue from removing their properties from the tax base fall squarely on Boston's taxpayers.

This point is critical to understanding the importance of PILOTs to a city like Boston. Many observers believe that the current interest in PILOTs is driven by the short-term fiscal stress associated with the recent recession. According to this school of thought, once the economy recovers and the municipal outlook brightens, the pressure for PILOTs will ebb. Boston's experience contradicts this assertion. The city has struggled with the fiscal impact caused by its nonprofit sector over a long period, through good fiscal times and bad. It is this fundamental disconnect between institutional benefits and fiscal costs that is the ultimate source of this debate. Until these benefits and costs are better reconciled, financial tension between the city and its nonprofits will continue.

Measuring the Fiscal Impact of Tax-Exempt Property

The impact of tax-exempt property on the city as a whole has long been the focus of spirited public discussion in Boston. One question that has often been asked is how much nonprofit institutions would pay if their properties were fully taxable. For a long time this question could not be answered. Since tax-exempt property paid no property taxes, the city had little incentive to maintain accurate data and up-to-date assessments for institutional property. However, the continuing focus on the fiscal impact of exempt property clearly required an answer to this question.

Given the scarce resources available for a project to value exempt property, Boston needed to be creative in coming up with a method to generate reliable assessments while minimizing the costs of collecting data. At the city's disposal was a particular type of tax return that nonprofit institutions are required to file annually, as well as broad statutory authority to request from property owners the information necessary to value their properties.

Boston was able to leverage these tools to collect detailed information on the property owned by nonprofit institutions—specifically, the physical characteristics (size, age, condition) and uses. Most major institutions maintain accurate data on their property holdings. Once the assessors had access to these data, they were able to plug the information into the city's computer-assisted mass appraisal system (CAMA) to generate assessments for the properties. Site inspections were performed to verify the information provided by the institutions and to ensure the accuracy and reliability of the CAMA-generated assessments.

The resulting assessments were then shared with the institutions. Each was given the details on the valuation estimates for their real estate holdings and provided with an opportunity to meet with assessors to review the results and raise any concerns. The city incorporated this feedback to complete the final value for the properties. Given that this was the city's first effort to generate assessments for nonprofit property, this review step provided a valuable check of valuation data quality as well as an opportunity to share the preliminary results of the revenue impact of their property tax-exemptions with each institution.

The analysis, which was completed in 2009, revealed that educational and medical tax-exempt property would have generated $347.9 million in revenue if it were taxable (City of Boston 2010). To put this amount in perspective, it would equate to approximately one-quarter of the city's total tax levy of $1.4 billion in Fiscal Year 2009, and would be equivalent to roughly half the revenue generated by the office, retail, and hotel properties that make up the commercial tax levy (figure 3).

PILOT Task Force

Once the assessment information was used to determine the amount of tax each institution would pay in a nonexempt scenario, a number of shortcomings of the current PILOT program became apparent. While the former program was considered one of the more successful PILOT programs in the country, the amount of realized revenue appeared small when compared with the revenue that exempt properties would generate if they were taxable. PILOT payments from educational and medical institutions in 2009 totaled $14.5 million, or 4.2 percent of what institutions would pay if their properties were taxed, and equivalent to just 1 percent of the city's property tax levy. In addition, the level of participation varied widely among institutions. Some institutions made substantial

contributions under the program, while others made limited payments or chose not to participate at all.

To address these concerns, Boston Mayor Thomas M. Menino appointed a task force to review the PILOT program and asked it to:

- set a standard level of contributions to be met by all major tax-exempt landowning institutions;
- develop a methodology for valuing community benefits;
- propose a program structure that creates longer-term, sustainable partnerships between the city and its nonprofits;
- clarify the costs associated with providing city services to nonprofits; and
- if necessary, provide recommendations on legislative changes needed at the local or state level.

The PILOT Task Force membership drew from a wide spectrum of participants: two leaders each from local colleges, nonprofit hospitals, and Boston's business community; and one each from the city council, public sector unions, and community-based organizations. The Task Force met over a two-year period to explore both the benefits and costs to Boston of hosting its nonprofit institutions and how these factors should be considered in the PILOT process. Also key was the discussion on how to ensure that institutions contribute to the program on a consistent basis. In December 2010, the Task Force recommended the following PILOT guidelines to Mayor Menino.

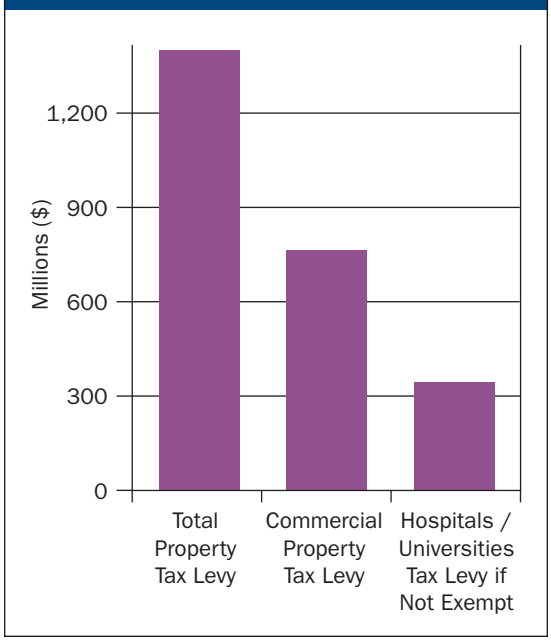
PILOT Program Should Remain Voluntary

The Task Force members believed a legal or statutory requirement for PILOTs runs counter to the spirit of partnership between the city and its nonprofit institutions. That partnership is critical to encouraging broad and uniform participation.

All Nonprofits Should Participate

Much of the PILOT discussion previously focused on hospitals and universities. The Task Force, however, felt all nonprofits that own tax-exempt real estate within the city should contribute to the PILOT program. To protect smaller institutions with fewer resources, the PILOT program was limited to those nonprofits with property valued at more than $15 million.

FIGURE 3
Potential Revenue from Hospitals and Universities for the City of Boston, FY2009



Source: City of Boston (2010).

Determining PILOT Payments

Many alternatives were considered for the basis of PILOT contributions, including a per-student or per-hospital-bed fee, or a charge based on the amount of land or building area. The Task Force determined that a charge driven by the assessed value of the institutions—reflecting size and quality of real estate holdings—would result in the most equity. There was a general consensus that nonprofits should contribute some amount toward their consumption of essential services such as police and fire protection, as well as public works such as street cleaning and snow removal. These services consume approximately 25 percent of Boston's budget, and the Task Force found that a PILOT equal to 25 percent of an institution's fully taxable amount was reasonable.

Credit for Community Benefits

The public benefit provided by nonprofit institutions was a major focus of the Task Force, which recommended that institutions receive up to a 50 percent credit on their PILOT in exchange for community benefits. This credit recognized the significant in-kind contributions made by nonprofit institutions that directly benefit Boston residents. The credit was limited to 50 percent of the PILOT amount to ensure significant cash contributions from each

institution. However, the Task Force felt that if an exceptional opportunity for a program or service were available, the 50 percent cap could be exceeded at the city's discretion.

While the Task Force did not offer detailed specifics on the services that were eligible for PILOT credit, it did provide general guidance on the types of services that should qualify. To be eligible, community services must directly benefit City of Boston residents, support the city's mission and priorities, offer ways for the city and nonprofit to collaborate to meet shared goals, and be quantifiable.

Phase-in Period

Finally, the Task Force recommended that the new PILOT formula be phased in over a period of not less than five years. Given the change in scope of the city's PILOT program, the Task Force understood that institutions would require time to make the necessary adjustments in their budget and financial plans to accommodate increased PILOT amounts.

Implementing the New PILOT Program

When Mayor Menino accepted the Task Force recommendations in December 2010, the city needed a plan to implement the new PILOT program. First, letters were sent to all institutions that fell within the criteria of the program. Each letter included a copy of the new PILOT guidelines and an analysis detailing the calculation of the PILOT that the city would request under the new formula. Each letter also indicated that the city would seek a meeting with each institution in the coming months to discuss the new program.

The subsequent meetings were a critical step in the implementation, providing a forum for each institution to ask questions about the program and to voice concerns. While these sessions were designed originally to provide information to the institutions on the new program, they also provided significant, valuable feedback for the city that in turn offered further guidance on the rollout.

The city's previous PILOT program included contracts that laid out the terms of each institution's PILOT commitment. While the contracts were useful as a reference, their value as a legal instrument was questionable since PILOT payments remained voluntary. For example, the city had never sought to enforce payment under a PILOT contract. As the city faced the question of whether contracts would be employed in the new program, the notion of negotiating, drafting, and executing over 40 contracts with institutions was daunting. Given that the guidelines already provided the details of each institution's requested participation, the city felt those documents should form the basis of the relationship with the institutions and decided to forgo the use of PILOT contracts.

Experience from the First Year

In October 2011, requests for payment of the first installments for FY2012 were sent to all participating institutions, and the results were impressive. The city collected a total of $19.5 million in cash payments, a 28.4 percent increase over what was collected in FY2011 under the previous PILOT program. This represented over 90 percent of what the city requested—an extraordinary level of participation given the first year of a new, voluntary program (figure 4). Boston also received an equivalent level of contributions in the form of community services provided by the nonprofit institutions, consistent with the PILOT guidelines.

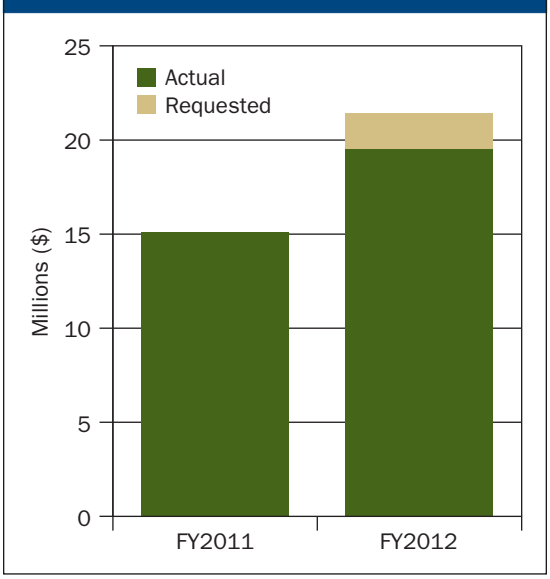
A key component of the program's initial success was the emphasis on promoting a sense of partnership between the city and its institutions. Based on its prior experience, the city understood that a more confrontational approach would not be effective in the short or long term. At the same time, the institutions needed to recognize that as charities they have a level of accountability to their host communities. This accountability was encouraged in part by providing a high degree of transparency in the process. Task Force meetings were open to the public, and materials used during the deliberations were posted on the city's website.

This theme of transparency continued in the implementation phase of the program. Information detailing each institution's participation in the program, from cash payments to the community services provided, was also posted on the city's website. Institutions that had less than full participation in the program were given the opportunity to communicate their reasons. Specific details on the community services delivered by the institutions were also disclosed, providing an opportunity for institutions to highlight and promote their valuable service contributions.

The Importance of Community Services

In its discussions with nonprofit leaders during the implementation of the new program, the city

FIGURE 4
Boston's PILOT Collections in FY2011 and FY2012



Source: City of Boston Assessing Department (2012).

discovered that institutions have a decided preference for providing community services over making cash payments. Given that service delivery is at the core of most nonprofits' charitable missions, this was not surprising. Conversely the city generally places a higher value on cash payments, which provide flexibility in applying resources to meet the highest-priority service needs of the community.

To reconcile these two divergent preferences, the city has recognized that it must further develop its ability to harness the community-service portion of the PILOT program to meet its service demands. Currently community benefits often are offered by the institutions based on their own initiative. While these services have value to the city and its residents, they may not be among the city's current service priorities. Even in cases where specific requests for services came directly from a city official to fill a near-term service gap, such *ad hoc* requests lack the prioritization and review that is associated with a more disciplined budgeting process.

Requests for PILOT services should be planned and prioritized to maximize their value to the city. Under such a structure services are more likely to either reduce or replace the cost to the city of providing a service, or to provide a new service to meet a priority that the city had been unable to deliver previously. Through careful planning, directing institutional resources to priority areas reduces the city's financial commitment and makes it is easier for the city to forgo cash in favor of institutionally preferred services. This planning process is also beneficial to the institutions, as they are better able to budget for their PILOT service commitments. As the program continues through its phase-in period, the ability of the city and institutions to work cooperatively on a structured approach to community services will be critical to the continued success of the PILOT program.

Closing Thoughts

The process Boston has followed to construct its new approach to PILOTs was both thoughtful and inclusive. The expertise and perspectives of the Task Force members, combined with the city's decades of experience on the issue of exempt property, led to program guidelines that were recognized as fair and reasonable. The process also demonstrated that for a PILOT program to be successful the city and its institutions must be partners, not combatants.

This philosophy has formed the basis of Boston's approach to the implementation of its new PILOT program. And, despite its early success, there is still much work to be done. The city needs to balance its need for revenue with the institutions' preference for services. If city officials and local institutions can continue to work cooperatively on the PILOT program, a balance can be struck that will work to the mutual benefit of the institutions, their constituents, and the residents of Boston.

ABOUT THE AUTHOR

RONALD W. RAKOW *has been commissioner of the City of Boston Assessing Department since 1992, and he took on the additional role of deputy chief financial officer in 2011. He was appointed in 2010 to the Board of the Massachusetts Convention Center Authority, and is currently serving as the chair of the Research Committee of the International Association of Assessing Officers (IAAO). Contact: rakow@cityofboston.gov*

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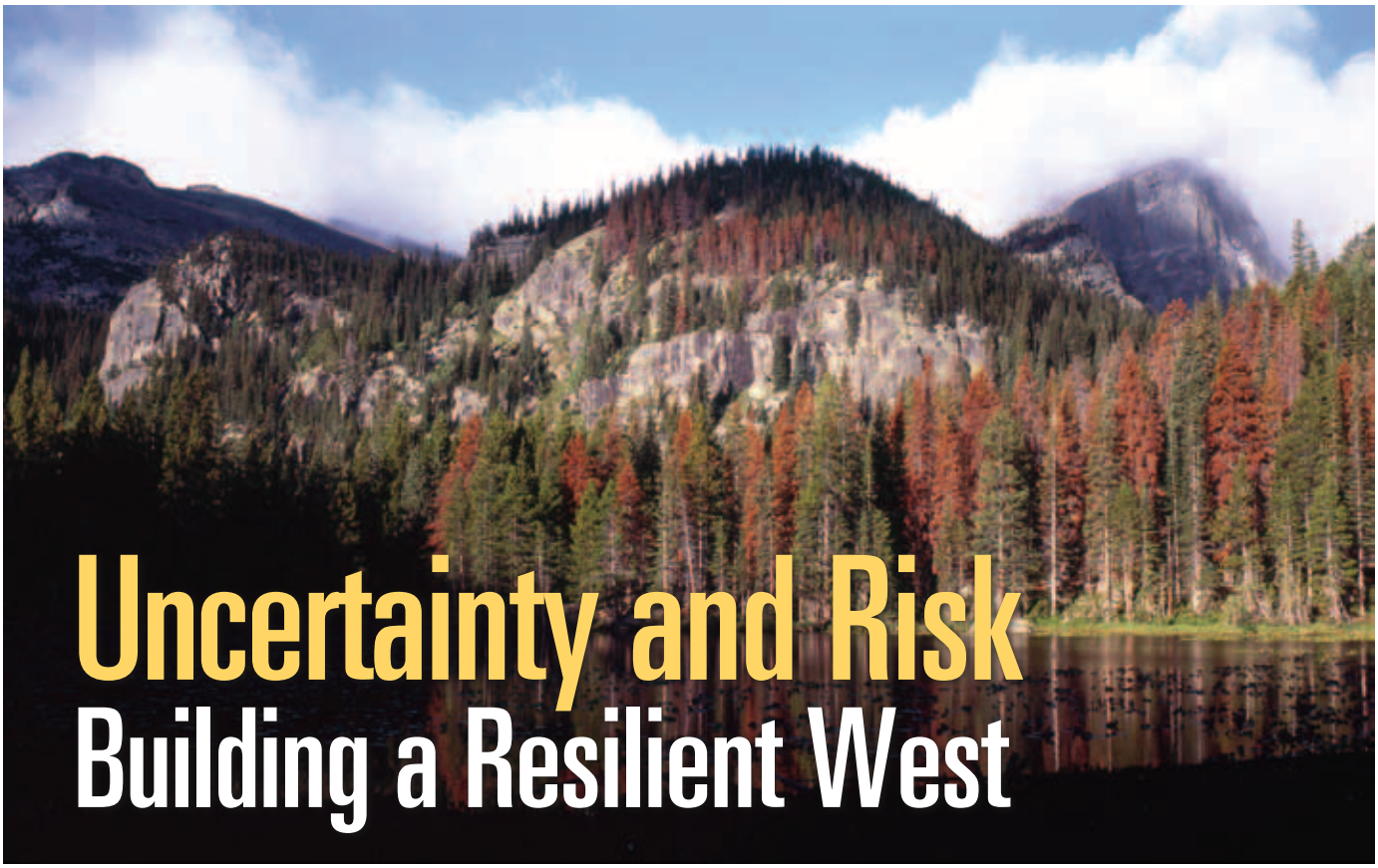


Uncertainty and Risk
Building a Resilient West

The pine beetle infestation aggravated by rising temperature has damaged many trees in Rocky Mountains National Park.

Erika Mahoney and Hannah Oliver

Climate-related impacts vary across regions, affecting communities economically, socially, and environmentally. While all regions of the United States are expected to experience temperature increases, the eight states located between the Rocky Mountains and the Cascade and Sierra Nevada mountain ranges are in a region forecast to be hard-hit by a variety of climate impacts that may expose vulnerabilities different from those in other U.S. regions. Western communities also face an uphill battle when attempting to plan for these future challenges.

Given the significant implications associated with a changing climate in the Intermountain West, this article takes a closer look at some innovations and tools designed to help communities plan and prepare for the uncertainty and risk attributed to a changing climate, and to increase community resilience.

The Intermountain West

Characterized by its scenic beauty, wide open spaces, abundant wildlife, mild climate, and countless recreational opportunities, the Intermountain West encompasses urban, rural, and amenity communities situated within large-scale intact open lands. The region's eight mountain states—Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming—are home to 22 million people, approximately 8 percent of the total U.S. population. Western cities are generally in arid or semi-arid environments, and although the footprints of some urban centers are large, the built environment of the major cities is decidedly dense and largely concentrated in megaregions such as the Arizona Sun Corridor and Colorado Front Range.

The vast expanses of open space between metropolitan centers have intrinsic economic, cultural, and biological value. More than half the region's land is in public ownership and is managed by the Bureau of Land Management, U.S. Forest Service, National Park Service, or U.S. Fish and Wildlife Service (figure 1). In mountainous regions, some counties are 80 percent publicly owned, and in states like Arizona and Nevada the land is more than 90 percent publicly owned. Tribal lands make up a large part of the region, and state trust lands

cover approximately 46 million acres in both rural and urban areas. One of the most extensive land uses in the region is agriculture, which includes ranching and other agricultural services.

Growth and Change

Over the past few decades, the West has experienced dramatic population growth as communities shift away from resource extractive industries such as agriculture, forestry, and mining and instead attract amenity-seeking retirees and telecommuters, as well as new professional businesses, tourism, construction, and consumer service industries (Winkler et al. 2007).

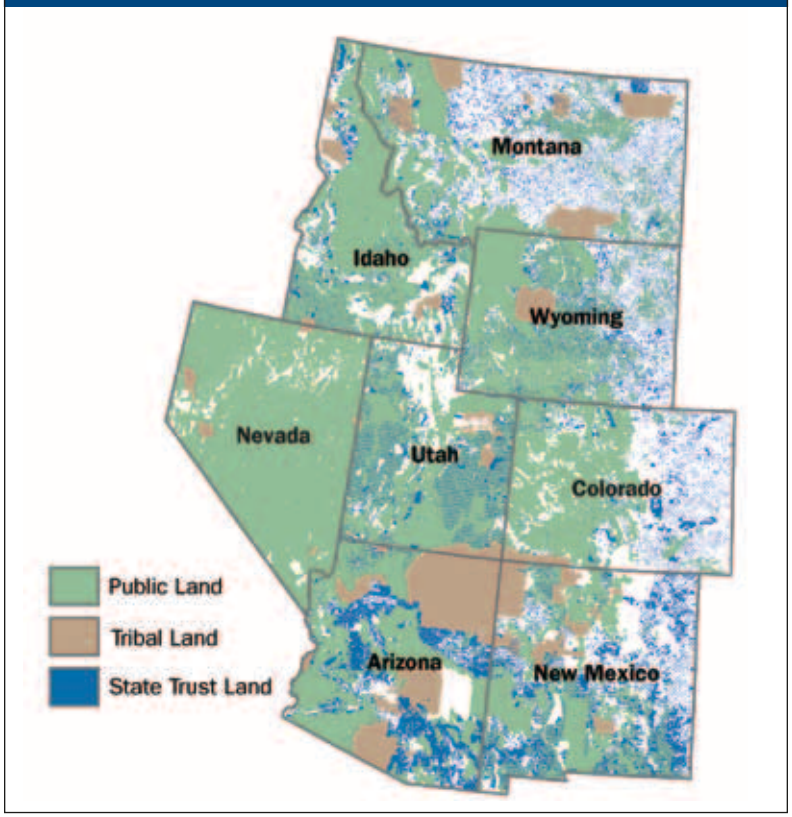
The high rate of urban growth has changed both the demographic and economic make-up of the West and also the allocation of resources. Land that was once used for grazing and agriculture has transitioned to residential and commercial uses. The proliferation of housing and industry requires the development of more energy and water resources to accommodate the growing population.

Many western communities are dependent on the Colorado River, which serves the water supply needs of 30 million people in seven U.S. states and Mexico. More than 70 percent of this water is used to irrigate 3.5 million acres of cropland. In addition to natural resource changes, the increase in growth has caused an expansion of housing in and near forests, an area known as the wildland urban interface, to take advantage of the West's natural amenities.

However, the changes in the region are not only attributable to growth; the climate is also changing. Since the 1880s, scientists have been measuring the Earth's surface temperature at thousands of locations, taking into account instrument deviations and local temperature factors such as urban heat islands. The analysis of this data shows that the Earth's average temperature has increased by more than 1.4° over the past 100 years, with much of this increase experienced over the past 35 years, and it is evident that the temperature is continuing to rise.

Although the temperature changes appear to be marginal, they have significant impacts on local climate. For example, winters are now shorter and milder, snow and ice cover are decreasing, heat waves are becoming more frequent, and many plant and animal species are moving to cooler or higher altitudes to escape the warmer weather.

FIGURE 1
Public, Tribal, and State Trust Lands in the Intermountain West



Source: Courtesy of the Sonoran Institute.

Although climate change is a highly complex issue that varies from region to region, the following impacts have been identified as overarching changes that will occur because of rising temperatures in the West:

- higher frequency of prolonged heat waves and drought;
- increased number and severity of forest fires;
- biodiversity changes, including the severity of disease outbreaks and other disturbances;
- prolonged and wider impacts of vector-borne disease; and
- damage to infrastructure due to unexpected and extreme weather events.

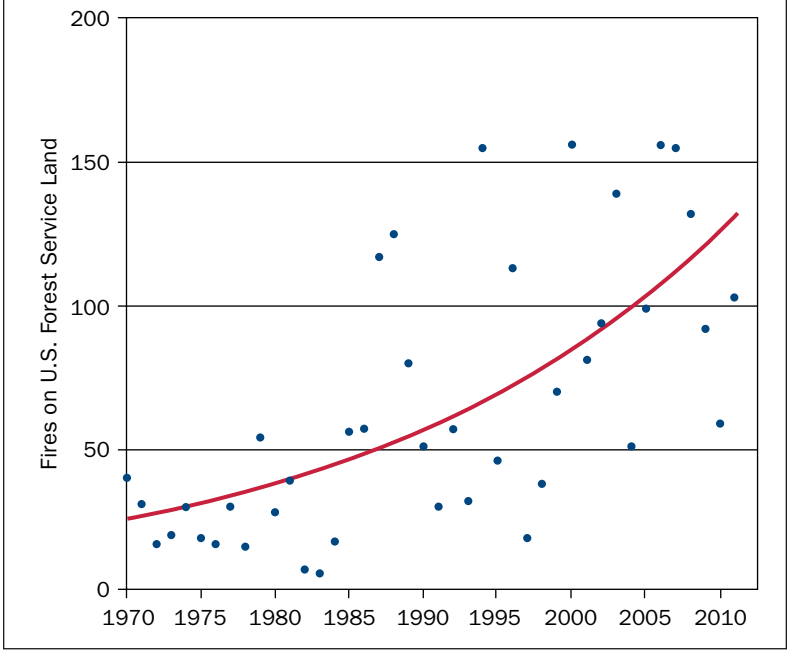
Changes are already in progress. There have been widespread temperature-related reductions in snowpack over the last 50 years, leading to changes in the seasonal timing of river runoff. Feng and Hu (2007) have demonstrated that the dates of peak snow accumulation and peak snowmelt runoff are occurring 10 to 40 days earlier than in previous years. The Colorado River is especially

vulnerable, often receiving a large portion of its water from a hydrological system dependent on snowmelt precipitation from three basin states: Colorado, Utah, and Wyoming.

Precipitation patterns also are changing and becoming more variable. Drought is becoming more prolonged along with the frequency and intensity of heavy downpours. Large wildfires are more frequent, and the fire season is getting longer (figure 2). Wildfires burn twice as much land area each year as they did 40 years ago with a burn season two and half months longer than 40 years ago (Climate Central 2012).

As the climate becomes increasingly variable and shifts further and further from the relative stability experienced by humankind to date, the resulting changes will make communities more vulnerable and may put their health and livelihood at risk. Even one season of drought can have dramatic repercussions, notably higher basic food prices that put considerable strain on vulnerable populations including the elderly and financially disadvantaged. Increasing temperatures, prolonged drought, and incidences of wildfire and biodiversity changes due to migration of invasive species play a significant role in the accelerating transformation of the landscape. With so many effects felt at the community scale, local governments have an important role to play in planning for intensifying climate changes.

FIGURE 2
Large Fires Are Becoming More Common in the West



Source: Courtesy of Climate Central (2012).

Planning for Change

Climate action occurs at multiple levels of governance and in a variety of different capacities. The federal government plays a significant role in responding to large-scale disasters that affect multiple states, such as the recent Hurricane Sandy. Regulatory federal actions that coincide with climate change, such as vehicle fuel efficiency standards or proposals for a national carbon tax, apply to the entire population. At the same time, state governments and regional groups are implementing regional strategies such as cap-and-trade systems and multijurisdictional transportation planning projects.

In terms of effective action on the ground, local governments are most suited to tackle local impacts and planning efforts relating to the issue of climate change. They are in a prime position to create comprehensive strategies that directly alter city functions to support mitigation and adaptation efforts. Local action plays an extensive role as city governments have direct authority over essential functions such as waste management, public transportation, public works, and facility management, as well as land use and zoning. For example, Boulder County recently adopted its Climate Change Preparedness Plan to help local residents and communities prepare for changing environmental conditions. This plan identifies local impacts, explores how these impacts will affect resource management, and outlines opportunities for adaptation planning.

The Context for Climate Planning in the West

Western Lands and Communities, a joint venture of the Lincoln Institute of Land Policy and the Sonoran Institute, has developed a large body of resources and reports to gain a better understanding of the needs and challenges facing western communities (Carter 2008; Richards 2009; Bark 2009; Metz and Below 2009). The seminal report, *Planning for Climate Change in the West*, identifies key barriers to implementing local climate action policies (Carter and Culp 2010). A review of these reports, along with interviews with western sustainability directors, revealed three key challenges associated with climate action:

- political context;
- communication of multiple values and beliefs; and
- lack of funding and resources.

Climate change can be a politically polarizing topic in the West. The clash of multiple viewpoints creates barriers in terms of building political support and conducting effective educational outreach, thus reducing the potential for civic engagement and limiting capacity for collective action in pursuit of common interests. Long-held cultural beliefs about limiting the role of government and protecting private property and citizens' rights contribute to the resistance to zoning and other policies that would change land use patterns or regulate growth.

Without the backing of significant decision makers, such as the mayor or city manager, or strong support from the municipal council, moving climate action forward can be a difficult proposition. There are also internal communication obstacles in bringing different city departments together to discuss local climate change impacts and the best approach to work collaboratively to ensure that the programs and policies address the adverse impacts effectively.

With local governments scrambling to accommodate shortfalls related to the recent recession, cities lack the financial resources needed to invest in current climate action in order to avoid the high cost of future climate impacts. Often, communities discount future impacts, which place the burden and expense of climate planning (or inaction) onto future generations. Dealing with rapid population growth and fiscal pressures to provide infrastructure makes it increasingly difficult to obtain funding to underwrite climate planning. Even communities that adopt climate plans may encounter obstacles in implementing those plans. Some communities may be overwhelmed by the task of deciphering climate science, and many are unfamiliar with policies and actions necessary to mitigate and adapt to climate change.

Unlocking Climate Action in the West

While some local governments in the Intermountain West, such as Salt Lake City, Flagstaff, Tucson, Denver, Las Vegas and Boulder County, are making concerted and laudatory efforts to address climate change, they represent a small sampling of the region. Overall, the West is behind the curve on implementation efforts to adapt to climate change and create communities that are more resilient.

However, the West is feeling the heat, literally and figuratively. After a summer of record temperatures, raging wildfires, and crippling drought, a large and growing majority of Americans believe that global warming is affecting weather patterns. They understand that droughts and heat waves are becoming more common and the weather is becoming increasingly volatile (Leiserowitz 2012). One of the main challenges facing communities is how to integrate new information about the risks of climate change into existing planning frameworks in order to plan effectively for an uncertain future.

Tools for Change

To help address the challenges associated with climate action, there are many tools that western communities can use to guide community resilience. Organizations such as ICLEI–Local Governments for Sustainability, the Institute for Sustainable Communities (ISC), and the Urban Sustainability Directors Network (USDN) provide information and trainings that offer sample policies and plans, peer networking opportunities, technical tools, and resources on vulnerability and risk. However, many of these organizations have a broad geographical focus and a target audience in large cities. It is important to address the needs of smaller communities that have political, fiscal, and resource constraints. In addition, there is a large need to better integrate climate adaptation policies into existing city departments and plans.

The Lincoln Institute and the Sonoran Institute are developing tools and resources that support efforts to plan and prepare for the ever-changing landscape of the West, including: information exchange and training; value setting planning tools; and anticipatory governance methods and tools. These tools offer promise for working in a variety of community types, including the underserved rural and amenity regions, and supplying the support and training that local planners need to integrate climate resilience planning holistically into current planning processes and encourage collaboration among multiple departments.

Information Exchange and Training

Communities often look to their peers that are similar in size, capacity, and geography to get a better understanding of planning efforts that will be successful in their own region. Local governments, institutions, and planning firms are encouraged to publicize their experiences so other communities can learn from their successes and missteps, and then modify and adapt their own plans as needed.

The Successful Communities Online Toolkit information exchange, also known as SCOTie, is an example of a tool that caters to western communities by encouraging the exchange of vital information in the form of best practice case studies and resources (figure 3). The case studies in SCOTie are organized by state, community type, and planning issue. To build and disseminate the toolkit's case studies and resources, SCOTie partners with state chapters of the American Planning Association and nonprofit organizations working to build stronger, more resilient communities. Educational webinars like the *Planning in the West* adaptation series offer a way for communities to learn about climate-related planning and interact directly with representatives from model communities.

FIGURE 3
Screenshot of the Successful Communities Online Toolkit information exchange (SCOTie) Website

Source: Courtesy of the Sonoran Institute.

Value Setting Planning Tools

To move past political debates over climate science, tools are needed to facilitate collaborative planning efforts that include stakeholders with varying values and beliefs. Facilitating a process that focuses on engaging the public and finding common ground in moving forward with action to mitigate climate variability can neutralize the polarizing debates that are often stuck on the causes of climate change and scientific uncertainty.

Value setting is a particularly useful resource for informing management decisions where communities have to make tough decisions when resources are stressed by demand and climate variability. For example, in January 2012 the Sonoran Institute, the Morrison Institute, and the University of Arizona hosted the *Watering the Sun Corridor* pre-conference workshop where 100 participants saw presentations from experts, engaged in interactive discussions in small groups, and interacted collectively using live polling. Participants explored value tradeoffs between competing uses of water for urban development, agricultural production, and the environment in a water system stressed by drought induced by climate change. This collaborative, interactive format brought together stakeholders with many different viewpoints to gain a better understanding of collective values regarding the distribution of water in Arizona.

Anticipatory Governance Methods and Tools

As the future becomes less certain and more risky, traditional planning approaches that involve making educated predictions and developing plans and tools to reach that desired result will likely prove to be inadequate. Cities need tools to "anticipate and adapt" to change rather than "predict and plan" in order to better incorporate the uncertainties and complexities of future conditions (Quay 2010). Scenario planning is a technique that cities can use to think about climate impacts and develop ways to adapt to them. The use of scenarios can enable planners to grapple with complex issues, think about how trends and changes will play out across multiple scenarios, and plan for policy options that are robust under many future scenarios.

Western Lands and Communities is collaborating with partners including the Consensus Building Institute to develop coherent methodologies, identify driving forces of change, and develop educational tools to support community adaptation using scenario planning tools and techniques. Computer-based planning tools are valued because they help communities gain a better understanding of how particular planning ideas and strategies will shape their future. Building better plans that adapt to challenges like climate change will require communities to make decisions in the face of competing economic interests, different cultural values, and divergent views about property rights and the role of government.

Over the years, planning tools have evolved to help professional and citizen planners analyze and develop options and scenarios. Some tools are available commercially and others are free to the public, with varied user and output complexity. Although these tools are gaining traction, the current use of interactive planning tools is limited and faces a number of challenges. For example, the complex tasks of selecting a tool, collecting data, calibrating the tool, developing scenarios, and using the tool to assess various scenarios present significant barriers to many potential users. Western Lands and Communities is collaborating with tool developers to address the near and long-term challenges and expanding the use of scenario planning tools (Holway et al. 2012).

Conclusion

The Intermountain West is a complex region with changing demographics, rapid population growth, and increased economic and cultural diversity. Western Lands and Communities is working to develop and disseminate educational tools and methodologies that will help western communities plan holistically for climate change, build capacity for understanding risk and managing uncertainty in an inclusive manner, and engage communities of disparate stakeholders. To accomplish these ambitious goals, planners need effective tools to shape the future of their communities. We will continue to explore new approaches and methods for assisting planners in the effort to anticipate and adapt to change, engage communities in the effort to develop and adopt adaptation policies, and ultimately create more resilient communities that are prepared for the impacts of a changing climate.

ABOUT THE AUTHORS

ERIKA MAHONEY *is a program associate at Western Lands and Communities, the Lincoln Institute's joint venture with the Sonoran Institute, where she develops planning tools, delivers trainings, and conducts research on local climate action efforts. Contact: emahoney@sonoraninstitute.org*

HANNAH OLIVER *is a research associate at Western Lands and Communities, the Lincoln Institute's joint venture with the Sonoran Institute, where she conducts research on local climate action efforts and assists with program development of the Successful Communities Online Toolkit information exchange (SCOTie). Contact: holiver@sonoraninstitute.org*

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WEB LINKS

Western Lands and Communities:
http://www.sonoraninstitute.org/where-we-work/westwide-research-tools/lincoln-sonoran-joint-venture.html

Successful Communities Online Toolkit information exchange (SCOTie):
http://scotie.sonoraninstitute.org

Planning in the West webinars:
http://www.sonoraninstitute.org/where-we-work/westwide-training-leadership/planning-in-the-west-webinars.html

Scenario Planning Tools:
http://scenarioplanningtools.org

Bus Rapid Transit and Urban Development in Latin America

Daniel A. Rodriguez and Erik Vergel Tovar

Latin American cities have been leaders in the implementation of bus rapid transit (BRT) systems—a transportation mode often characterized by infrastructure improvements that prioritize transit over other vehicles, provide off-vehicle fare payment, and allow quick vehicle access. More than 45 cities in Latin America have invested in BRT, accounting for 63.6 percent of BRT ridership worldwide.

In Curitiba, Brazil, BRT has been used as a tool to spur development that supports and reinforces the overall transit system. The city introduced exclusive bus lanes in 1972 and encouraged mixed-use, high-density development along the five main corridors that converge in the downtown center and have guided urban growth for decades. Curitiba's new green line is predicated on similar principles: to encourage urban development that enhances and facilitates transit use. The case of Curitiba suggests that the success of BRT can increase with the presence of concentrated land development along the transit corridor. Other studies have examined whether BRT can actually stimulate land development.

Transit-oriented development (TOD) is the term used to describe development that is compact and has a mixture of land uses, often including residential, commercial, and office uses, as well as high-quality pedestrian environments that effectively connect with transit. Development is considered transit-friendly or transit-supportive because it can concentrate demand along corridors, balance passenger flows, and create opportunities for multimodal travel. U.S. evidence suggests that residents of TODs do use public transportation more than other commuters. Although the majority of TODs are built around rail systems, TOD can be a strategy to complement and build on the strengths of BRT as well.

TOD Typologies

Researchers and practitioners have developed a variety of TOD typologies, but none have focused specifically on BRT. The type of development that could happen around BRT stops is critical for planning development around them, for understanding how TOD fits within a regional growth strategy, for raising awareness and engaging the public, and, ultimately, for increasing the success of the system.

The literature on TOD suggests important potential differences in the characteristics and types of such development. One approach relies on the expertise and experience of planners, architects, and urban designers. Peter Calthorpe (1993) used urbanity to identify urban and neighborhood TODs with such distinguishing features as the quality of transit service, land uses, development intensity, and urban design. The geography of these TODs could vary from greenfield development to infill and redevelopment. A similar typology developed for the state of Florida in 2011 focused on center size (regional, community, neighborhood), but also included another dimension that was specific to the transit mode (Renaissance Planning Group 2011).

Dittmar and Poticha (2004) blended geography and urbanity in their TOD typology that includes urban downtown, urban neighborhood, suburban town center, suburban neighborhood, neighborhood transit zone, and commuter town. The same approach has taken hold in most recent applications of TOD typologies. For example, Sacramento, California, defined TOD as urban core/downtown, urban center, employment center, residential center, commuter center, and enhanced bus corridor (Steer Davies Gleave 2009). Reconnecting America developed a typology for the San Francisco Bay Area that included regional center, city center, suburban center, transit town center, urban neighborhood, transit neighborhood, and mixed-

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Bus rapid transit in Curitiba, Brazil, has stimulated development along bus corridors.

use corridor (Metropolitan Planning Commission 2007). In Denver, Colorado, the Center for Transit Oriented Development (CTOD 2008) developed a guide for station area planning that included the addition of a special use/employment district type.

An alternative approach to developing typologies a priori is to use data-grouping techniques to examine existing evidence. For example, a typology of development around 25 rail stations that had integrated development in Hong Kong revealed five types: high-rise office, high-rise residential, large-scale residential, large mixed use, and mid-rise residential (Cervero and Murakami 2009). Another study used cluster analysis to develop a spatial-functional definition of station area types around Phoenix's light rail lines (Atkinson-Palombo and Kuby 2011). Employment centers, middle-income mixed-use areas, park and ride nodes, high population/rental areas, and areas of urban poverty were the types identified.

A final set of emerging typologies led by CTOD embodies the built environment with an implementation or performance dimension. These typologies often become a two-dimensional matrix, with built environment types in one axis and measures of implementation readiness in the other. Such typologies developed for Portland, Oregon, and Baltimore, Maryland, are used to guide investments and promote policy change and are particularly helpful in raising awareness about the travel benefits of TOD (Deng and Nelson 2012).

Study Cities and Data Collection

To understand the status of BRT-oriented development in Latin America we examined the built environment around BRT stops in seven cities (table 1). We looked for large cities that had BRTs in operation for five years or more and identified the following places: Bogotá (Colombia); Curitiba (Brazil); Goiânia (Brazil); Guatemala City (Guatemala); Guayaquil (Ecuador); Quito (Ecuador); and the São Paulo (Brazil) metro region (ABD Corridor). Together, these cities represent 16 percent of the world's BRT ridership and 31 percent of Latin-America's BRT ridership. We considered two types of stops: regular stops, which refer to common

TABLE 1
Cities and BRTs Studied

					Regular Stops		Terminals	
City/Metropolitan Area	Population (millions)[1]	BRT Start Date	BRT Length (km)[2]	Passengers Per Day	Total	# Studied	Total	# Studied
Bogotá, Colombia	7.2	2000	84	1,650,000	114	5	7	5
Curitiba, Brazil	1.8	1977	81	505,000	113	9	30	7
Goiânia, Brazil	1.3	1976	27	240,000	19	6	5	5
Guatemala City, Guatemala	1.1	2006	39	210,000	18	9	3	1
Guayaquil, Ecuador	2.7	2006	33	310,000	50	8	3	3
Quito, Ecuador	1.6	1990	56	491,000	79	7	11	5
São Paulo ABD Corridor, Brazil[3]	2.2	1988	33	180,000[4]	53	7	8	5
Total	28,725,394		353	3,586,000	446	51	67	31

1 Sources: *www.brtdata.org*, Instituto Brasileiro de Geografia e Estatística (IBGE, Brazil), Departamento Administrativo Nacional de Estadistica (DANE, Colombia), and local governments.

2 Source: *www.brtdata.org*. Calculations of length of BRT stops in Quito and Guayaquil were made by adding all corridors available in the BRT database.

3 Includes the municipalities of Diadema, São Bernado do Campo, Maua, and Santo André, but not the city of São Paulo.

4 Source: Empresa Metropolitana de Transportes Urbanos de São Paulo (EMTU).

BRT stops; and terminals, which refer to stops at the end of the line or where significant transfers occur from one BRT line to another. With the help of local planners we identified particular stops that were representative of the entire system, regardless of the development orientation towards BRT. In the end, we identified 51 regular stops and 31 terminals for further examination.

The absence of common data at a high spatial resolution required that we collect data in the field with an environmental audit tool designed for use at the road segment and block levels. A segment was defined as the street between two intersections. The data collection form contained the following fields about the environment:

- pedestrians (pedestrian-only paths, pedestrian bridges, bicycle paths);
- land uses (industrial, commercial, residential multifamily, commercial-industrial, commercial-residential, institutional);
- development intensity (low, medium, high);
- the presence of public or quasi-public spaces (big-box developments, schools, hospitals, churches, libraries, markets, sports and recreational facilities);
- the presence of open spaces (green areas, parks, squares, pocket squares);
- mix of housing;
- the degree to which the area has been built out; and
- maintenance condition of the built environment and green spaces (low, medium, high).

For regular stops, we examined road segments within 250 meters (m) of the stop. For terminals, we examined the area within 500m. In some instances (seven cases in Guatemala City and one in Goiânia) we examined two stops (instead of one) because of one-way streets that influenced the location of stops along parallel streets. In these cases the area analyzed was slightly larger than 250m. In addition to the audit data, we used some secondary data obtained from local authorities, such as population within each stop area.

Overall, we audited 10,632 segments and 2,963 blocks around 82 BRT stops and terminals. Because the surface area audited among stops was similar, comparisons of segments and blocks per stop provide information about compactness and connectivity in those areas of each city. One stop in Guayaquil had the most segments (102.1), while stops in São Paulo (ABD) had the fewest (43.1). A similar pattern was detected when examining segments per block.

All data were aggregated at the stop level. Data collected at the segment level were aggregated to develop measures of the percentage of segments around a stop with or without a given feature. Data collected at the block level were aggregated to develop measures of the raw number or the density of features around a stop. In the end, we calculated 38 variables characterizing the built environment around each stop.

BRT Stop Typologies

With such a large number of variables (38) and a relatively low number of observations (82), we used exploratory factor analysis to develop a subset of variables and to estimate their factor scores. Factor analysis relies on the correlation of the data to identify groups of variables that are most alike. The 38 variables were reduced into nine factors for further study:

- pedestrian-friendly, with connected green and public spaces;
- single-family attached residential uses not centrally located;
- high-density residential multifamily;
- undeveloped land;
- well-maintained mixed-use areas ;
- well-maintained green spaces;
- BRT-oriented public facilities for institutional uses;
- large-scale commercial development; and
- consolidated nonindustrial urban fabric.

Several observations emerged from examining the factors and their descriptive statistics. First, development intensity around stops seems to be relatively low. For example, only 8 percent of segments have developments of high density, but 31 percent of segments contain low-density development. Second, in the cities studied redevelopment as a strategy to encourage BRT-oriented development seems critical. Only 8 percent of segments had low levels of consolidation and 11 percent of them had vacant lots. By contrast, almost half of the segments had development that was highly consolidated. This result suggests limited opportunities for BRT-oriented development in undeveloped greenfield sites. Third, in terms of parking, it is remarkable that 26 percent of segments had on-street parking and 30 percent had commercial and retail activity with off-street parking. This highlights the challenge of managing parking supply (and demand) and may indicate that the environment around BRT stops often is not as friendly to pedestrians and BRT users as it should.

The performance of each stop on the nine factors was combined with population density and three additional variables that did not correlate with any other variables in an agglomerative cluster analysis to determine which stops could be grouped. The resulting cluster analysis was the basis for the typology, which identified 10 development types around BRT stops (table 2).

When examining the typology by city we find that two stop types capture city-specific factors: Quito's city center and several stops unique to Guatemala City, which has the newest system among those studied. Its newness and the fact that it serves fairly consolidated parts of the city might explain why the stops cluster together. The other eight stop types represent a broad cross-section of stops across several cities.

Five attributes appear to discriminate among stops: (1) multifamily developments with and without BRT orientation; (2) single-family attached housing, in some cases built informally, and with access to some commercial activity, often away from activity nodes; (3) high population density, supportive pedestrian infrastructure, and access to parks and green spaces, often away from activity nodes; (4) institutional stops with green spaces, not necessarily open to the public; and (5) stops that are saddled with physical barriers set by the convergence of multiple high-volume roads.

The types identified embody a wide range of possible built environments around BRT. The BRT-oriented Satellite Center type, illustrated by Bogotá, contains significant commercial activities, public facilities, parks, and pedestrian amenities while mixing in multifamily residential and single-family attached housing (figure 1). Together, these characteristics come close to the ideal of an urban TOD. Similarly, the type represented by the downtown, city center Quito stop also has many attributes of urban TOD. Whether the presence of these types translates into higher transit ridership remains an empirical question to be tested.

Community Center and Neighborhood Center stops seem to align well with Calthorpe's (1993) definition of community and neighborhood TODs. Among the cases analyzed, the former type exhibits some single-family attached housing and mixed uses that include institutional uses often aimed to

TABLE 2
BRT Stop Types

Stop Type	# of Stops	Description
Mixed-use Corridor	17	Stops along a corridor with a high mixture of land uses, including institutional uses; not particularly dense or well-located.
Downtown City Center (Quito)	1	Quito's historic center, with a high concentration of government jobs, many pedestrian amenities, several public and private venues such as churches and hotels, and considerable small-lot commercial activity.
Urban Center	7	High-density multifamily developments with incipient pedestrian infrastructure and public spaces, and a weak BRT orientation.
Institutional Use Corridor	12	Corridor stops with institutional uses such as schools, hospitals, churches, libraries, and recreational facilities not oriented towards BRT.
BRT-oriented Satellite Center	2	High population density with the presence of pedestrian infrastructure, green areas, public spaces, and BRT-oriented facilities; located far from activity nodes, with a low consolidation and high availability of open space.
Nexus	11	Connections between or among BRT lines, and with other transportation services; located where avenues and roads converge, thus acting as barriers between the stop and the rest of the neighborhood.
Guatemala City Corridor	5	Low consolidation, low-quality green spaces, with some institutional uses located close to activity nodes.
Community Center	16	Noncentral single-family attached uses, with some institutional land uses oriented towards the BRT.
Neighborhood Center	5	High population density in relatively low-quality residential developments, with considerable commercial development, far from activity nodes, but with a good BRT orientation; several stops in this cluster with informal housing.
Green Area	5	Undeveloped land, high-quality green spaces, with some institutional land uses, and far from activity nodes. One of the stops (Base Naval in Guayaquil) is an institutional land use next to the airport, thereby explaining the presence of undeveloped land (large green areas). Other stops in Bogotá and Quito are located in urban expansion areas often with affordable housing.

serve proximate areas of the city. Neighborhood centers have a higher intensity of residential development, mostly focused around single-family attached housing. Our Corridor type stops seem consistent with the concept developed for enhanced bus services in Sacramento and San Francisco, although our data can clearly distinguish between corridors that are dominated by institutional uses and others that simply have a broad mix of uses.

Our typology also identified challenges and opportunities to improve the BRT orientation of development. Only the Downtown City Center and the BRT-oriented Satellite Center types provided adequate integration between the pedestrian environment and transit. The Urban Center type, such as in Curitiba, is ripe for improved integration with the BRT because it has the densities and mix of uses to support it (figure 2). The Nexus stop type, as shown in Goiânia, embodies a frequent challenge for local planners (figure 3). Such stops and terminals should be located to facilitate intermodal transfers, but this often sacrifices access by local users and the transit orientation of the stop.

Compared to other typologies, we did not find strong evidence for employment and commuter-based stops. This may be due to the relatively muted role played by mixed land uses among stops, since land uses played a significant role in other typologies. One explanation could be the typically high degree of mixed uses already present in Latin American cities, which contributes to a low degree of variation across stop areas.

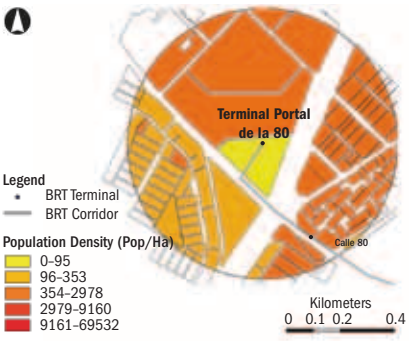
In terms of housing policy, the Neighborhood Center and Green Area types contain an interesting combination of distance to centers of activity and low-income housing. Because the stops are far from activity nodes, they are more likely to contain green spaces, affordable housing, and sometimes informal housing. Latin American cities tend to have a fairly strong land price gradient, with areas with privileged access to activity nodes having

higher prices than peripheral areas. These two types raise questions over the possible consequences of BRT on exacerbating the segregation of housing and the financial burden of mobility on low-income residents.

Analysis of Stop Types and Planning Visions

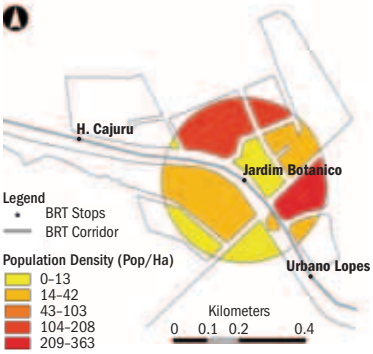
Our examination of 82 BRT stops in seven Latin American cities revealed a variety of development patterns. Some types have attributes that are consistent with the principles of TOD. Others are

FIGURE 1
Example of a BRT-oriented Satellite Center Stop: Portal 80, Bogotá, Colombia



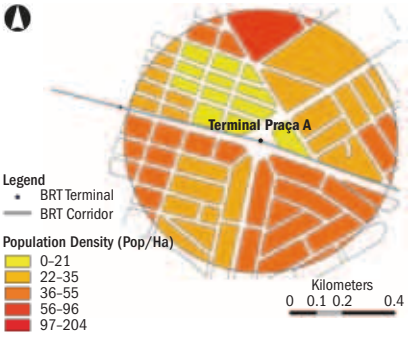
Score	Mean	Std Dev	Min	Max
Pedestrian-friendly with connected green and public spaces	0.23	0.73	-0.77	1.20
Single-family attached residential uses not centrally located	-0.25	0.53	-1.07	0.50
Undeveloped land	0.06	0.88	-0.97	1.47
Well-maintained mixed-use areas	-0.46	0.96	-2.40	0.27
Institutional uses	-0.46	0.34	-0.94	0.02
BRT unsupportive land uses	-0.62	0.30	-1.11	-0.24
Population density	0.73	0.80	-0.01	2.15
BRT orientation	-0.61	0.15	-0.78	-0.40
Entropy (measure of mixed use)	0.26	1.03	-1.58	1.10
Centrality	-0.87	0.40	-1.34	-0.34
Segment density	0.17	0.94	-0.55	2.23

FIGURE 2
Example of an Urban Center Stop: Jardim Botanico, Curitiba, Brazil



Score	Mean	Std Dev	Min	Max
Pedestrian-friendly with connected green and public spaces	4.57	2.60	2.73	6.41
Single-family attached residential uses not centrally located	0.52	1.32	-0.42	1.45
Undeveloped land	-0.16	0.95	-0.83	0.51
Well-maintained mixed-use areas	0.33	0.62	-0.10	0.77
Institutional uses	-0.26	0.04	-0.29	-0.23
BRT unsupportive land uses	-0.48	0.74	-1.01	0.04
Population density	2.53	2.73	0.60	4.46
BRT orientation	0.92	1.72	-0.30	2.14
Entropy (measure of mixed use)	0.37	0.01	0.36	0.38
Centrality	0.21	0.92	-0.44	0.86
Segment density	3.24	3.09	1.05	5.42

FIGURE 3
Example of a Nexus Stop: Terminal Praca A, Goiânia, Brazil



Score	Mean	Std Dev	Min	Max
Pedestrian-friendly with connected green and public spaces	-0.39	0.37	-0.81	0.32
Single-family attached residential uses not centrally located	-0.55	0.54	-1.66	0.22
Undeveloped land	-0.39	0.56	-0.94	1.03
Well-maintained mixed-use areas	-0.50	0.96	-1.83	1.19
Institutional uses	-0.72	0.39	-0.94	0.30
BRT unsupportive land uses	-0.07	0.58	-0.91	0.86
Population density	-0.76	0.34	-1.16	-0.03
BRT orientation	-0.59	0.34	-0.98	0.28
Entropy (measure of mixed use)	-0.88	0.62	-1.94	0.21
Centrality	0.04	0.82	-0.84	1.87
Segment density	-0.03	0.76	-1.56	0.89

burdened by land uses, road infrastructure, and development characteristics that do not support BRT. Still other types appear to be works in progress, with significant vacant land and development that has not been fully consolidated. Finally, some stops seem to capture urban conditions that arise in many Latin American cities: informal housing distant from activity nodes; large commercial developments, frequently of the big-box type, providing private spaces for public use and commerce; and a relative absence of green spaces open to the public. This information is helpful in facilitating planning for BRT-oriented development given the rapid growth of BRT over the last two decades. Some 146 cities worldwide now have some form of a bus-based priority transit system.

Understanding the type of development that could happen around BRT stops is critical for planning station areas and for identifying how TOD fits within a regional growth strategy. Robert Cervero (1998) argues that a successful urban development vision must precede and guide transportation investments, and that planning is necessary if subcenters around transit stops are to take place. He buttresses his argument with the impressive evidence of Copenhagen, Stockholm, and Singapore, suggesting that efforts to develop regional and station-area visions are critical for the future success of TOD. In fact, the burgeoning TOD typologies in the United States are predicated in part on their ability to support long-term TOD planning. For example, the Denver typology was critical to create a land use vision for its existing and forthcoming light rail station areas.

Visions of what potential future development could take place and where it would occur are central to planning, and are frequently embodied in potential future scenarios that decision makers, the public, and planners must consider. Visionary planning is often a precondition for effective TOD station area planning. The CTOD calls for planning for the plan, involving the public, marketing the project, and creating a regional TOD strategy, all of which necessitate a vision of what development can occur. Visions are particularly powerful to engage the public because they materialize potential outcomes of the planning process and enable a better understanding of the impact of their decisions about density, the mix of uses, and access to station areas.

The next step in our research is to determine the causes of the different development patterns we have identified. In some cases, the environment has changed dramatically with BRT investments, whereas in other cases there has been little change. At play are market and regulatory forces that determine the outcome of development and revitalization. Changing land use regulations, relaxing density caps, or reducing parking requirements are ways to further leverage the development potential of parcels close to BRT or other mass transit stops. This coordinated strategy between land use and transportation is the cornerstone of TOD.

ABOUT THE AUTHORS

DANIEL A. RODRÍGUEZ *is professor of city and regional planning, adjunct associate professor of epidemiology, and director of the Carolina Transportation Program at the University of North Carolina at Chapel Hill. His research focuses on the reciprocal relationship between the built environment, including bus rapid transit, and the behavior of travelers. Contact: danrod@email.unc.edu*

ERIK VERGEL TOVAR *is a Fulbright scholar and doctoral student in city and regional planning at the University of North Carolina at Chapel Hill. Trained as an architect, he received a master's degree in urban management and development with distinction at the Institute for Housing and Urban Development Studies (IHS) at Erasmus University in Rotterdam, The Netherlands. He researches the relationships of urban transportation (especially bus rapid transit) with affordable housing and land policies. Contact: evergel@live.unc.edu*

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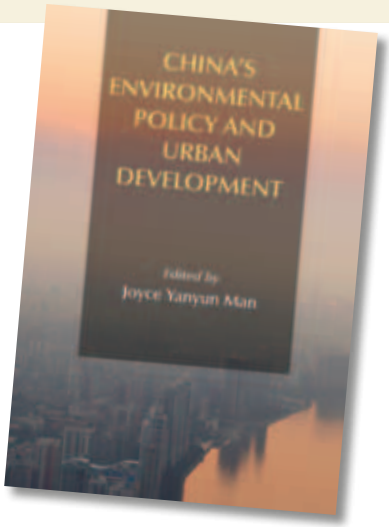
China's Environmental Policy and Urban Development

For more than three decades China has achieved remarkable success in economic development, but its rapid growth has resulted in considerable damage to the natural environment. In 1998, the World Health Organization reported that seven of the ten most polluted cities in the world were in China. Sulfur dioxide and soot produced by coal combustion fall as acid rain on approximately 30 percent of China's land area. Industrial boilers and furnaces consume almost half of China's coal and are the largest sources of urban air pollution. In many cities, the burning of coal for cooking and heating accounts for the rest.

At the same time, since the beginning of economic reform in the late 1970s, the government has paid considerable attention to environmental problems, particularly in terms of regulatory responsibility and enforcement at the local government level. China passed the Environmental Protection Law for trial implementation in 1979, and in 1982 the constitution included important environmental protection provisions. Since then, various laws and policies have been put in place to address China's current and future urban environment. The 2010 World Exposition in Shanghai provided evidence that the Chinese government views its environmental problems as a priority. The green construction of the facilities for the Expo and particularly of the Chinese Pavilion reflected the emphasis the government has placed on protecting and improving the environment through new technologies.

This volume, based on a May 2010 conference sponsored by the Lincoln Institute of Land Policy, addresses a range of environmental issues and policies in urban China. It brings together the work of leading scholars from various academic disciplines, such as economics, public policy, urban and environmental studies, and international studies. The topics include current environmental policies and regulations; government decentralization and environmental protection; urban development; industrial air pollution and household greenhouse gas emissions; consumption and emissions; and transportation systems.



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ABOUT THE AUTHOR

Joyce Yanyun Man is senior fellow and director of the Program on the People's Republic of China at the Lincoln Institute; director of the Peking University–Lincoln Institute Center for Urban Development and Land Policy in Beijing; and professor of economics in the College of Urban and Environmental Sciences at Peking University. Contact: *yman@lincolninst.edu*

Carlos Morales-Schechinger

Carlos Morales-Schechinger joined IHS, the Institute for Housing and Urban Development Studies at Erasmus University in Rotterdam, The Netherlands, in 2008. This international institute attracts students from all over the world, mostly from developing countries. Some IHS programs are sponsored jointly with the Lincoln Institute.

Previously Morales was a part-time lecturer at UNAM, the National Autonomous University of Mexico. He has been collaborating on a regular basis in seminars and courses organized by the Lincoln Institute throughout Latin America for the past 12 years. He lectures primarily on land value capture instruments, land and property taxation, and land-based preventive policies as alternatives to informal settlements.

He has held various government posts, including director of land policies and instruments in Mexico's ministry for urban development, where he designed and implemented an ambitious program on land banking; and as director of cadastral policy for Mexico City's government, where he managed an extensive fiscal reform of property taxes. He also held posts in both public and private banks in Mexico, dealing with property valuation, mortgages, property administration, and loans for large urban developments and for local governments.

He holds a bachelor's degree in architecture from UNAM, a diploma in local government finance from the University of Birmingham, UK, and a Master of Philosophy in urban studies from the University of Edinburgh, UK. Contact: c.morales@ihs.nl

LAND LINES: *How did you become involved with the Lincoln Institute?*
CARLOS MORALES: My first introduction was in the early 1980s when I attended an Institute-sponsored international conference in Cambridge that related to my work for the government on urban land policy. The ideas I learned about were put to direct use two years later when I worked on a reform to increase the supply of serviced land in medium-sized cities and to subsidize sites and services for low-income households in Mexico. In the early 1990s, when I was working for the government of Mexico City on an ambitious property tax reform, I attended another Institute conference on property taxation.

From 2000 onward, I participated in many education activities organized by Martim Smolka through the Program on Latin America and the Caribbean. Around 2004 the Institute started a joint venture with IHS and I was one of the visiting lecturers hired by the Institute to teach in those programs. I was later invited to join the IHS staff full-time as the manager of this joint venture.

LAND LINES: *How do you compare the effectiveness of institutions such as IHS and the Lincoln Institute?*
CARLOS MORALES: I believe they are complementary. The Institute is a leader in research and education on land policies, with an international focus on Latin America and China. IHS is recognized for its education and capacity building on urban management and development for a worldwide audience, focusing on developing and transition countries. IHS courses are open to students from all regions, but most come from countries in Africa, Asia, and Central and Eastern Europe. Through its joint venture with IHS, the Lincoln Institute is able to reach out to those from many more countries in an efficient way.

LAND LINES: *Conveying fundamental knowledge about land policy and urban management to practitioners is not an easy task. What have you found is the most effective approach?*
CARLOS MORALES: Using a combination of two things is important: the profile of the lecturer and the appropriate pedagogy. Lecturers should have experience both as practitioners and as academics to be able to answer questions that are relevant to practitioners, especially when the answers imply moving away from their comfort zone and facing some kind of change.

The ultimate purpose of social science is precisely to change reality, not only to understand it. Consultancy brings academics close to practice, but it does not confront them with the moral commitment of implementing policy or the ethical responsibility for making policy work on the ground. Experience in direct practice is crucial. The Institute's programs in Latin America employ lecturers with this profile, and they have proven effective in addressing issues such as the impacts of taxation and regulations on land markets and in choosing instruments for capturing incremental land value, both of which are hot topics in the region.

Regarding pedagogy, practitioners tend to be skeptical about theory. They regard it as impractical, and they want to test it to be convinced. Using examples of policies implemented in other cities is very useful. Some students from developing countries do not accept cases from more developed countries, arguing that their governance structure is too different. Others prefer cases from diverse situations because in spite of contextual differences they aspire to better development opportunities for their own countries. A lecturer should have an arsenal of many different cases to examine when questions rise.

Doing simulation games is also a very effective technique. Games involving role playing where participants compete against each other are the most useful for understanding land markets and helping solve problems. Role playing is revealing even when participants fail to solve problems since it prompts them to question

what happened. I have seen how participants who experience failure in a game begin to cooperate and design clever regulations on their own. Another strategy is to assign participants roles contrary to their beliefs or experience. For example, government officials playing the role of pirate land developers learn about the substantial amounts of money the poor must spend just to access land.

Playing the devil's advocate works well when discussing controversial concepts, as if the participants are in a land court. This is not a new technique except when played with a couple of twists. An example is determining the criteria for compensating eminent domain. In this game one team argues in favor of current use values and the other future use values. Background literature and practical information are provided for arguments on both sides. Practitioners from many places can relate to examples of regulatory takings, whether as expropriations in China, land restitutions in Eastern Europe, or the sale of building rights in Brazil.

Since participants have to defend a position with which they do not agree, they have to study and work harder. In many cases they end up changing their minds, or at least identifying new arguments to use later in debating their opponents in real life. At the end of a land court game the group acting as jury secretly votes twice, first on the team's performance as advocates and second on the conceptual arguments. When a team gets more votes than the position they defended, it is clear that more research on the issue is needed. What I like best is that the game does not impose a position on the participants, but it raises the level of debate.

LAND LINES: *What are the main types of resistance to concepts and ideas on land policy?*
CARLOS MORALES: Perhaps the concept most frequently resisted is how taxes and regulations are capitalized into the price of land. Resistance can come from an ideological standpoint (either left or right, both have arguments), self-interest (landowners do not readily accept sacrificing profit), or ignorance of how the capitalization concept works. As an educator I have a role to play in addressing the last challenge.

Even if theory is explained to practitioners, they remain skeptical if their experience contradicts the theory. Misunderstanding can come from referring to a tax on a commodity that is not as scarce as land, but it can also come from experience with land markets themselves. This happens when two policies with opposite effects are introduced together, for example, increasing densities and increasing taxes. The combined effect of these measures makes it difficult to understand the impact of each one. A simulation game can help isolate each impact. Practitioners need to experiment with each policy measure to better understand them both. I have noticed that they may nod with skepticism when you lecture them, but they give you a "eureka" smile when they reach understanding by playing a game.

LAND LINES: *How do you overcome resistance to topics such as value capture?*
CARLOS MORALES: A charge linked to the increase in densities is a way of capturing the incremental value of land and a source of funds to finance infrastructure, as São Paulo is doing when it charges for extra building rights. The discussion about how this policy impacts market price is controversial. Landowners oppose it because it reduces their price expectations, but developers favor it because it reduces land prices and the payments are returned in the form of public works. A similar situation happened in Bogotá when a tax on the increment in the value of land was introduced.

Both cases are useful references to explain land value capture in developing countries, yet more city cases need to be documented and disseminated, and some practitioners want examples from developed countries. This is not easy, because land value capture is a buzzword in Latin American circles, but not in most developed countries. This is not because value capture is not used in the United States or other places, but rather because it is assumed as part of the operation of the land market. It is the role of lecturers to point this out and open opportunities for sharing experiences among practitioners from both developed and developing countries.

LAND LINES: *Please comment on the difficulties of conveying taxation concepts to planners.*
CARLOS MORALES: Planners learn about property taxes if they are high enough to have an impact on decisions by landowners, developers, and land users, as in the United States. In developing countries these taxes generally are so low that they do not impact market decisions, so planners are not interested. When I play games that illustrate land markets to architects—who are often also planners—and they realize that the city is not going the way they expect, their most frequent reaction is to suggest more taxes and more efficient land markets. Seldom do they propose a traditional land use plan.

LAND LINES: *What in your opinion are the central concepts or ideas that could make the difference in the international debate on urban land markets?*
CARLOS MORALES: Pointing out that land value capture is a significant source for financing infrastructure and preventing slums can bring more stakeholders into a serious discussion. Ideas related to security of tenure, land registration, and titling in order to increase access to loans have been dominating policy, but results have not been as positive as predicted. Slums continue to develop and service provision is still lagging behind.

Policies that have to do with land taxation and property obligations—not just property rights—have more potential to improve the functioning of urban land markets. UN-Habitat and the World Bank adopted the earlier notions of security of tenure as a solution, but are now beginning to show interest in land-based urban development instruments. Land value capture policies will have an effect tomorrow, but with a political cost today because giving titles is cheap and appeals to short-term politicians. This is the challenge that should be faced in the international debate to ensure more effective and long-term land market reform.

fellowships PROGRAMS

Kingsbury Browne Fellowship

The Lincoln Institute established the Kingsbury Browne Fellowship in association with the Kingsbury Browne Conservation Leadership Award in 2006. Both awards honor Browne (1922–2005), a Lincoln Fellow in 1980, whose work led to the creation of the Land Trust Alliance (LTA). Now a national organization of about 1,800 land trust members, LTA trains thousands of conservation leaders, encourages the passage of legislation on land conservation, and develops standards and practices to professionalize and safeguard work on land trusts. This annual fellowship, administered by the Lincoln Institute's Department of Planning and Urban Form, supports research, writing, and mentoring activities.

Peter Stein, a leader in forests and rural lands conservation and managing director of Lyme Timber Co., was named the Kingsbury Browne Fellow and the winner of the Conservation Leadership Award at the Land Trust Alliance's annual Rally in October 2012. Stein, who previously was senior vice president at the Trust for Public Land, was recognized for his outstanding leadership, innovation, and creativity in land conservation.

Since joining Lyme Timber in 1990, Stein has been providing leadership in the development and structuring of conservation-oriented forestland and rural land purchases and dispositions. He also manages the company's conservation advisory business. At the Trust for Public Land, he directed conservation real estate acquisitions in the Northeast and Midwest. He lectures extensively at graduate schools and professional conferences on conservation investment schemes and strategies, and serves on numerous boards. He graduated from the University of California at Santa Cruz in 1975, and in 1981 he was a Loeb Fellow and received a Certificate in Advanced Environmental Studies from Harvard University.

Lincoln/Loeb Fellowship

The Loeb Fellowship was established in 1970 through the generosity of the late John L. Loeb, Harvard College '24. Based at the Graduate School of Design, the program offers ten annual post-professional awards for independent study at Harvard University. The fellowship is a unique opportunity to nurture the leadership potential of the most promising men and women in design and other professions related to the built and natural environment. Each year one fellow is selected to be the Lincoln/Loeb Fellow and to work with the Lincoln Institute's Department of Planning and Urban Form.

Lynn Richards, policy director in the Office of Sustainable Communities, U.S. Environmental Protection Agency, has had a distinguished career focused on storm water management issues, community engagement, and interagency cooperation. She has been instrumental in framing the national debate around the role of density and development as a storm water management practice.

She has played a major role in efforts by EPA, the U.S. Department of Housing and Urban Development, and the U.S. Department of Transportation to coordinate important elements of their respective funding. She has taken the initiative to build linkages among these and other agencies in order to help break down the silos that separate otherwise closely linked elements of our built and natural environment. As the Lincoln/Loeb Fellow, Richards is studying regional and urban planning, and in particular the interrelationships among policy, regulation, and community design.

WORKING *papers*

More than 770 working papers are currently available on the Lincoln Institute website for free downloading, including the results of Institute-sponsored research, course-related materials, and occasional reports or papers cosponsored with other organizations. Some papers by associates affiliated with the Institute's Latin America and China programs are also available in Spanish, Portuguese, or Chinese. Listed below are papers that have been posted recently at *www.lincolninst.edu/pubs*.

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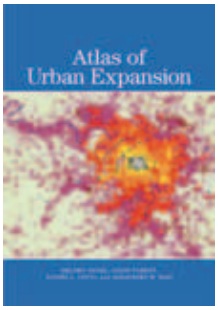

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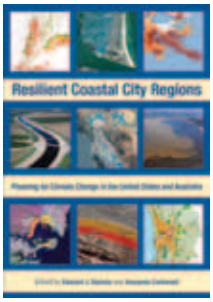

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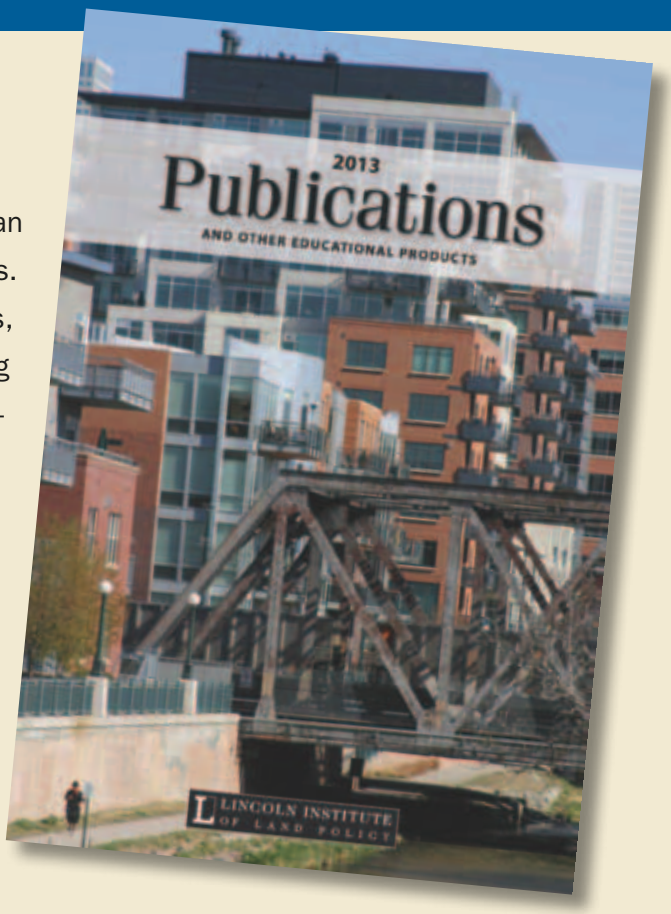

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