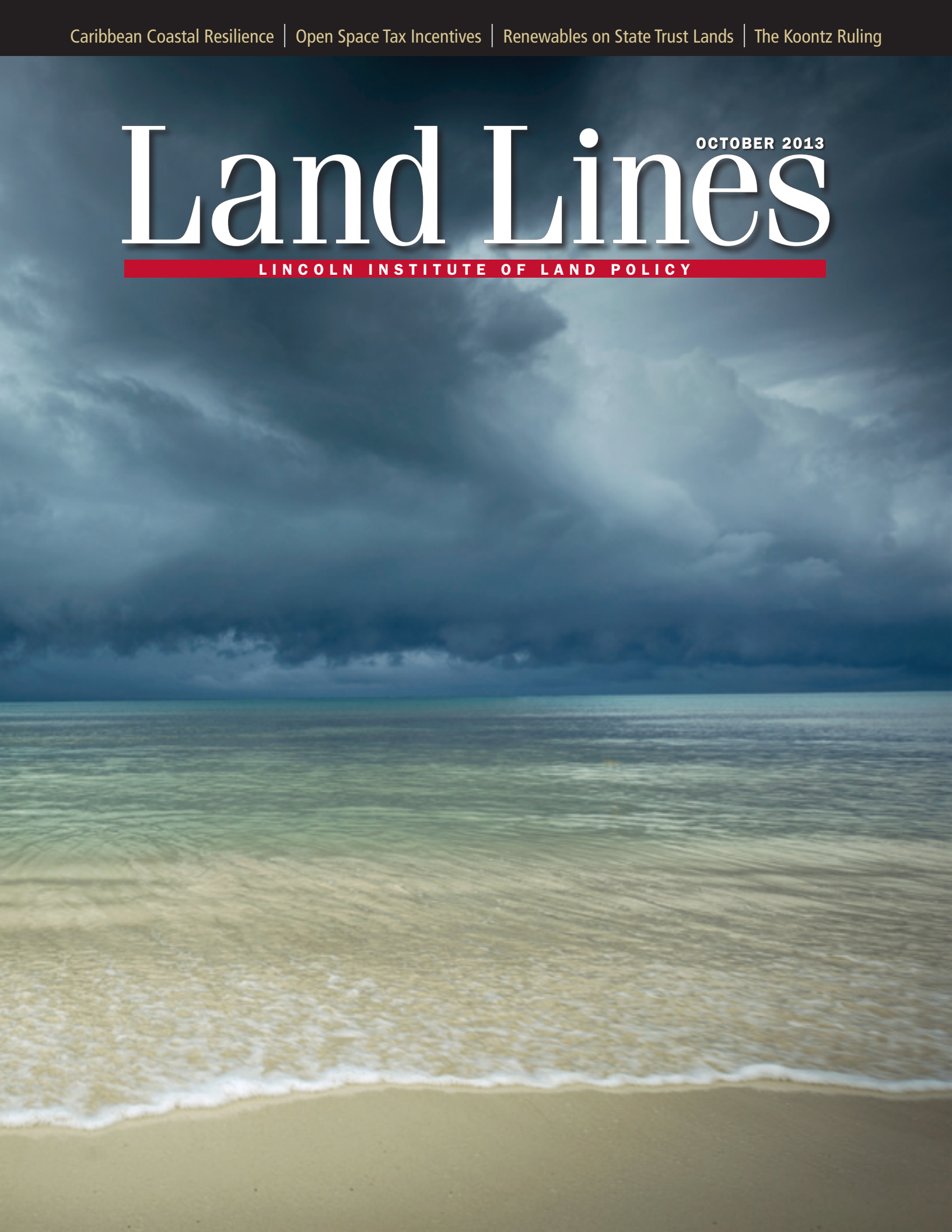


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A tropical storm gathers over the Caribbean (see page 2).

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Detecting and Preventing House Price Bubbles

The United States is emerging from a great recession whose major hallmark has been the collapse of national housing prices, which grew by 59 percent from 2000 to 2006 and then fell 41 percent by 2011, all in constant dollars. Nationally, real house prices in 2011 were 6 percent below levels in 2000. The housing price collapse had unanticipated contagion effects that helped produce the accompanying financial crisis and the most severe economic downturn since the Great Depression. The share of U.S. mortgages that were delinquent by 90 days or more rose from about 1 percent in 2006 to over 8 percent in 2010. The economic and social costs of this house price bubble and subsequent collapse have been immense.

The benefits of preventing future house price bubbles is obviously great, but realizing such benefits will require that policy makers learn to detect price bubbles as they are forming and then implement policies that will attenuate or mitigate them. A recent Lincoln Institute policy focus report, *Preventing House Price Bubbles: Lessons from the 2006–2012 Bust*, by James Follain and Seth Giertz, addresses the challenges of diagnosing and treating price bubbles in the real estate market. Their report builds on extensive statistical analysis available in several Lincoln Institute working papers.

While it is common to summarize the recent housing market bust using national indicators (as in the first paragraph above), these national indicators don't account for great variations in both the levels and changes in housing prices across metropolitan areas. For example, from 1978 to 2011, constant dollar housing prices in Dallas, Texas and Omaha, Nebraska varied by less than 20 percent from their 1978 levels; those in Stockton, California nearly tripled from 1978 to 2006, but by 2011 fell back to their 1978 levels. Local housing markets are all influenced by national economic and financial policies and conditions, but these large differences across metropolitan markets indicate that local conditions play a very important role as well.


A key element of the statistical work by Follain and Giertz is to use metropolitan housing markets as the unit of observation for their analyses, which are based on annual data



Gregory K. Ingram

(for 1980 to 2010) and quarterly data (for 1990 to 2010) for up to 380 metropolitan areas. Their econometric work indicates that house price bubbles can be detected across metropolitan areas and that price changes and the accompanying credit risk vary greatly in size. Stress tests, such as those used to evaluate mortgage credit risk, can be useful indicators of potential price bubbles at the metropolitan level.

Because the levels and changes in housing prices vary greatly across metropolitan areas—with bubble-like price increases in some and essentially stable prices in others—Follain and Giertz conclude that policy measures to mitigate housing bubbles should be tailored to target metropolitan areas or regions rather than be applied uniformly across all metropolitan areas at the national level. Thus monetary policy would be an unattractive intervention to counter house price increases in a few metropolitan areas, because it would affect financing terms across both frothy and stable housing markets. Instead, Follain and Giertz favor policy interventions that would target those metropolitan areas with high price increases. The policy they advance would raise the capital reserve ratio that banks are required to hold against mortgages that they finance in those areas. Such countercyclical capital policies would both dampen house price increases and strengthen the reserves of the issuing banks, improving their ability to withstand any unexpected financial shocks.

Applying prudential housing market policies at the metropolitan level seems to be an obvious thing to do; so why has it not been done before? A major part of the answer is that housing market analysis is benefitting from a revolution in the availability of spatially disaggregated data at the metropolitan, county, and even zip code level. The data required to inform policy interventions targeted at the metropolitan level have only recently become widely available, and such data underpin the empirical work carried out by Follain and Giertz. For more information on their analysis, see http://www.lincolninst.edu/pubs/2245_Preventing-House-Price-Bubbles. 

Coastal Zone Management

The Barbados Model

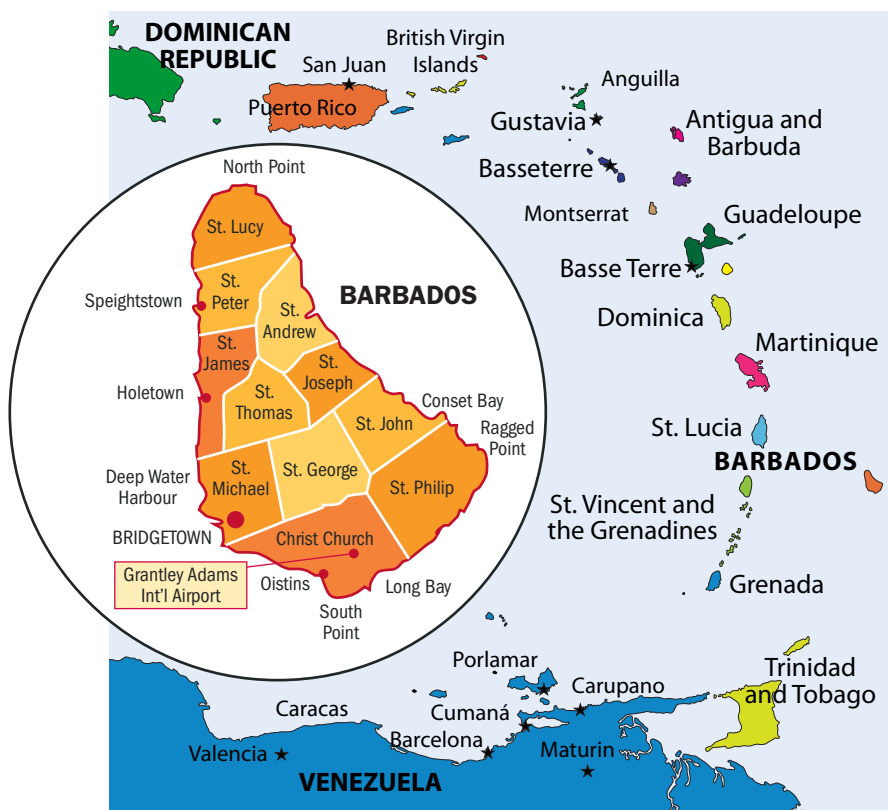
Gregory R. Scruggs and Thomas E. Bassett

For every travel article featuring a Caribbean paradise with gentle waters lapping a sandy beach, there is an anxious news story about a brewing hurricane. The Lesser Antilles, an archipelago of small islands that form a crescent in the eastern Caribbean, have always been particularly vulnerable, thrust into the volatile waters of the Atlantic Ocean. In 1776, the Pointe-à-Pitre hurricane struck the French colony of Guadeloupe and killed 6,000, making it the deadliest Atlantic

storm on record at that time. Four years later, the Great Hurricane of 1780 hit even harder, making landfall in Barbados, then ravaging nearby islands, killing at least 20,000 and wrecking British and French fleets maneuvering at the height of the American Revolution. Two centuries and dozens of storms later, even Hurricane Ivan wasn't as deadly when it devastated Grenada in 2004, leaving the parliament in ruins and 85 percent of the structures on the island damaged.

In recent decades, climate change has heightened threats to the region. U.S. strategies employed in the wake of Hurricane Katrina or Superstorm Sandy are not especially relevant to the fragile, yet vibrant islands of the Lesser Antilles, from Puerto Rico in the north to Trinidad and Tobago in the south. With tourism-dependent economies and extremely limited amounts of developable land, especially on mountainous islands, this potpourri of independent countries, dependent territories, and overseas departments share a common land use challenge: how to grapple with development patterns oriented toward the coast while managing the growing threat of sea level rise.

One island in the region stands out for its exceptional capacity to recognize and prepare for the rising tide: Pear-shaped Barbados has become a Caribbean leader in integrated coastal zone management—the contemporary practice of integrating sectors, levels of government, and disciplines to address the coastal zone both in the water and on dry land. Coastal land use and environmental management are always contentious issues on a small island. But, as former UN Secretary General Kofi Annan once remarked, “Barbados consistently punches above its weight.” Almost 50 years since independence, the island nation has leveraged a combination of foresight, international support, and local capacity to develop planning institutions and prepare for an uncertain future.



Barbados is the easternmost island in the Lesser Antilles. Owing to British-style town and country planning, the island is divided into 11 parishes (inset).

Amanda Wait/NonprofitDesign.com



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From Sugar to Sun Worshippers

Today, Barbados is famous as a top international tourist destination, with trademark white-sand beaches, warm aquamarine water, and ample sunshine along its 60 miles of coastline. Nearly 300,000 people live on the 166 square-mile island; 44 percent of Barbadians are classified as living in urban areas, centered in Bridgetown and along the developed south and west coasts. With a per capita GDP of US\$23,600 and near-universal literacy, Barbados ranks 38th in the world and first in the Caribbean according to the United Nations Development Programme's 2013 Human Development Index. Relying on its sand and surf, Barbados derives 80 percent of its US\$4.4 billion GDP from its tourism and service industries.

But this evolution is a recent one, part of a similar pattern of development across the Caribbean in light of independence movements and the advent of commercial aviation. Originally inhabited by a native Amerindian population, Barbados was first settled in 1627 by the English, who quickly turned it into one of the world's leading sugar producers. Barbados's colonial history is unusual for the region; unlike many other Caribbean islands that saw multiple changes of European powers, Barbados did not leave British rule until

independence in 1966—earning it the nickname “Little England.”

The colonial economy was a classic model of trade to enrich the metropolis. The English imported African slaves to work sugarcane plantations, molasses refineries, and rum distilleries. As a result, 90 percent of modern-day Barbadians claim African descent. Following independence, the already-lagging sugar crop, which suffered fluctuations common to any monoculture, became even less reliable as the push for free trade led the U.K. and later the EU to slowly draw down subsidies and preferential pricing.

At the same time, Barbados invested heavily in its tourism services, which shifted the locus of development. Historically, the island was mostly rural, with sugarcane plantations carving up the interior of the country, home to slaves and, later, itinerant sharecroppers toting moveable wooden “chattel” houses, Barbados's typical vernacular architecture. The coast was home to Bridgetown, the principal port, where a navigable river meets the ocean, and a few smaller towns and fishing villages. A deep-water port dredged in 1961 also laid the groundwork for the arrival of cruise ships. The growing number of tourists necessitated hotels, resorts, restaurants, shops, and bars, all within a

As climate change intensifies hurricanes in the Caribbean, Barbados works hard to protect its best asset: 60 miles of coast in the eastern Caribbean.

stone's throw of the ocean. This impulse led to strips of coastal development between the airport and Bridgetown, on the south coast, and along the west coast, home to the calmest water and charming Holetown and Speightstown. By the 1990s, Barbados's Grantley Adams International Airport was receiving regularly scheduled British Airways flights from London on one of the few Concorde supersonic jets.

“Key decision makers have recognized that coastal zone management is important not just as an environmental program but to grow the economy of Barbados.”

The Local Response to Rising Waters

Lying just east of the main arc of the other eastern Caribbean islands, outside the Atlantic hurricane belt, Barbados has a meteorological advantage. Although it's still susceptible to major storms, it experiences far fewer hurricanes than its neighbors to the northwest. Yet any threat to the beach and coral

lining Barbados would have devastating consequences, given the island's economic dependence on the coast. Its well-being is endangered by creeping sea level rise, coupled with possible storm surge if the island suffers even a glancing blow from a major hurricane. The Intergovernmental Panel on Climate Change (IPCC) has strong evidence that following a period of almost no change for centuries, there was an increase in global sea level measures in the 20th century, and that trend is accelerating in the 21st century. In August, the IPCC said sea levels could rise more than three feet by 2100.

Never a major contributor of carbon emissions, small island states are disproportionately impacted by global climate change resulting from modern industrialization elsewhere in the world. Shifts in weather patterns have produced a greater number of major storm systems, increased global temperatures, melted polar ice caps, and contributed to sea level rise. While major industrialized countries such as the United States, China, and Western Europe also experience impacts from sea level rise, the vulnerable proportion of these countries is miniscule compared to the susceptible areas of Barbados. The developed world's inability to understand the impacts and consequences of its behavior, as evidenced by political inaction on issues such as carbon cap-and-trade agreements,

has forced countries in the developing world to act now or face a perilous future.

Paradoxically, Barbados's imperial history—often a burden on postcolonial countries—has proved an advantage, in that the island has a long, uninterrupted history of British-style town and country planning. Like the United Kingdom, Barbados is administratively divided into parishes, and modern development law is based on the British Town and Country Planning Act of 1947. Once independent, Barbados established its own planning framework with the 1972 Town and Country Planning Development Order. Presently, the Town and Country Development Planning Office (TCDPO) oversees all construction on the island, with the chief town planner reporting directly to the prime minister.

The Physical Development Plan from 1988 guides development on the island. Since the document's amendment in 2003, there has been a turn toward sustainable development, not just as a catch phrase, but as an inherent value for the government's vision for the island. In a 2008 conference speech, the previous prime minister, David Thompson, outlined a few core ideas of the plan: protect natural, agricultural, and cultural resources; promote mixed-use centers and corridors to encourage a diversified economy; maintain central Bridgetown as the financial and commercial hub; and stimulate tourism by the modernization of older beachfront properties and development of new opportunities. Today, the current prime minister, Freundel Stuart, continues this push for sustainability, as shown by his participation in high-level panels at last year's United Nations Conference on Sustainable Development, Rio+20.

By the late 1970s, individual property owners began to notice coastal erosion affecting their land. The media began to harp on this issue, as it was concurrent with the push for tourism, quickly becoming the country's main source of foreign exchange reserve. Prompted by this coastal erosion—but also concerned about catastrophic events such as hurricanes, earthquakes, tidal waves, volcanic eruptions, and oil spills—the Barbados government embarked on a diagnostic pre-feasibility study in 1981 with funding from the Inter-American Development Bank (IDB) as part of its Coastal Conservation Program. The study focused on the west and south coasts, as these areas of the island had the greatest potential for tourism infrastructure.



© Gregory R. Scruggs

At that time, the government set up the temporary Coastal Conservation Project Unit (CCPU), which oversaw the pre-feasibility study and came to a series of conclusions on the causes of coastal erosion and damage to beachfronts. For example, because inland Barbados had poor water quality, the runoff polluted the sea, damaging coral reefs. Natural phenomena, such as storm swells and the occasional erratic hurricane, also caused erosion. In turn, the sea defense structures in place were poorly designed. The IDB study mandated the CCPU to continue monitoring the shorelines, to provide advice to the public on coastal matters, and to serve as an advisor to the TCDPO on waterfront development.

Coastal Zone Management Unit is Born

As the Coastal Conservation Project Unit continued its mandate for a decade, the Government of Barbados, along with additional funding from the IDB, embarked on another study, which recommended the establishment of a permanent unit to oversee the coastal zone. This Coastal Zone Management Unit (CZMU) was created in 1996 to regulate, make recommendations, and educate the Barbadian population about coastal management. Still receiving a large amount of its funding from the IDB, the CZMU is currently housed in the Ministry of Environment, Water Resources, and Drainage. As its title suggests, the CZMU manages the coastal zone, which it defines as “the transition zone where the land meets water;



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the region that is directly influenced by marine hydrodynamic processes; extends offshore to the continental shelf break and onshore to the first major change in topography above the reach of major storm waves.” Therefore, the unit oversees the coral reefs around Barbados and all coastal engineering projects, while serving as an advisor to the TCDPO for onshore coastal development.

Land use issues are at the forefront of the relationship between the CZMU and TCDPO. When the TCDPO receives any application for development in the coastal zone, it forwards it automatically to the CZMU for review and comment. Since the tourism industry is based mainly in the coastal zone of the island, many of Barbados’s development applications go through the CZMU for review. The unit vets the application to make sure the setbacks are correct, 30 meters from the high water mark for developments along the beach and 10 meters for developments along cliffs,

TOP: Colonial architecture lines Bridgetown’s natural harbor, known as the Careenage.

BOTTOM: The success of Barbados’s coastal zone management owes in part to the population’s 98% literacy rate.



Photos: © Gregory R. Scruggs

The Richard Haynes Boardwalk (left) doubles as a concrete seawall. Groynes (right) help prevent sediment from shifting.

measured from the landward point of undercut. In addition to verifying setbacks, the CZMU looks at drainage requirements, buffer zones, fencing restrictions, and other regulations. The CZMU then makes recommendations to the TCDPO on the application.

CZMU Acting Director Dr. Lorna Inniss, who holds a Ph.D. in oceanography from Louisiana State University, praises this process. She says, “Our interministerial collaboration is extremely high. We have the ability to establish and improve government structure that’s inclusive and consultative by nature.” The government process is admirable for its cooperation and silo-breaking tendencies; unfortunately the CZMU’s recommendations are purely advisory and have no binding power for the TCDPO to enforce. Regulations in the coastal zone are not retroactive for the legions of properties built during the resort boom, and penalties for violations also remain very low. This process is the closest Barbados approaches to a formalized environmental impact assessment, per a U.S. model, but it’s a strong first step for the Caribbean. CZMU and TCDPO have been more successful in planning for low-impact future development—along the more rugged east coast, for example, where the Physical Development Plan envisions a national park.

The CZMU is most effective in implementing coastal engineering projects to protect the coastline and stop beach erosion. The most natural conservation technique is to restore sand dunes and mangroves. Planting vegetation in the coastal areas allows the dunes to form naturally and hold back inundations from storm surges, while mangroves absorb wave action. Beach nourishment is a popular quick fix but more of a Band-Aid approach that is more costly and less effective, as currents

and storms can easily erode the nourished beach.

The CZMU safeguards the coast with various physical interventions as well, including breakwaters, groynes, and seawalls. Breakwaters are concrete structures, sunken close to the beach, that force waves to break farther from the coast so they don’t directly pummel the sand. Groynes are rock structures that jut out into the ocean to disrupt the movement of sediment. Seawalls are the CZMU’s largest type of intervention. Intended to protect more populated areas, these construction projects involve either a riprap design of large rocks or a flat, concrete seawall that can create public space attractive to both tourists and residents, such as the Richard Haynes Boardwalk, partially funded by an IDB loan. Because these techniques can sometimes exacerbate erosion and require more expensive maintenance than natural interventions, their long-term efficacy is up for debate, but, in the short term, they protect the coastline and the tourism industry.

Given the island’s vulnerability to storms, engineering projects can be costly. Inniss, however, explains, “We have a policy of rigorous stakeholder consultation, and it’s not just lip service. November through April is our high season; on a recent project in Holetown, we heard from merchants that it was vital to complete work by November, so we hustled to do so. In a spirit of mutual cooperation, we can get private sector buy-in.” Hopefully, the CZMU can leverage the political capital it earns from the private sector on such projects, in order to make more demanding regulations become binding down the road.

In order to build support, the CZMU maintains a major outreach campaign to educate the island’s population, to which Inniss herself attributes the success of the CZMU internally and externally:

“It begins with a nationally high level of education and literacy—over 98 percent for decades.” Former Senator Henry Fraser echoes her, “People ask, ‘Why do things work in Barbados?’ It’s largely because of the emphasis on education since emancipation. And, because it’s a small, highly religious place with people living close together, respect, tolerance, and a work ethic are greater than elsewhere.”

To deepen the educational foundation of Barbados’s cooperative approach to coastal zone management, the CZMU distributes a newsletter, maintains a strong social media presence, and produces an educational television show that explains the geological history of the island and techniques to raise awareness about sea level rise and the importance of coastal management. It also hosts many activities such as International Coastal Clean-Up Day, Sundown Beach Walks, Summer Seminar Series, and a summer internship program for secondary- and tertiary-level students. It also provides lectures for schools and educational institutions, NGOs, private organizations, and the general public.

Next Steps and Global Cooperation

The IDB continues to be a major supporter of Barbados’s efforts. The development bank’s most recent aid to the country includes a 25-year, \$30 million loan to pursue a Coastal Risk Assessment and Management Programme. Inniss is excited by the confidence that such support expresses, as it indicates the government’s belief that the CZMU can execute a project that will create enough value to repay the money. “It will be a next level, state-of-the-art integrated coastal zone management strategy that will involve a series of stakeholders: tourism, rum distilleries, light and power utilities, marinas, boaters, commercial fishermen, the port, divers,” Inniss details. “Key decision makers have recognized that coastal zone management is important not just as an environmental program but to grow the economy of Barbados.” Hopefully other Caribbean countries have taken notice, as Inniss herself has provided technical assistance to St. Lucia, Trinidad and Tobago, and St. Vincent and the Grenadines—while in turn taking cues from New Zealand, Hawaii, and Fisheries and Oceans Canada as a model of how to implement international standards.

Of course, there is still room for improvement. Even as the CZMU works closely with TCPDO

on land use planning, with national marine parks to conduct ecosystem-based monitoring, and with civil engineers from the Ministry of Public Works, CZMU is still not fully integrated with the Ministry of Agriculture and Fishing. For example, Inniss acknowledges, “We know scientifically that agricultural runoff is the biggest contributor of marine pollutants.”

Indeed, on a small island, the land and water are intrinsically interconnected. While Barbados continues to do its part in the battle against global climate change—another IDB loan signed alongside the coastal management funding will establish an Energy Smart Fund to reduce dependence on fossil fuels—it cannot sit tight and wait for the larger countries of the world to act. As small, developing island states in the Indian and Pacific oceans face the prospect of resettling their populations in other countries a few decades down the road, Barbadians plan to stay and protect their piece of paradise. **L**

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Leasing Renewable Energy on State Trust Lands in the Intermountain West

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Judith Gap Wind Farm, on state trust land in Montana, generates about \$50,000 a year and funds public education.

Alison Berry

State trust lands in the Intermountain West could play an important role in the growing market for renewable energy. Congress granted these territories, covering 35 million acres, to states upon their entry to the Union, to support schools and other public institutions. As managers of these state trust lands search for innovative and sustainable ways to lease and sell parcels to generate income, renewables could prove to be a double boon—by supplying clean, sustainable power and providing a strong revenue stream for the public benefit.

All seven states in the Intermountain West—Arizona, Idaho, Colorado, Montana, New Mexico, Utah, and Wyoming (figure 1)—are using state trust lands to develop renewables, including wind, solar, geothermal, and biomass projects. Yet the industry has not flourished to its full potential. In 2011, the installed renewable energy production

capacity on state trust lands was only 360 megawatts—not enough to power 2 percent of the homes in the region. The \$2 million in revenue generated by these sources on state trust lands amounts to less than 1 percent of the \$1 billion-plus generated there annually by other means (Berry 2013; WSLCA). Wind energy is experiencing the most activity by far; all the Intermountain West states have leased state trust lands for wind projects, and all have operational wind farms. Although Arizona, New Mexico, and Utah have leased state trust lands for solar operations, only one generation facility is in production on state trust lands in the Intermountain West, in Arizona. Only Utah has a geothermal plant on state trust land, and no states in this region have active biomass facilities on trust lands.

This article will focus on three types of renewable energy production in three states—a wind farm in Montana, geothermal projects in Utah, and solar generation in Arizona—and the conditions,

legislation, and other factors that led to successful operations. All three examples demonstrate that these territories offer a largely untapped bounty for this burgeoning, sustainable market; provide learning opportunities across state lines; and help meet growing demand for renewable energy.

Judith Gap Wind Farm, Montana

Judith Gap is Montana's only operational wind farm on state trust land, straddling private land as well, in the central-eastern part of the state. It has 90 turbines total, each with a capacity of 1.5 megawatts; 13 are on state trust lands, on the leading edge of the wind farm, with a total capacity of 19.5 megawatts. The per-megawatt fee of approximately 2.6 percent of gross receipts brings in about \$50,000 per year according to Mike Sullivan of the Montana Department of Natural Resources and Conservation (DNRC). At the time of construction, there was a one-time installation fee of \$20,000 (Rodman 2008).

Bob Quinn, founder of a local wind development company called Windpark Solutions, initiated the project in 2000, when he proposed the idea to a small group including representatives from the local utility, the Montana Department of Environmental Quality, and the DNRC. Quinn says that close collaboration between the developer and personnel in these state agencies was key to successfully siting the project on state trust land. State staff also helped Quinn navigate other difficult challenges including unanticipated delays in the request for proposals (RFP) process required by the state.

After conducting preliminary studies—allowed for one year through a land use license from the DNRC—developers must apply to the DNRC in order to proceed with energy projects. The state then issues a request for proposals (RFP). Applicants with a land use license do not receive preferential treatment. After a successful applicant is identified, the developer must conduct environmental analyses, secure a power purchase agreement with a utility, and determine economic feasibility before signing a lease with the DNRC. Currently, fees for new land use licenses are generally \$2 per acre per year. Lease agreement costs for new wind projects include a one-time installation charge of \$1,500 to \$2,500 per megawatt of installed capacity, and annual fees of 3 percent of gross annual revenues or \$3,000 for each megawatt

of installed capacity, whichever is greater (Rodman 2008, Billings Gazette 2010).

Lease and Fee Structures

Every state has different leasing systems for renewable energy projects on state trust lands, but they all follow a similar pattern. The process usually starts with a short-term planning lease that allows for exploration and meteorological studies. The construction phase is next, followed by a longer-term production lease. Payments to the trust land management agency usually include a per-acre rent during the planning phase, which may continue into the production phase. There are additional installation charges for equipment, including meteorological towers, wind turbines, solar collectors, structures, and other infrastructure. During the production phase, the fee is typically based either on the installed capacity or the gross revenues of the generation facility.

Since Judith Gap was completed in 2005, several wind farms have proposed development on state

FIGURE 1
State Trust Lands in the Intermountain West



Source: Western States Land Commissioners Association website, <http://www.wslca.org>.

TABLE 1
Renewable Portfolio Standards in the Intermountain West

Many states have adopted Renewable Portfolio Standards (RPS), which mandate that a certain percentage of a state's energy derive from renewable sources. This table shows the RPS and the current proportion of energy generated from renewable sources in Arizona, Montana, and Utah.

	RPS: Proportion of Energy from Renewable Sources	Target Year	2011: Proportion of Energy from Renewable Sources
Arizona	15%	2025	9%
Montana	15%	2015	46%
Utah*	20% (goal)	2025	5%

Sources: Database of State Incentives for Renewables & Efficiency (<http://www.dsireusa.org>) and U.S. Energy Information Administration (<http://www.eia.gov/electricity/data/state>).

* Utah has no regulation, but rather a goal of 20% by 2025.

These territories offer a largely untapped bounty for this burgeoning, sustainable market and provide learning opportunities across state lines.

trust lands in Montana, but none have reached the production phase. These include the Springdale Wind Energy project—an 80-megawatt wind farm consisting of 44 turbines, 8 of which would be on state trust lands. The DNRC has also leased 3,000 acres near Martinsdale to Horizon Wind Energy for a wind farm with 27 turbines, 7 to 15 of which would be on state trust lands. The Martinsdale wind farm could expand to 100 turbines in the future (MT DNRC).

In order to make state trust lands more attractive to these and other renewable energy developers, the DNRC would benefit from a more streamlined process. Developers working on state trust lands in Montana have cited struggles with timing, financing, environmental mitigation, cooperation from power buyers, and transmission (Rodman 2008). According to Quinn, Judith Gap succeeded in part due to dedication and close collaboration between agency personnel and the energy developer. In the future, the DNRC may need to assign personnel to renewable energy projects in order to guide developers through the process. The DNRC could also attract projects by granting land use license holders preferential status in the RFP process and by opening up bidding faster. Quinn notes that evaluating bids according to performance rather than price alone would improve the system.

Geothermal Energy, Utah

Geothermal energy is a potentially constant power source, offsetting fluctuations from intermittent

renewables such as wind and solar. However, it's also technically complex and expensive—and thus rare on state trust lands in the Intermountain West. Utah is currently the only state in the region with active geothermal facilities on state trust land. Measured by land area, geothermal is Utah's largest renewable energy supply, with approximately 100,000 acres leased on state trust lands. There are currently two geothermal energy plants in production, generating revenue of \$200,000 to \$300,000 per year. For geothermal projects, the State and Institutional Trust Lands Administration (SITLA), which manages state trust lands in Utah, charges 2.25 percent of electricity sales for the first 5 or 10 years, and 3.5 percent thereafter.

PacifiCorp's 34-megawatt Blundell plant, on a mix of federal, state, and private territory, was the state's first, built in 1984. Blundell taps into an underground reservoir that is 3,000 feet deep, more than 500° F, and pressurized at 500 pounds per square inch. A well brings the hot, high-pressure water to the surface, where it powers a steam turbine. The Blundell plant has two units, a 23-megawatt unit built in 1984 and an 11-megawatt unit completed in 2007.

The newer Raser plant in Beaver County has been less successful. Raser originally planned to build a 15-megawatt operation using a new, modular technology produced by United Technologies, says John Andrews, SITLA associate director. The company aimed to cut costs and development time by exploring the geothermal resource while constructing the generation facility—instead of fully developing geothermal wells first, then building the power plant later. Unfortunately, the geothermal resource fell short of expectations and could not support a 15-megawatt operation. With limited income, Raser could not cover debts and declared bankruptcy in 2011. The plant continues to run at limited capacity (Oberbeck 2009).

The experience at Raser shows that the costs of geothermal development continue to be daunting and that it's worthwhile to fully characterize the available geothermal resource prior to constructing generation facilities, although that additional step is costly and time-consuming. Future technological advances may help to cut the costs and time required for geothermal development, but, given the current state of technology, geothermal projects still require significant upfront outlays.

For renewable energy development, SITLA

responds to applications as they are received; they can also offer lands through a request for proposals or a competitive sealed bid process (Rodman 2008). The state has mapped renewable energy zones, but the task of finding locations and proposing renewable energy projects devolves to developers.

Utah faces other challenges to all forms of renewable energy development on trust lands. Because of the high proportion and pattern of federally owned territory, national agencies sometimes take the lead on energy development projects. According to Andrews, the absence of an RPS in Utah is another drawback, leaving local utilities without a state mandate to supply renewable energy.

Even without an RPS, however, Utah is geographically well-positioned to export energy to other states—particularly to population centers on the west coast. Although transmission can be a barrier in some parts of the state, transmission capacity is available between Utah and southern California. What's more, developers can tap an array of renewable resources—wind, solar, and geothermal. SITLA would benefit from marketing trust lands within renewable energy zones to potential developers and by offering reduced rates for renewable energy projects within these areas.

Solar Developments in Arizona

Even in Arizona—the sunniest state in the U.S., according to the National Weather Service—the solar industry faces several obstacles on state trust lands. The only active solar facility on state trust lands, the Foothills Solar Plant opened on 400 acres in Yuma County in April 2013, when the first 17 megawatts came online. An additional 18 megawatts are scheduled to go online in December 2013. Once it's fully operational, the facility will serve 9,000 customers. The 35-year lease will generate \$10 million for state trust lands beneficiaries, and most of that money will fund public education.

The slow development of the solar industry on trust lands mirrors a larger trend seen nationwide. In 2010, only 0.03 percent of the nation's energy came from solar projects, while 2.3 percent came from wind (www.eia.gov). Solar projects usually require exclusive use of a site—putting them at an even greater disadvantage on state trust lands, where many acres are already leased for agriculture, grazing, or oil and gas production. Wind

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projects, by contrast, can co-exist with other land uses. Solar projects also require large tracts—as many as 12 acres per megawatt (Culp and Gibbons 2010)—whereas wind facilities have a relatively small footprint. And, although prices are dropping, solar generation facilities can be very expensive.

Despite these drawbacks, there are ways in which solar development is well-suited to state trust lands. For starters, these territories are untaxed and owned free and clear; unburdened by the carrying costs that private owners might have, state trust land management agencies have an advantage for holding and maintaining renewable energy projects. Some solar developers have found state trust land attractive because they can work with one owner for very large tracts. Solar generation is also well-suited to previously disturbed sites, such as old landfills and abandoned agricultural areas, which may include trust lands. Near urban areas, state trust lands slated for future development could be used for solar generation in the interim; after the solar leases expire, the grounds could be developed for urban uses (Culp and Gibbons 2010).

State-level RPS and tax incentives could also encourage solar development. Some states provide up to 25 percent investment tax credits, property tax exemptions, and standard-offer contracts on solar, guaranteeing a long-term market for solar output.

The Blundell geothermal energy plant, on state trust lands in Utah, draws on a 3,000-foot-deep underground reservoir to generate 34 megawatts of power.

The slow development of the solar industry on state trust lands mirrors a larger trend seen nationwide. In 2010, only 0.03 percent of the nation's energy came from solar projects, while 2.3 percent came from wind.

As one of the largest landowners in the state, with several large, consolidated parcels, the Arizona State Land Department (ASLD) would do well to position itself as an attractive partner for the renewable energy industry (Wadsack 2009). The ASLD is taking steps in the right direction by developing a GIS-based renewable energy mapping system to analyze state trust lands for general suitability for solar production, based on avoiding critical wildlife habitat and wilderness areas, and minimizing distance to roads, transmission, and load. But it must follow up and market the most suitable areas for renewables (Culp and Gibbons 2010) and facilitate the process for developers, who can be deterred by complex leasing structures, requirements for public auctions, and required environmental and cultural analyses (Wadsack 2009). The more the agency can build capacity to help developers through this process, the more the renewable energy industry might flourish on state trust lands. For example, the department could offer long-term leases, expedite land sales, or develop a reduced-cost, revenue-sharing lease system specifically tailored for renewable energy development.

The Foothills Solar plant, on state trust lands in Yuma, Arizona, will provide power for 9,000 customers once it's fully online in December 2013.

General Recommendations for Montana, Utah, and Arizona

Leasing renewable energy on state trust lands is complicated. Each state has a unique set of political, environmental, and economic circumstances that makes it difficult to determine any one best method

for all. However, the accomplishments, problems, and solutions detailed in the examples above provide some general recommendations for success.

At the state land trust agency level:

- Proactively market suitable sites to developers. State trust land management agencies in some states, including Arizona and Utah, are creating inventories of the most suitable areas for renewable energy development on state lands. Other states could follow this model (BLM 2011, Berry et al 2009), market these parcels, and offer incentives for development, either as a part of the leasing process or through tax incentives (Culp and Gibbons 2010).
- Reduce risks to developers by granting them exclusive rights early in the discovery phase or prioritizing those who have conducted initial site assessments in the bidding or auctioning process.
- Foster close collaboration between the developer and trust land managers by educating staff on renewable energy issues in order to guide developers through the process of permitting, financing, and working with federal agencies.
- Break down silos and collaborate with other landowners and land management agencies to streamline permitting and coordination between various agencies at the local, state, and federal level.



Foothills Solar

At the state level:

- Streamline environmental requirements. The National Environmental Policy Act (NEPA) requires a thorough analysis of environmental impacts for projects on federal lands. Montana and other states require additional, separate analyses for developments on states lands, while others streamline their requirements by allowing federal NEPA analyses to meet state obligations for projects on both federal and state jurisdictions. This streamlined approach can be more attractive to energy developers, while still effectively protecting environmental resources.
- Adopt or increase renewable portfolio standards. In the Intermountain West, Arizona, Colorado, Montana, and New Mexico have enacted RPS policies, whereas Utah has only a renewable energy goal. Trust land managers in Utah and Idaho cited the lack of a renewable portfolio standard as an impediment to the renewable energy industry in their states. Within the region, states' RPS targets range from 15 percent renewable energy up to 30 percent. Those states with lower targets could reasonably consider strengthening their RPS policies to encourage more renewable energy development.
- Offer tax policies that encourage renewable development, including property tax incentives, sales tax incentives, or tax credits. Each state could either adopt additional tax incentive policies, or increase existing incentives to better encourage renewable energy development.

Federal policies play a considerable role as well. Production tax credits in particular have spurred U.S. renewable energy deployment in recent decades. Likewise, federal investment tax credits for renewable energy—which provide developers with a tax credit during the planning and construction phases—have helped the renewable energy industry grow in recent years, even when the national economy was in recession. Finally, there have been several proposals for a federal-level renewable portfolio standard, although researchers disagree whether this type of policy would interfere with existing state-level RPS policies, which have proven extremely effective.

Renewable energy offers state trust land managers an opportunity to diversify their revenue stream to benefit the public good. For the most part,

wind and transmission projects can be co-located with pre-existing leases for grazing, agriculture, oil, and gas. Solar projects could have great potential in previously disturbed sites or areas with little other value. Where geothermal resources are available, they offer consistent power that can offset intermittent sources like wind or solar. Technological advances could help bring down prices for renewables, particularly solar, geothermal, and biomass. As our energy demands grow, state trust lands are poised to play an important role in the growing renewable energy industry. **L**

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Tax Incentives for Open Space Preservation

Examining the Costs and Benefits of Preferential Assessment

Jeffrey O. Sundberg

Twenty-three states offer an incentive to preserve open space by providing preferential property tax assessment of qualifying parcels (table 1, p. 15). These property tax reductions can be considered expenditures in that they reduce revenue available for other uses in the interest of protecting the many amenities and environmental benefits of undeveloped land.

Programs vary widely from state to state, but all preferential assessment programs for open space must define the type and size of qualified parcels; permissible uses; certification requirements; assessment methods; enrollment term lengths; and penalties, if any, for removing a parcel from preferential status. Several states offer more than one program, each with its own qualification requirements. This article considers these differences, offers examples of how the tax expenditure is calculated, and describes potential societal benefits and costs of such programs.

Protected by a Nature Conservancy easement, Findley Butte and the Zumwalt Prairie Preserve in Oregon qualify for preferential property tax assessment.

Determining Eligibility for Preferential Assessment

States define eligibility in many different ways, but the requirements are usually relatively easy to meet. A parcel might qualify simply by being undeveloped. Several states allow landscaped land to qualify provided the building density doesn't exceed established limits. Washington, for example, allows land to qualify if it meets at least one of eleven very general requirements, including the protection of streams or water supplies, conservation or enhancement of natural or scenic resources, preservation of visual quality along roads, or enhancement of recreational opportunities.

While these criteria are very general, states may raise the bar by placing additional requirements on landowners. Some states require landowners to create and seek state approval for a property management plan that improves benefits for local wildlife. Vermont stipulates that a qualified conservation organization must own and manage the open space. One of two Texas programs requires



landowners to provide land and wildlife management to propagate a breeding, migrating, or wintering population of indigenous wild animals for human use, including food, medicine, or recreation.

Several states offer preferential assessment to properties that have attained federal status as open space. For example, parcels restricted by a conservation easement that meets the IRS requirements for a charitable donation automatically qualify for preferential assessment in Illinois and Oregon. Ohio will qualify only parcels under contract to one of four USDA programs (Conservation Reserve Program, Conservation Reserve Enhancement Program, Wetlands Reserve Program, and Grassland Preserve Program).

Parcels may have to meet minimum size requirements as well. The most common minimum is ten contiguous acres, though some programs allow properties as small as two acres, and several have no stated requirements. A few states limit the total acreage that any individual landowner may enroll. Tennessee, for example, limits eligibility to 1,500 acres per owner per county, including agricultural land, forest, and open space combined. The stated use of the property may influence its acceptability; several states specifically prohibit commercial property, including golf courses. At least two states, however, have programs specifically designed for golf courses and other commercial properties that provide outdoor recreational opportunities.

State Versus Local Criteria

State governments typically authorize preferential assessment programs and the criteria for inclusion. Six states allow local or county government officials to determine criteria by authorizing a program and requiring only that parcels be “included with- in a plan for preservation approved by state or local planning agencies” (Chervin, Gibson, and

TABLE 1
States Offering Tax Expenditures for the Provision of Open Space

State	Program Title(s)
California	Farmland and Open Space Program (Williamson Act)
Colorado	Agricultural Valuation Program
Connecticut	Rule of Valuation for Farmland, Forest Land, and Open Space Land
Florida	Environmentally Endangered Land and Conservation Easement Program
Georgia	Conservation Use Assessment Program
Idaho	Valuation of Agricultural Land
Illinois	a) Land Conservation Stewardship Program b) Open Space Valuations c) The Real Property Conservation Rights Act
Massachusetts	Recreational Land Tax
Maryland	Agricultural Use Assessment Law
Maine	Open Space Assessment
Michigan	Open Space Preservation
Minnesota	a) Private Outdoor Recreational, Open Space, and Park Land Tax b) Rural Preserve Program
New Hampshire	Current Use Taxation Program
Nevada	Assessment of Open-Space Real Property
Ohio	Current Agricultural Use Value
Oregon	a) Conservation Easement Special Assessment b) Open Space Land Special Assessment c) Wildlife Habitat Conservation and Management Special Assessment
Pennsylvania	Farmland and Forest Land Assessment Act
Rhode Island	Farm, Forest, and Open Space Program
Tennessee	Agricultural, Forest, and Open Space Land Act (Greenbelt Law)
Texas	a) Qualification for Agricultural Appraisal based on Wildlife Management Use b) Use Valuation for Recreational, Park, or Scenic Land
Vermont	Agricultural Land, Forest Land, Conservation Land, and Farm Buildings Value Appraisal Program
Virginia	Special Land Use Assessment
Washington	Open Space Taxation Act

Source: Significant Features of the Property Tax (2012).

The Lassen Foot-hills of California are eligible for preferential assessment under California's Farm-land and Open Space Program.



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Green 2009, 8), for example, or by requiring that the appropriate governing body accepts the property via resolution. States with this requirement include California, Connecticut, Florida, Nevada, Tennessee, and Oregon. It is then up to local or county officials to choose the criteria for qualification, in some cases naming specific parcels. In other cases, the assessor's office determines the eligibility, based on the characteristics of the property and whether it meets the criteria.

This approach allows local governments to control the amount of the expenditure in their jurisdiction and tailor the program to protect the specific qualities most important to the area. For example, officials in a predominantly agricultural environment may prefer to use tax expenditures on forests or wetlands, while open fields might prove most valuable in a more urban setting.

Calculating the Value of the Tax Expenditure

Open space preferential assessment programs typically use one of three methods to determine the property's assessed value. Nine states value open space as if it were enrolled in the state's program for agriculture or forestry, even though the land isn't used for either activity. Nine other states instruct assessors to value the property considering only its current use, excluding the value of development rights (i.e., the market value as if its future

use were permanently restricted to its current use). Four states instruct the assessor to determine the fair market value as if it were not in the program and then apply a statutory formula to determine the preferential assessed value. Illinois has three programs for preferential assessment of open space, which vary by the criteria for eligibility; all offer statutory reductions that range between 75 percent and 85 percent. Nevada applies a lower statutory reduction of 26 percent.

States occasionally choose to define maximum or minimum values per acre for open space parcels. For example, Maryland set a statewide value of \$187.50 per acre for 2009. Washington allows local governments to determine a use value for their region, depending on a public benefit rating system; if no such system exists, open space land may receive an assessment no lower than the lowest agricultural valuation in the county. Massachusetts calculates the preferential value as use value, not to exceed 25 percent of fair market value.

Program Duration and Penalties for Early Withdrawal

Many programs provide for automatic annual renewal unless the landowner chooses to withdraw from the program. In some cases, length of contract is predetermined, most frequently for ten years, which generally carries forward upon the sale of

the property unless the new property owner alters the use and violates the terms of the program. Landowners pay a penalty for withdrawing from the program in order to alter land use, or for altering it without notification. Such penalties tend to equal the value of the tax expenditure received for a specified number of years prior to the current year, plus interest on that expenditure. Several states either charge 10 percent of the fair market value when use of the parcel changes, or charge a conveyance or transfer tax when a parcel in the program is sold.

If an owner withdraws a parcel from the program after a minimum number of years, however, the state may reduce or even eliminate penalties. For example, Vermont charges owners 20 percent of fair market value for withdrawing the property in the first decade and 10 percent for withdrawing after more than 10 years. Rhode Island exacts 10 percent of the new fair market value for removing a property after 6 years, but that penalty declines until it terminates, 16 years after enrollment.

Economic Benefits of Open Space Preservation

The large literature discussing the effect of environmental amenities on surrounding property values suggests that preventing development on a parcel will raise the value of neighboring parcels. The studies find complicating factors, however, that make it difficult to predict changes in value for specific regions. One study in Maryland, for example, finds that open space programs have very different effects on the value of property in three different counties, probably due at least in part to variations in the amount of open space present (Geoghegan, Lynch, and Bucholtz 2003). Numerous other studies indicate that the value of open space for individual homeowners declines with distance from the protected parcel (Chamblee, et al. 2011). The type of habitat or green space is also likely to be influential; one analysis finds that the presence of broad-leaved trees in a neighborhood is associated with positive values, but the presence of spruce trees has a negative effect on property values (Garrod and Willis 1992). An analysis of home prices in Tucson, Arizona, finds a preference for homes in areas with green space including native riparian habitat (Bark, et al. 2009; 2011).

Public access to privately owned open space for recreation or educational purposes would also

be likely to provide substantial local benefits in many cases. States rarely require public access as a condition for the tax expenditure, but Maine and New Hampshire both encourage it by offering an additional reduction in assessed value of 25 percent and 20 percent, respectively.

Protected open space can also reduce growth in the demand for municipally provided services and forestall negative effects of development, such as heavy traffic or overcrowded schools, which would likely impose a heavier tax liability on current residents. A growing literature on cost of community services indicates that the property taxes paid on developed land are often insufficient to cover the cost of services created to support that development, while open space frequently generates tax revenues well in excess of the cost of services expended on the property. The American Farmland Trust, reporting results from 151 studies covering counties and municipalities in 25 states, finds that the owners of working and open land frequently pay taxes above or even twice the cost of services received on those properties, while residential property owners typically pay less than the cost of services received (Farmland Information Center 2010).

Findings like these suggest that preferential assessment can be justified on the grounds of fairness, because the owners of open space may be subsidizing services sent to owners of developed property. However, the fact that most programs require a long-term agreement and include penalties for early conversion indicates that the goal is not fairness, but preventing development for a specified period.

Unfortunately, there is very little literature evaluating whether preferential assessment programs prevent future development on parcels that aren't under permanent protection such as an easement. Much of the existing evidence is based on studies of farmland protection programs rather than evaluations of the impact of property tax expenditures on open space. Two studies of Tennessee's Greenbelt Program evaluated a survey of woodland owners enrolled in the program and found little support for the hypothesis that preferential assessment reduced the likelihood of development on these parcels (Brockett, Gottfried, and Evans 2003; Williams, et al. 2004).

It's easier to evaluate land under long-term or permanent protection of either a perpetual



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The Land Conservancy of Western Michigan has permanently protected this 130-acre easement with mature hardwood forest and extensive wetlands, in Mason County.

conservation easement or a long-term preferential assessment contract with substantial penalties for withdrawal. In those cases, it's possible to reliably predict the continued presence of open space; unfortunately, these protection agreements may predate the preferential assessment or be otherwise uninfluenced by it.

Costs of Preferential Assessment for Open Space

In addition to the tax expenditure itself, these programs may incur several other potential costs. Programs that require an approved conservation plan, for example, might generate a particularly challenging expense. While a state agency could develop and approve such a plan, it will be costly to ensure that conditions of the plan are met.

Program enforcement requires evaluating not only changes in a property's market value but also changes in its use. If open space is used to graze livestock, for example, this new use might protect the undeveloped condition of the property but still reduce the environmental benefits.

Additionally, evidence suggests that in some instances open space preservation can lower property values by shifting development patterns, typically by resulting in the development of nearby properties (Irwin and Bockstael 2004; McDonald, et al. 2007). If preferential assessment prevents development on particular parcels, that development may shift to other parcels in ways that increase sprawl. If a leapfrog pattern of development occurs because a program prevented development on a parcel-by-parcel basis, the negative effects,

such as higher infrastructure costs, could overwhelm any public benefits from the program.

Given the voluntary nature of these programs and resulting changes in development patterns, a worst-case scenario is that lower-quality parcels might receive the preferential assessment, increasing development pressure on parcels that generate greater public benefits. On the one hand, local government approval might reduce this problem by allowing individuals who know the area best to choose the parcels that most deserve protection. On the other hand, it might inspire local officials to protect open space in their jurisdiction, pushing development into other communities and creating undesirable development patterns at the regional level. It is also important to mention that preferential assessment of open space to some degree creates a split-rate system with a higher rate on developed land, particularly on improvements to the land—an issue that concerns many property tax scholars and may also significantly affect land use patterns.

Finally, the value of the public benefits is not static; it may increase or decrease depending on the condition of the property and surrounding area. The changes may be uncorrelated, or even negatively correlated, with future changes in assessed value. For example, more intense development pressure might increase the benefit of preserving a large parcel as open space; or it might decrease the benefit of preserving a small “island” parcel. Twenty-five acres of open space in the middle of a town can greatly benefit a community, but, if 24 of those acres are developed, it will likely diminish the environmental benefits of the remaining acre. Both scenarios, however, are likely to increase tax savings from preferential assessment, as development pressure drives up local property values.

These factors indicate that, while preferential assessment does offer landowners an incentive to preserve public benefits, the amount of the incentive may under-correct or even over-correct for the benefit being created. This will result in an inherently inefficient program, though such programs may still result in significant net benefits compared to having no program at all.

Distributional Consequences

Property tax expenditures to protect open space will have distributional consequences. Most immediately, the program would redistribute the tax burden onto other property owners in the same tax

districts, as governments change the mill rate in order to maintain budgeted revenue. Owners of developed properties will now constitute a larger share of the tax base and will need to pay a greater fraction of the total tax bill as a result.

Since preferential assessment programs are primarily designed to maintain existing open space, enrolled parcels continue to generate benefits, but those benefits don't necessarily increase. Thus the public benefits should be expected to continue to accrue as before. Local residents alone will benefit from scenic views and the foregone external costs of development, while residents and nonresidents alike may benefit from protecting watersheds or habitat for endangered species (Anderson and West 2006). Benefits may be expected to increase, however, if the program requires owners to improve the value of the open space by activity such as habitat restoration.

Several studies indicate that the effects of open space on surrounding property values depend critically on the type of protection and its ability to prevent development in the future. For example, land acquired as a park or forest preserve, or land placed under a conservation easement, has a much more positive effect on neighboring property values than open space that is not permanently protected (Geoghegan 2002). Enrollment in a preferential assessment program might have little or no effect on surrounding property values if the protection is perceived to be temporary, resulting in either

permanent reductions in revenue or permanently higher tax rates on the non-enrolled parcels.

Calculating the Fiscal Cost of Preferential Assessment Expenditures

The methodology for calculating the tax expenditure resulting from the preferential assessment of open space is straightforward. The property owner will see a reduced tax burden based on the difference between the assessment without the program and the preferential assessment. This reduction in assessed value can lower tax revenue due to a reduced base. Alternatively, the lost revenue could be recouped by shifting the burden onto other property owners by increasing the tax rate. A combination of both outcomes is also possible. Oregon reports both the loss and the shift in their tax expenditure report (table 2), which listed exemption values of \$126 million in fiscal year 2009–10 for the three open space programs. The estimated revenue loss over two fiscal years is \$3.2 million, while the estimated revenue shift during that period is \$0.7 million.

Data is inconsistent from state to state, which makes it difficult to estimate the revenue effects of preferential assessment. The aggregate data presented for Oregon is much more useful than what many other states present. States that do not calculate property tax expenditures frequently do not make such data available; at best, they usually offer aggregate figures that combine the programs for agriculture, forestry, and open space. Table 2

TABLE 2
Oregon Tax Expenditures for Open Space

Program	2009–10 Assessed Value of Property Exempted ¹	2009–11 Revenue Impact: Loss ¹	2009–11 Revenue Impact: Shift ¹
Wildlife Habitat	\$51 million	\$1.1 million	\$0.2 million
Conservation Easements	\$14 million	\$0.4 million	< \$0.1 million
Open Space Land	\$61 million	\$1.7 million	\$0.4 million
Totals for Open Space Programs (as rounded)	\$126 million	\$3.2 million	\$0.7 million
Private Forests²	\$5.3 billion	\$104 million	\$19.9 million
Farmland³	\$14.1 billion	\$303.9 million	\$58.2 million
Open Space, percent of total	0.6%	0.8%	0.9%

Source: Oregon Department of Revenue (2012), pp. 317–329.

- 1 Numbers in the table are reported as listed in the report. The dollar values are rounded to the nearest million or tenth of a million.
- 2 Private Forests includes preferential assessment programs for forest homesites, western private forestland, eastern private forestland, and small tract forestland. It does not include property tax exemptions for standing timber.
- 3 Farmland includes preferential assessment programs for farmland and for farm homesites.

also indicates the relative scope of open space in that context. The exemption values for private forestry were over \$5 billion, and the exemption values for farmland and farm home sites were \$14.1 billion. The three conservation programs combined represent approximately one-half of one percent of the total exemption value, and less than one percent of the revenue lost or shifted.

Such calculations also depend on other effects

that may be very difficult to observe. It will be impossible to determine the extent to which revenue shifted, without detailed information about local government's ability to respond by changing the mill rate. In that case, the estimate will account for only foregone revenue. It will also be necessary to ignore the program's possible positive property value effects on neighboring parcels.

Conclusion

Designing a preferential assessment program for open space requires careful consideration. While land with limited development does provide amenities and environmental benefits under many circumstances, the value of those benefits may vary dramatically according to local conditions. If the program's goal is primarily to provide local, rather than regional, benefits, one set of criteria for the entire state is unlikely to maximize benefits. Local determination of the enrollment criteria may provide the flexibility necessary to react to those varying conditions, whereas state-level criteria are probably necessary to protect regional resources such as watersheds.

The shortage of empirical work in this area makes it difficult to assess the effectiveness of existing programs. If the goal is genuinely to forestall development on certain parcels, program design should consider the length of contract and penalty for early conversion. Short-term delays in development will primarily benefit the owners of open space. For a program to succeed, the open space must generate significant community benefits in the form of either long-term environmental protection or higher property values for other residents of the area. Higher eligibility requirements for inclusion in the program should reduce the amount of acreage enrolled; however, the number of acres should not be the program's primary goal unless legislators intend it solely as a means to reduce local development. Significant enrollment in the program could have substantial fiscal implications for local jurisdictions, especially if broad criteria and low conversion penalties make it easy for landowners to enroll and then develop the property later. Program design must ensure a maximum of public benefit in exchange for the fiscal effects. **L**

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Property Rights and Climate Change

Anthony Flint

As coastal cities continue to face the potentially expensive threat of increasingly volatile weather, storm surge, and sea level rise associated with climate change, building resilience has become a top planning priority. But resilience has multiple dimensions. It means not only building things, like flood gates and hardened infrastructure, but also keeping natural systems such as wetlands free of development—and, in many cases, deciding not to rebuild in the most vulnerable places. Therein lies an evolving and complex issue affecting private property rights.

From at least the turn of the 20th century, the Supreme Court has wrestled with a basic question: When does land use regulation constitute a taking, requiring compensation for property owners under the 5th amendment of the U.S. Constitution (“... nor shall private property be taken for public use without just compensation.”)? Since *Pennsylvania Coal v. Mahon*, 260 U.S. 393 (1922) and *Euclid v. Amber Realty*, 272 U.S. 365 (1926), the essence of the rulings has been that government has considerable leeway in its power to regulate land use. In *Kelo v. City of New London*, 545 U.S. 469 (2005), the high court affirmed the state’s power to use eminent domain for economic development in the 21st century.

In June 2013, however, a decision on a Florida development project seemed to indicate a subtle shift in another direction. In *Koontz v. St. Johns River Water Management District*, the justices ruled 5 to 4 that government was overzealous in imposing mitigation requirements on developers as conditions for building permits. Coy Koontz, Sr., who had wanted to build a small shopping center on his property,

timomedy/flickr



A few years after enacting tougher development standards on the coast, Long Branch, NJ, withstood Hurricane Sandy far better than neighboring towns.

objected to a Florida water management district’s demands that he pay for off-site wetlands restoration to offset environmental damage caused by the construction. Citing two cases, *Nollan v. California Coastal Commission*, 483 U.S. 825 (1987) and *Dolan v. City of Tigard*, 512 U.S. 374 (1994), Koontz claimed that the requirements constituted a taking for exceeding a “rough proportionality” between the requirements and the scope of damages caused by the development. In 2011, the Florida Supreme Court rejected Koontz’s argument, but in June the high court ruled that the mitigation requirements on the builder went too far.

The ruling alarmed some environmentalists and groups such as the American Planning Association, who feared new limits on the government’s ability to control development and impose require-

ments to restore and conserve natural areas. The concern extended to coastal metropolitan regions preparing for the impacts of climate change, such as New York City, which in May proposed a model \$20 billion plan that is a mix of strategies for living with water and keeping it out. Property rights experts speculated that developers could cite the Koontz case as justification to refuse to pay into a fund for such initiatives.

At a broader level, the question remains: After an event like Hurricane Sandy, is government within its rights to forbid rebuilding or to modify regulations in order to prevent new building? The legal answer is essentially yes, according to Jerold Kayden, an attorney and professor at Harvard University’s Graduate School of Design, who was part of the Lincoln Institute’s Journalists

Journalists Forum on Land and the Built Environment: The Resilient City

Thirty-five leading writers and editors who cover urban issues attended the 6th Journalists Forum on Land and the Built Environment on April 20, 2013, at Lincoln House. The theme was The Resilient City, from coastal municipalities preparing for sea level rise and storm surge to legacy cities trying to evolve despite diminished populations and business activity.

Kai-Uwe Bergmann, principal at Bjarke Ingels Group, opened the forum with a look at urban design innovations that maximize efficiency in land, housing, and major infrastructure projects. Johanna Greenbaum from Kushner Companies, who helped run New York City Mayor Michael Bloomberg's microhousing initiative, detailed that project as well as other similar efforts around the country to accommodate singles and couples who can live in just 300 square feet.

Alan Mallach, co-author of the Lincoln Institute's policy focus report *Regenerating America's Legacy Cities*, noted signs of resurgence in places such as the Central West End in St. Louis or Over-the-Rhine neighborhood in Cincinnati, while acknowledging the challenges facing Camden, New Jersey; Flint and Detroit, Michigan; and Youngstown, Ohio. Antoine Belaieff, Innovation Director at MetroLinx, detailed the use of social media to gain citizen input on a \$16 billion investment in resilient transportation infrastructure in the Toronto area.

John Macomber, from Harvard Business School, led a session on the global city by recognizing the hundreds of millions of people who continue to migrate from rural to urban areas, requiring large-scale planning for infrastructure. Martim Smolka, director of the Lincoln Institute's Program on Latin America and the Caribbean, lamented widespread dislocations caused by preparations for the World Cup and the Olympics in Rio de Janeiro. Bing Wang, from Harvard University's Graduate School of Design, noted that 11 cities in China have populations over 10 million—and yet the rapidly growing nation is only halfway to its expected urbanization.

John Werner, chief mobilizing officer at Citizens Schools, spelled out how urban school systems can ignite passion in students by bringing in outside professionals as teachers and mentors. Gordon Feller of Cisco Systems envisioned a completely connected world and an Internet of everything, joined by *Washington Post* investigative reporter Dan Keating, who shared his experiences extracting data from various levels of government.

The forum had to be shortened because of the manhunt for the Boston Marathon bombers in the Cambridge-Watertown area—but that event prompted dialogue about the “shelter in place” request by Massachusetts Governor Deval Patrick, security and public space, and another kind of resilience in the Boston area. Several participants wrote about the events, including Emily Badger at *The Atlantic Cities*, Donald Luzzatto at the *Virginian Pilot*, and Inga Saffron at *The Philadelphia Inquirer*.

The springtime gathering is a partnership of the Lincoln Institute, Harvard's Graduate School of Design, and the Nieman Foundation for Journalism at Harvard University. The mission is to bring journalists together to share ideas and learn about cutting-edge trends in the coverage of cities, architecture, and urban planning. — AF

Forum on Land and the Built Environment, held in April.

Particularly as more data become available on sea level rise and storm surge, government has the legal right to restrict owners from building on a vacant lot that is subject to flooding and sea level rise, or from rebuilding a home that has been destroyed. But, Kayden said, “politically, it's another story.”

New York and New Jersey represented two different approaches to post-Sandy reconstruction. New York Governor Andrew Cuomo and New York City Mayor Michael Bloomberg called for a mix of rebuilding and “strategic retreat,” while New Jersey Governor Chris Christie focused on allocating money to residents so they could rebuild on parcels battered by the storm—even when the property remained in harm's way.

The City of Boston, meanwhile, has begun to require waterfront developers to prepare for rising seas and storm surge by relocating mechanicals from basements to higher floors, among other measures. As the Koontz case opens the door for heightened scrutiny of various measures imposed by local government as a condition for building, developers might sue over these expensive, climate-related requirements, arguing that they are too burdensome and may constitute a regulatory taking.

While property rights lawsuits over reconstruction and restrictions on new building in coastal areas will no doubt continue to proliferate, Pratap Talwar, principal at the Thompson Design Group, presented an alternative in long-range planning that could help prevent such conflicts from arising. He detailed for the journalists the case study of Long Branch, New Jersey, which overhauled its planning process several years ago to include tougher standards but also a fast-track process for development that satisfied the guidelines. Long Branch was the one mile of New Jersey shore that weathered Sandy relatively intact, Talwar said. ■

2013–2014 C. Lowell Harriss Dissertation Fellows

The Lincoln Institute's C. Lowell Harriss Dissertation Fellowship Program assists Ph.D. students, primarily at U.S. universities, whose research complements the Institute's interests in land and tax policy. Administered through the departments of Valuation and Taxation and Planning and Urban Form, the program provides a link between the Institute's educational mission and its research objectives by supporting scholars early in their careers. Dissertation fellowship applications for the next cycle are due by February 1, 2014.

Valuation and Taxation

Trey Trosper

Department of Economics
University of Oklahoma

Non-Linear Spatial Capitalization Effects of Fire, Police, and Emergency Medical Services

Adam Found

Department of Economics
University of Toronto

The Effect of Property Taxes on Capital Investment in Structures

Andy Krause

Department of Urban Design and Planning
University of Washington

Partitioning Land and Improved Values: A Comparative Study

Planning and Urban Form

Alexis Schulman

Department of Urban Studies and Planning
Massachusetts Institute of Technology

Sustainable Cities and Institutional Change: The Transformation of Urban Stormwater Management

Stuart Andreason

Department of City and Regional Planning
University of Pennsylvania School of Design

How Regions Get Smarter and What it Means for Individual and Place Outcomes

Drew Bennett

Department of Geography
Oregon State University College of Earth, Ocean and Atmospheric Sciences

Investing Upstream: Examining Public Utility Investments in Ecosystem Services as Drivers of Sustainable Land Use

LAC Graduate Fellows

The Lincoln Institute's Program on Latin America and the Caribbean offers fellowships to doctoral and masters candidates. The students listed below received fellowships for the 2013–2014 academic year. Applications for fellowships in the LAC Program for 2014–2015 will be announced in Spring 2014.

Frederico Román Ramos

Doctoral candidate in public administration and government
Getúlio Vargas Foundation, São Paulo, Brazil

Three Essays on the Urban Spatial Structure of Cities in Contemporary Brazil: Urban Economy and GIS in the Construction of New Insights.

Julia Helena Tabbita

Master's candidate in urban economics
School of Government, Torcuato di Tella University, Buenos Aires, Argentina

Selection of Beneficiaries and Assignment of Social Housing: Analysis of Their Incidence on the Decisions on Formalization and Housing Improvement by Families of Greater Buenos Aires, 1997–2007.

Cristiano Tolentino Pires

Master's candidate in public law
Graduate Program in Law, Pontifical Catholic University of Minas Gerais, Brazil

Acquisitive Prescription (Usucaption) of Public Land. A New Reading of Articles 183, §3.º, and 191 of the Federal Constitution through the Lens of the Social Function of Public Assets.

Lincoln Lecture Series

Lectures take place at Lincoln House, 113 Brattle Street, Cambridge, at 12 p.m. (lunch is provided). The programs are free, but registration is required at www.lincolninst.edu/news/lectures.asp.

WEDNESDAY, OCTOBER 23

The Hub's Metropolis: Boston from Railroad Suburb to Smart Growth
Jim O'Connell, author, planner for the Boston Regional Office of the National Park Service

THURSDAY, OCTOBER 31

Condominium and Homeowners Associations as Private Governments: Positive Force for the Public Welfare and Individual Rights?
Gerald Korngold, Professor of Law at New York Law School

**SUNDAY–FRIDAY OCTOBER 27–NOVEMBER 1
Curitiba, Brazil**

Professional Development Course on Land Management in Large-Scale Urban Projects

Martim Smolka, Lincoln Institute of Land Policy, Cambridge, MA, USA; Eduardo Reese, General Sarmiento University, Buenos Aires, Argentina

This course analyzes projects designed to promote the redevelopment or regeneration of deteriorated or abandoned urban areas, the extension of the urban perimeter, the strengthening of growth centers, and/or the creation or rehabilitation of central city areas, including historic centers. The course also includes a broad set of management instruments for large-scale urban projects, financing alternatives, mechanisms for fair redistribution of costs and benefits, and critical analysis of a wide variety of case studies.

SUNDAY–FRIDAY DECEMBER 1–6

Cochabamba, Bolivia

Professional Development Course on Informal Land Markets and Regularization in Latin America

Martim Smolka, Lincoln Institute of Land Policy, Cambridge, MA, USA; Claudio Acioly, United Nations Human Settlements Program, UN-Habitat, Nairobi, Kenya

This course is designed to meet the needs of practitioners involved in the planning, management, and implementation of land regularization and citywide slum upgrading programs in Latin America. Those involved in urban planning, housing, and land policy will find the course particularly useful. Participants will examine informality and the land tenure regularization process through the analysis of cases from Latin America and other regions. Topics include the formal-informal urban land market nexus and the economics of land price formation and land markets; land regularization within the framework of housing policies; legal issues associated with the security of tenure; property and housing rights; alternative policy instruments; citywide slum upgrading and slum prevention; new institutional settings for managing large-scale programs; managerial procedures leading to alternative modes of project and program implementation, including community participation; and program evaluation at the project and city levels.

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.

Langley, Adam H.
Methodology Used to Create Fiscally Standardized Cities Database

Zeng, Douglas Zhijia
China's Special Economic Zones and Industrial Clusters: Success and Challenges

Feng Xingyuan
Features, Problems, and Reform of County and Township Fiscal Administration System in China

Wang, Rui
Built Environment, Travel, Nutrition, and Health in Chinese Cities: Evidence from the China Health and Nutrition Survey

Wang, Ya Ping
New Trend of Urbanization in China: Land and Housing Development in Suburban Areas and Small Towns

Sanders, Arie, Denisse McLean, and Alexandra Manueles
Assessment of Land Use Effect on Climate Change Sensitivity on the Northern Coastal Zone of Honduras

Velandia Naranjo, Durfari Janive
The Impact of Bus Rapid Transit System on Land Prices in Mexico City

Liu, Zhilin and Ran Tao
Social Capital and Housing for Temporary Migrants in Urban China: Evidence from a Twelve-City Migrant Survey

Yang, Yizhao, Wenzhong Zhang, Zhilin Liu, and Yao Li
Does Market-Based Housing Offer Higher Housing Satisfaction to Urban Residents than Other Housing Access in China?: Evidence from the 2005 Beijing Livable City Evaluation Survey

Yi, Chengdong and Youqin Huang
"Ying Bao Jin Bao"?: An Empirical Evaluation of the Cheap Rental Housing System in Beijing, China

Yuming Fu and Xu Yuan
Social Capital across Residential Communities in China

Shi, Linda, Marisa Escobar, Brian Joyce, and James Kostaras
Strategic Land Use Planning for Climate Change-Driven Water Shortages in El Alto, Bolivia

Goytia, Cynthia and Ricardo A. Pasquini
Assessing Urban Land Use Regulation in Argentina: Literature Review and Research Strategy

Lewis, Rebecca, Gerrit Knaap, and Jamie Schindewolf
The Spatial Structure of Cities in the United States

Mallach, Alan and Lavea Brachman
Finding New Forms for America's Legacy Cities

Coslovsky, Salo
The Resolution of Land-Use Conflicts in Sao Paulo

Anderson, John E.
Income-Based Property Tax Relief: Circuit Breaker Tax Expenditures

Connolly, Katrina D. and Michael E. Bell
Assessment Limits

Coogan, Daniel, Michael E. Bell, and David Brunori
Use Value Assessments and the Costs to Local Governments

Sundberg, Jeffrey O.
Preferential Assessment for Open Space

Bassett, Thomas E. and Gregory R. Scruggs
Water, Water Everywhere: Sea Level Rise and Land Use Planning in Barbados, Trinidad and Tobago, Guyana, and Pará

Scruggs, Gregory R. and Arthur Acoca-Pidolle
Rio de Janeiro Residents Associations and Recent Favela Real Estate Trends

Li Zhang, Fanghua Li, and Xinye Zheng
Fiscal Disparity across Chinese Cities

Afonso, José Roberto Rodrigues, Erika Amorim Araujo, and Marcos Antonio Rios da Nóbrega
The Urban Property Tax (IPTU) in Brazil: An Analysis of the Use of the Property Tax as a Revenue Source by Brazilian Municipalities

Celemín, Juan Pablo and María Laura Zulaica
Future Sea Level Rise Scenarios and the Shoreline of Mar del Plata, Argentina: Assessing Socioeconomic Impacts and Relief Measures

Coles, Ashley R.
The Messy Business of Ordering: The Impacts of Urban Redevelopment in Manizales, Colombia

Pujol-Mesalles, Rosendo and Eduardo Pérez Molina
Urban Growth in the Metropolitan Region of San José, Costa Rica: A Spatial and Temporal Exploration of the Determinants of Land Use Change, 1986–2010

Hickey, Robert
The Role of Community Land Trusts in Fostering Equitable, Transit-Oriented Development: Case Studies from Atlanta, Denver, and the Twin Cities

Weibo Xing and Joyce Yanyun Man
Regional Tax Transfer and Horizontal Tax Assignment in China

FOCUS ON THE WEBSITE

FISC DATABASE (FISCALLY STANDARDIZED CITIES)

The Lincoln Institute's **Fiscally Standardized Cities (FiSC)** database enables unprecedented, meaningful comparisons of local government finances in the largest U.S. cities. Until now, such comparisons have been impossible because of major differences in the ways that cities provide public services. **FiSC** provides a full picture of revenues raised from city residents and businesses and government spending on their behalf—not just by the city but also by separate overlying governments, such as counties or school districts.

Consider, for example, the comparison (below) of Baltimore, Maryland and Columbus, Ohio: Baltimore spends three times more per capita than Columbus (\$4,633 v. \$1,527), but FiSC reveals that per capita expenditures for residents of both cities are nearly identical (\$5,140 v. \$5,002) after accounting for the fact that Columbus shares the cost of local services with overlying Franklin County and a number of independent school districts.

From a series of drop-down menus, users can create custom tables, drawing on 34 years of data, to compare 112 of the largest U.S. cities across more than 120 categories of revenues, expenditures, debts, and assets. An invaluable resource, FiSC presents an accurate portrait of the fiscal conditions of America's central cities for policymakers, journalists, researchers, and others.

The screenshot shows the FiSC Database website interface. At the top, there are navigation tabs: About, News & Events, Education & Research, Publications & Multimedia, and Resources & Tools. Below these are sub-links: Links, Databases, Planning and Management, Tax Tools, and Visualizing. The main content area is titled "Fiscally Standardized Cities" and includes a sidebar with links like "Home", "Access FiSC Database", "Explanation of FiSCs", "Methodology of FiSCs", "List of 112 FiSCs", "Research Papers", and "Contact".

The main content area is divided into two sections:

- 1. Select Cities and Years**: This section allows users to select cities and years. The "Cities" dropdown menu is set to "OH: Columbus". The "Years" dropdown menu is set to "2007".
- 2. Choose Revenue and Spending Categories (Up to 10)**: This section allows users to select revenue and spending categories. The "Revenues" dropdown menu is set to "Total Revenue". The "Direct Expenditures by Function" dropdown menu is set to "A. General Expenditures".

Below the selection tools, there is a "Create Table" button and a "Search:" input field. The "Order By" dropdown menu is set to "Year". The "Orientation" dropdown menu is set to "Initial".

The data table shows the following results for 2007 (Real Per Capita Dollars):

Variable	MD: Baltimore	OH: Columbus
General Expenditures	5,140	5,002
General Expenditures (City)	4,633	1,527
General Expenditures (County)		1,056
General Expenditures (School)		1,796
General Expenditures (Spec. Dist.)	507	623

Land Lines

OCTOBER 2013

2013–2014 Program

The Lincoln Institute's annual Program for 2013–2014 presents a comprehensive overview of the Institute's mission and its diverse programs for the new academic year. It includes department descriptions; courses, seminars, conferences, and online education programs; research, demonstration, and evaluation projects; publications and multimedia products; Web-based resources and tools; and lists of fellows and faculty.

The complete Program catalog is posted on the Lincoln Institute website for free downloading. To request a print copy, contact help@lincolninst.edu.

