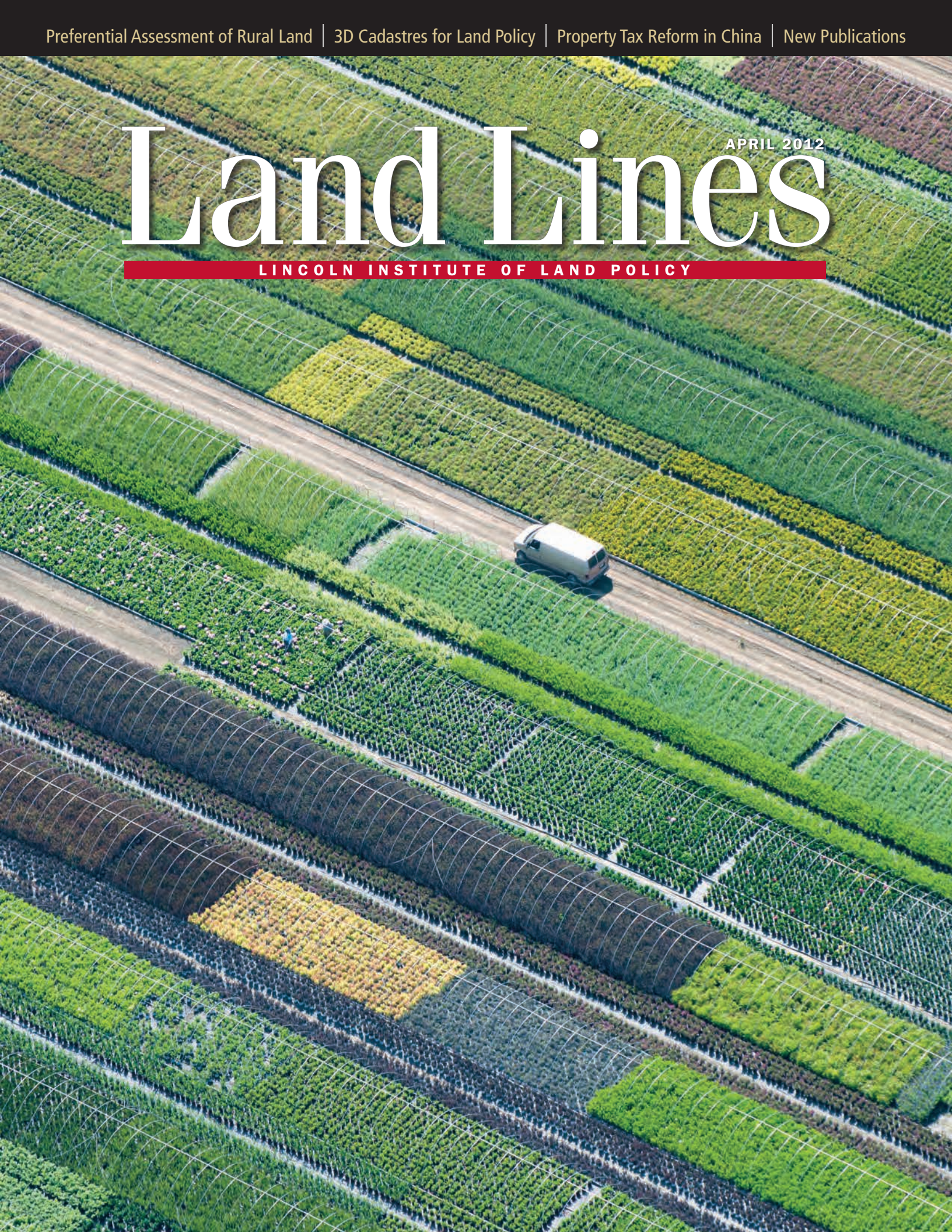


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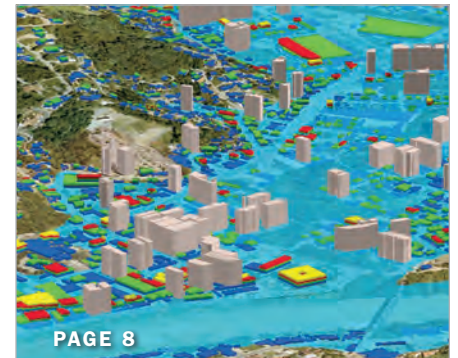
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CONTENTS



FEATURES

- 2 Reconsidering Preferential Assessment of Rural Land
RICHARD W. ENGLAND

Preferential assessment of rural land has become a central feature of property taxation in the United States. Governors and state legislatures need to pause and consider whether various proposed reforms would improve the performance of and increase popular support for these use value assessment programs.

- 8 Application of 3D Cadastres as a Land Policy Tool
DIEGO ALFONSO ERBA

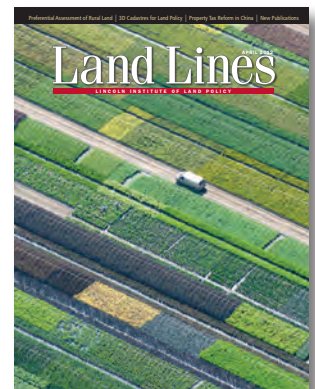
The consolidation of a 3D cadastre, which registers how 3D parcels intersect with the corresponding legal norms and regulations, would contribute to more effective urban and environmental planning, infrastructure network design, and the prevention of informality.

- 15 China's Property Tax Reform: Progress and Challenges
JOYCE YANYUN MAN

China's property tax reform aims to establish a system to tax the existing property (including both land and housing structures) based upon its assessed value on an annual basis to make the tax a significant revenue source for local governments.

DEPARTMENTS

- 1 Report from the President
20 Faculty Profile: *Jay Espy*
22 New Lincoln Institute Publications:
Value Capture and Land Policies
Opening Access to Scenario Planning Tools
24 Working Papers
24 Program Calendar
25 What's New on the Web: *Databases*
Track Land Values and Property Taxation



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The Evolution of Computer-Based Planning Tools

The use of computer models in the planning of land use and transportation and for the analysis of urban housing markets has a long and variable history. One pioneering application of a large-scale computer model that linked land use and urban transportation was the 1960 Chicago Area Transportation Study. It used a spatially disaggregated model that included a detailed transportation network and embodied the classic land use, trip generation, modal choice, and network assignment steps of urban transport planning.

Applying a more analytic approach to predicting land use patterns, an influential model formulated by Ira Lowry at Pittsburgh in 1964 used economic base theory to distribute export-oriented economic activity. This was followed by the allocation of residences and population-serving employment within the metropolitan area to derive work and shopping trip patterns.

More attention to spatially disaggregated models of urban housing markets followed in the early 1970s in the form of the Urban Institute Housing Model (representing decadal housing market changes) and the National Bureau of Economic Research Urban Simulation Model (a microanalytic model annually projecting the behavior of 85,000 households identified by workplace and residential locations). Both models were used to analyze the impact of housing allowance programs and were applied more for policy analysis than planning.

In the late 1970s, the focus turned to the development and application of sketch planning models, particularly in transportation. While these models were still spatially disaggregated, they used tens instead of hundreds of traffic zones, and transport networks were represented in less detail. Such models were adapted to represent transport-related outcomes beyond network flows, including vehicular emissions, exposure of populations to air pollution, vehicle miles of travel, and energy consumption. These smaller models migrated from mainframe computers to personal computers in the 1980s, easing their application. Their data needs were still great, but many of them made more systematic use of available spatially disaggregated census data, aiding the transfer and calibration of models among locations.




Gregory K. Ingram

In the past two decades, the advent of geographic information systems (GIS) and the development of software to visually display data in three dimensions have been transforming the use of computers in planning. GIS-compatible data are now available from satellites, census sources, and government agencies. Local municipalities have moved rapidly to combine their data on property records with data on crime, transport,

and demographics, and such municipal data files are often available on the web. While the availability of GIS data has clearly increased, variations in formats, definitions, and coverage can make it challenging to combine information from different sources into a unified data set for a metropolitan region.

The use of three-dimensional displays of spatially disaggregated data has transformed the presentation of data and model results. These techniques, including 3D maps at the metropolitan level and the ability to “fly through” a street or neighborhood at the project level, facilitate community consultation. They also make it much easier for nonspecialists to understand and participate in the process and interpret the results of alternative planning scenarios.

Along with the advances in data and its presentation, computer software has become easier to use and more widely available on open source platforms. While the codes of many earlier computer-based planning tools have been available in the public domain, using them generally has required high-level programming skills. As more of these tools are presented in user-friendly formats and integrated with other modules, the use of computer-based methods to compare and contrast alternative development scenarios will be more accessible than ever. Indeed, many planning agencies are now able to use scenario planning tools to produce alternative possible futures that provide a foundation for discussions and public consultations to identify which outcomes are desirable and which are to be avoided.

As reported elsewhere in this issue of *Land Lines*, the Lincoln Institute is supporting the use of various types of planning tools for research and evaluation on the effectiveness of policies intended to improve land development outcomes. 



Reconsidering Preferential Assessment of Rural Land

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Working farmland in Klingerstown, Pennsylvania, is assessed for its agricultural use value.

Richard W. England

More than 50 years ago, a slowly unfolding but fundamental process began to transform property taxation in the United States. Because this process took place at the state and local, not federal, levels of government, and because the almost universal adoption of preferential assessment spanned several decades, most citizens are unaware that owners of rural parcels often enjoy such treatment of their properties. As a result, millions of acres of rural land are now assessed far below fair market value for purposes of local property taxation.

These modifications of the property tax began in Maryland in 1957, when the General Assembly enacted an agricultural use assessment law. This statute provides that farm fields and pastures can be assessed below market value as long as they are being “actively used” for agricultural purposes. As evidence of active agricultural use, an owner can

document that the property had generated \$2,500 or more of annual gross revenue from the sale of agricultural products during recent years.

Several factors prompted dozens of state governments to emulate Maryland and enact use value assessment (UVA) programs during the 1960s and 1970s. First was the massive expansion of U.S. metropolitan regions after World War II, which led to the conversion of tens of millions of acres of farm, ranch, forest, and other rural lands to residential and other nonagricultural uses. Alig et al. (2003) estimate that the nation’s developed area more than doubled between 1960 and 1997, from 25.5 to 65.5 million acres. Rapid urbanization of rural land had come earlier to Maryland than other states because its populations in Montgomery and Prince George’s Counties, near the fast-growing nation’s capital in Washington, DC, quadrupled from 1940 to 1960.

Second, agricultural land on the fringe of metropolitan regions escalated in price during the postwar decades because of its development

potential, causing some farmers to face escalating property tax bills because of higher land value assessments. From 1950 to 1971, for example, there was a 330 percent increase in the ratio of farmland prices to net farm income in Maryland (Gloude-mans 1974). A study of the two-state, seven-county Kansas City region in the early 1960s found that the proportion of gross farm income absorbed by the property tax in the most urbanized county was four times greater than in the metropolitan region as a whole (Blase and Staub 1971). Hence, adoption of preferential assessment of rural land was often justified as a policy measure to protect family farmers and ranchers from financial stress or even ruin.

A third and more subtle reason for the adoption of UVA programs reflects how the property tax had been administered in many states before 1957. Until that moment in U.S. history, county and municipal assessors had frequently given de facto tax preferences to farmers despite state constitutional provisions requiring uniformity and equality of taxation. These informal assessment practices were intended to provide property tax relief to “deserving citizens,” but often resulted in dramatic differences in assessment ratios among taxable properties within the same community.

The expansion of state aid programs for local governments after World War II exposed some of these discrepancies. Property wealth per resident or pupil often played a major role in determining the formulas used to allocate state grants. Thus, pressure mounted at the state level for uniform local assessment practices to ensure an equitable distribution of state grants. The elimination of de facto tax preferences that had been granted by tax assessors to farmers and ranchers within their communities fueled efforts to gain de jure tax preferences for rural land via state statutes or constitutional amendments.

California was one of the early adopters of use value assessment of rural land. In 1965, its legislature passed the California Land Conservation Act, commonly known as the Williamson Act. The goals of this statute are to preserve agricultural land in order to ensure adequate food supply, to discourage premature conversion of farmland to urban uses, and to preserve agricultural properties for their open-space amenity values.

The Williamson Act enables counties and cities to offer preferential assessment of agricultural land

to an owner in return for a contract barring land development for a minimum of ten years. After the first decade of the contract, an automatic extension continues every year unless the owner files a notice of contract nonrenewal. If such a notice is filed, the property’s assessment rises annually until it reaches fair market value and the contract finally terminates after nine years.

Diversity and Extent of Use Value Assessment Programs

With little fanfare in the national media, preferential assessment of rural land has become a central feature of local property taxation across the United States. In California, for example, over 16.5 million acres of agricultural land were subject to Williamson Act contracts in 2008–2009. According to the California Department of Conservation, Williamson Act properties comprised nearly one-third of the state’s privately owned land at the beginning of 2009.

More than 16 million acres of Ohio farmland had been enrolled in that state’s current agricultural use value (CAUV) program by 2007. On average, those acres had been lightly assessed at only 14.2 percent of market value. In December 2011 the Ohio House of Representatives voted unanimously to expand the state’s CAUV program to include land used for biomass and biodiesel energy production.

In New Hampshire, 2.95 million acres were enrolled in the state’s current use assessment program in 2010. These preferentially assessed parcels comprised over 51 percent of the Granite State’s total land area. Since agriculture plays a minor role in the New Hampshire economy, over 90 percent of this undeveloped acreage consisted of forests and wetlands, not farm fields and pastures.

Because economic, political, and legal circumstances vary substantially among the 50 states, it is not surprising that state governments have adopted diverse UVA programs. By 1977, eleven states had implemented programs in which eligible parcels enjoyed automatic enrollment. In another 38 states these programs required owners to file applications for preferential assessment. Nearly all states offered assessments below market value to agricultural land, but only 21 states extended preferential assessment to timberlands and forests.

From a land conservation perspective, the most important difference among the states is that 15 do

not collect a penalty if a landowner converts his property to an unqualified use (figure 1). Another seven states levy a percent payback penalty on development of enrolled land parcels. That is, the owner has to pay the state or town a percentage of the parcel's market value during the year of property development.

Far more common is the rollback penalty, a development deterrent that requires the landowner to pay the difference between property taxes actually paid during recent years of use value assessment and the taxes that would have been paid during those years with market-value assessment (plus accrued interest on that difference in some cases). Twenty-six states utilize this form of development penalty. Economic research has demonstrated that failure to levy a development penalty severely weakens the capacity of a UVA program to delay development of rural land at the edge of metropolitan regions (England and Mohr 2006).

The practice of use value assessment sometimes creates political tension within a community and can even damage the legitimacy of property taxation as a local revenue source. In November 2011, a Wisconsin TV station reported that owners of vacant lots in an upscale residential subdivision

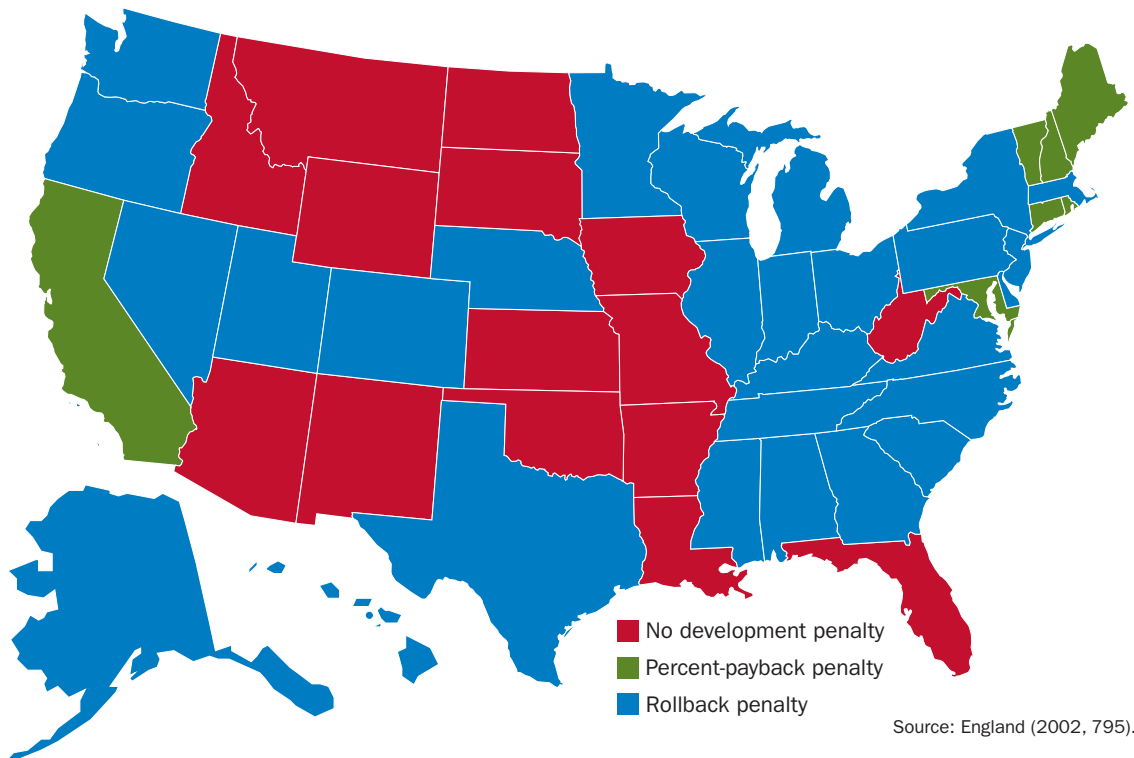
had harvested weeds from their parcels and successfully applied for agricultural assessment of their house lots pending construction. This allegation led at least one state representative to call for legislative hearings about abuses of the state's use value assessment program. According to Rep. Louis Molepske, "It should upset every Wisconsinite because they are being duped by those who... [want] to shift their property taxes to everybody else, unfairly" (Polcyn 2011).

Saving Family Farmers and Rural Landscapes

Have UVA programs "saved the family farmer" as some proponents had originally predicted? Not exactly. During the 1980s, the U.S. farm population fell dramatically by 31.2 percent. From 1991 to 2007, the number of small commercial farms continued its decline, from 1.08 million to 802,000. During that same time period, very large farms (with at least \$1 million of gross cash income) increased their share of national farm production from nearly 28 percent to almost 47 percent (USDA Economic Research Service n.d.).

If preferential assessment of rural land has not prevented the decline of family farming, has it slowed the rate of land development in rural

FIGURE 1
Development Penalties Levied by Use Value Assessment Programs, 2002



America? The evidence on this question is positive, but modestly so. A study of land use change in New Jersey from its adoption of use value assessment in 1964 to 1990 found that the program had a very modest impact on the rate of conversion of agricultural land to urban uses (Parks and Quimio 1996). After her 1998 study of nearly 3,000 counties across the U.S., Morris (1998) concluded that, on average, UVA programs resulted in roughly 10 percent more of the land in a county being retained in farming after 20 years of program operation. After their detailed study of land use changes in Louisiana, Polyakov and Zhang (2008) concluded that an additional 162,000 acres of farmland would have been developed during the five years after 1992 if there had been no UVA program in the state. It seems, then, that UVA programs have slowed down metropolitan sprawl somewhat during recent decades.

Shifting the Tax Burden to One's Neighbors

Although slowing the rate of land development is an environmental and public benefit of UVA programs, it entails a social cost. When the properties of farmers, ranchers, and forest owners are assessed far below market value, local governments collect fewer property tax receipts unless they raise the tax rate that is levied on all taxable properties. If they raise their property tax rates to maintain public expenditure levels, rural towns and counties increase the tax bills of non-UVA owners, primarily homeowners.

This potentially regressive impact of UVA programs has been known for decades. In its 1976 report on preferential assessment of farms and open space, the President's Council on Environmental Quality (1976, 6–8) stated clearly that these state programs result in tax expenditures of significant magnitude that redistribute income among taxpayers:

All differential assessment laws . . . [entail] 'tax expenditures,' by means of which the tax bills of some taxpayers are reduced. . . . In most cases, the cost of this reduction is spread over all the other taxpayers. . . . The effect of a tax expenditure is precisely the same as if the taxpayers who receive the benefit were to pay taxes at the same rate as other, non-preferred taxpayers, and then were to receive a simultaneous grant . . . in the amount of the tax benefit.



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The magnitude of this tax shift among property owners can be quite substantial. Anderson and Griffing (2000) report estimates of the tax expenditures in two Nebraska counties associated with the state's UVA program. The average tax expenditure is approximately 36 percent of revenue in Lancaster County and 75 percent of revenue in Sarpy County.

Dunford and Marousek (1981) have studied the impact of the 1970 Open Space Tax Act (OSTA) in Washington State on the distribution of the property tax burden in Spokane County. Eight years after enactment of the OSTA program, roughly 444,000 acres in Spokane County had been enrolled—about 40 percent of the county's total land area.

The authors calculate that the revenue-neutral increase in property taxes paid by nonparticipating properties to offset the tax cuts enjoyed by owners of enrolled parcels would equal 1.3 percent. Hidden within this countywide average, however, are huge

Farms in Maryland benefit from one of the earliest agricultural use assessment laws in the country.

Farmland on the edge of suburban neighborhoods, as here in central New Jersey, should be re-evaluated to determine its eligibility for use value assessment.



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differences among communities. Although the tax shift to nonparticipating properties would be 1–2 percent in many localities, it would range as high as 21.9 percent in one community. The implication of this and other studies is that granting preferential assessment to rural landowners might help to delay development of their properties, but it might also impose a fiscal burden on homeowners as well as owners of commercial and industrial properties.

Reform of Use Value Assessment Programs

Because many states have had nearly half a century of experience with their UVA programs, this is a good time for state legislatures and tax departments to pause and ask whether this feature of their state and local tax system should be reformed or not. The shift in property tax burden caused by UVA programs in many communities can be justified only if this tax preference serves the broader public interest. The case for reform seems stronger when one realizes that 94 percent of farm households have a net worth greater than the median for all U.S. households.

After the severe downturn in residential and commercial real estate markets in 2008–2010, the rate of conversion of rural land to urban uses slowed in many states, at least for the moment. It might be easier for communities to consider and adopt reforms of UVA programs during this period when many owners of rural land do not expect

to sell to real estate developers in the near future. After an extensive review of the research literature on state UVA programs, I recommend the following set of reforms (England 2011).

Those states that do not yet levy a penalty when land is removed from their UVA programs should do so. Unless the owner of rural land faces a penalty at the moment of development, he or she will simply collect the property tax saving offered by the UVA program until the market price of developed land is attractive enough. On the other hand, enactment of a high penalty per acre that declines with years of enrollment in the program could induce the owner of rural land to defer development for years. During those years, land trusts and state agencies have an opportunity to place conservation easements on those rural parcels that deserve permanent protection from development. In an era when few owners of rural land are poor working farmers, UVA programs should help to protect rural landscapes and conserve ecosystem services, not subsidize wealthy landowners.

States should also reconsider three categories of rural land that are eligible for use value assessment. (1) Farm and ranch land should not be enrolled automatically, as is the practice in some states. Rather, landowners should be required to document substantial net income from the sale of agricultural commodities during the previous tax year. This would prevent the owner of idle land that is about to be developed from receiving a property tax

break. (2) Agricultural parcels should not be eligible for use value assessment if subdivision plans have already been filed or if the parcels have been rezoned for residential, commercial, or industrial use. If there is substantial evidence that a landowner will soon develop a parcel, there is no reason to continue the UVA tax preference. (3) Forest, wetland, and other nonagricultural parcels should be eligible for use value assessment if they generate public goods such as flood protection, wildlife habitats, and scenic views. On the other hand, barren land with great development potential on the fringe of a metropolitan region should be assessed at market value if it does not produce ecosystem services that benefit society at large.

States should carefully review the income capitalization methods they employ to estimate the agricultural use value of rural properties. The guidelines for estimating the net income of agricultural land and for selecting the discount rate that capitalizes that income stream should be based on sound economic principles and should be presented to taxpayers in a transparent fashion. Because income capitalization calculations are so sensitive to choice of discount rate, that choice needs to be justified and should not be ad hoc. In principle, the risk-free rate of discount needs to be adjusted for inflation, default risk, maturity risk, and liquidity constraints.

State governments should acknowledge that, although their UVA programs generate environmental benefits for the general public, they also impose fiscal burdens on those localities in which private owners of rural land enjoy preferential assessment. For example, California enacted its Open Space Subvention Act in 1972 to mitigate the impact of the Williamson Act on local government budgets by providing state grants to partially replace foregone local property tax revenues. From 1972 through 2008, those subvention payments from Sacramento to the cities and counties totaled \$839 million. (Subvention payments were suspended during 2009, however, because of the state's mammoth budget deficit.)

Since preferential assessment of rural land has become such a central feature of property taxation in the United States, governors and state legislatures need to pause and consider whether these types of reforms would improve the performance of and increase popular support for their UVA programs. **L**

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Application of 3D Cadastres as a Land Policy Tool



© Martin Smolka

Distinct areas of formal and informal housing densities are evident in Caracas, Venezuela.

Diego Alfonso Erba

A city's master plan typically describes development goals and objectives through the use of multiple maps and written documents. Most maps and other representations of urban design are built with a two-dimensional (2D) vision and then transferred into regulatory instruments and strategic planning tools. Urban space is treated as being flat and divided up into puzzle pieces such as administrative areas (municipal, rural, urban, growing, expanding, fringe); land use areas (residential, commercial, central business, historic, tourist, informal, recreational); environmentally protected or restricted area (water catchments, floodplains, landslide-prone hills); and other categories.

When urban space is described through digital maps integrated with databases in a geographic information system (GIS), many additional layers of information can be considered in a three-dimensional (3D) platform. However, when real 3D urban space is managed by laws and other conventions based on a 2D vision, the physical and legal cities are operating in quite different and incompatible dimensions. This discrepancy was accepted in the past, when 2D maps were the primary resource available to represent the real city, but nowadays computer graphics can handle more complex objects in space.

Rethinking the legal and economic aspects of urban society by shifting from the traditional 2D vision to a 3D approach will be necessary to develop, implement, and control urban land policies more

efficiently. A 3D cadastre is one of the tools that can facilitate that process through spatial databases and representations. The institution of a territorial cadastre is familiar in many countries, but does not exist in the same way in the United States. A modern cadastre is an integrated database system that holds information on land registration and ownership, physical characteristics, econometric modeling for property valuation, zoning, geographic information, transportation networks, infrastructure and services, and environmental attributes, all of which are linked to socioeconomic and demographic information on property owners.

Creating a New 3D Framework

Google Earth has popularized geographic information by allowing users to visualize a virtual 3D location at the desired level of detail and in a global environment. Google Earth and other geographic software can be used quite easily to change the viewpoint of reality. Moving from a top-down view, which shows the city as a flat area, to an oblique perspective permits the viewer to see the relief and height of buildings, trees, aerial utility networks, and other objects in space.

This type of 3D visualization can identify undeveloped spaces, buildings of different heights, scattered suburban housing, structures in isolated rural areas, and precarious slum construction, thus helping to infer changes in land uses. Even when 3D images are represented on a flat screen or printed surface, they show details that are hard to identify in a 2D map, such as shadow movements during the day, views from an apartment window, and spatial relationships between buildings.

The constantly evolving 3D technology is changing the paradigms of urban planning and land policy because it impacts not only how the city is viewed but the way property rights and other restrictions in space are described. As a result, a new urban legal framework based on 3D laws and 3D property registries will be needed to describe objects in space instead of just flat contours. The 3D laws affect rights in space, not in a plane of projection, and in this context it will be possible to define 3D land policies.

For example, a 3D image of the basic, maximum, and actual floor-area-ratio (FAR) for a set of land parcels would facilitate the use of land management instruments such as charges for the purchase of building rights for new development. To support

a 3D legal framework it is necessary to have spatial data systematized on 3D cadastral, which create and maintain up-to-date spatial databases and volumetric representations of cities, as well as a 3D property registry in which every property and its restrictions are identified and documented.

Land surveyors, geologists, biologists, and engineers are accustomed to determining the location of physical objects in space by specifying attributes such as mineral deposits, water bodies, contamination or fumes in the air or underground, or restricted spaces around power lines, but legislators, urban planners, assessors, and others are not used to describing the intersections of more than two attributes in space. The increasing complexity of infrastructure and densely built-up areas requires the proper registration of their legal status (private and public), which can be provided only to a limited extent by the existing 2D cadastral registrations.

Despite its promise as a tool for urban planning and the extensive research and progress in practice to date, no country has a true 3D cadastre with complete functionality. The evolving concepts involved in this new process should be based on the ISO 19152 Land Administration Domain Model (LADM), which provides support for 3D representations (van Oosterom 2011).

The Virtual 3D City

The first idea that usually comes to mind regarding a 3D image is its representation in regular shapes such as cubes, prisms, and cylinders, but these simple forms have proved insufficient to analyze urban space. Seeking a closer match with reality, researchers and designers have developed techniques to overlay photographs of building facades on building contours, and to represent all architectural characteristics of a building using 3D computer-aided design (CAD) software.

However, even these types of virtual 3D buildings typically were placed on a flat reference plane, which created a false image because it showed all buildings at the same level. By adding relief through digital perspectives based on digital terrain models, virtual 3D buildings could be placed at the correct altitude relative to sea level. The next step was to overlay aerial orthophotos on digital relief images, resulting in much more realistic 3D images of the real (physical) city (figure 1).

Presently, 2D and 3D urban models continue to be built with points, lines, polygons, and images.

FIGURE 1
Virtual 3D City Representation of Blumenau, Santa Catarina, Brazil



Note: The blue, green, red, and yellow colors show different floor levels of low-rise buildings, and the light blue overlay indicates the level of flooding in 1983.

Source: Aeroimagem S/A (www.aeroimagem.com); prepared by Everton da Silva and João Norberto Destro.

These models are useful but still insufficient for detailed urban analyses because, as noted by the Brazilian geographer Milton Santos, “Geometries are not geography” (Câmara 2000). In fact, several kinds of geographic information are used to develop land policies—human, physical, economic, and environmental—and all of them occur in space.

GIS contributes to the process of building a virtual 3D city by permitting linkages between statistical data and geometric shapes to generate thematic information images that can be applied to a variety of land policy issues. The 3D image created in a GIS platform is frequently more useful for urban planning purposes than a photograph of the same sector because the 3D platform makes it possible to highlight certain information of interest, create prospective scenarios that anticipate the economical effects of certain land policy decisions, or evaluate the environmental impacts of new development.

Formal and Informal Virtual 3D Cities

The virtual 3D city represented geometrically is useful in several types of analyses, such as vehicle traffic studies, propagation of cell phone waves, or any type of infrastructure network analysis. For other kinds of analysis, even the virtual 3D city is not sufficient, as when a lawyer needs to visualize the legal 3D city as defined by urban and environmental regulations. Figure 2 shows two sets of virtual 3D city blocks, one representing existing buildings and the other indicating the development potential of those buildings based on the applicable urban regulations. These two images show different densities and consequently variable land and property values, but in both cases the property tax base and potential value capture charge can be estimated precisely.

In Latin America, where the incidence of informality is emblematic of the urban landscape, it is important to visualize and define the informal as

well as the legal dimensions of the city. Informal settlements develop when households cannot afford housing supplied by the market or by social programs. People must find a place to settle, which is often on hazardous or protected land that is inappropriate for housing, or on vacant public or private land. The magnitude of the need for housing often surpasses the amount of land available, thus forcing informal settlers to build taller structures at higher densities (figure 3).

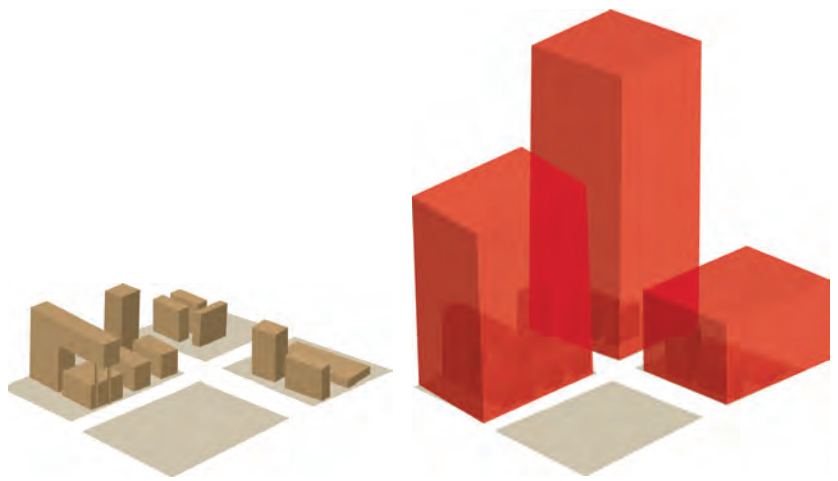
Every occupied space is a part of the city and should be considered in the urban databases of the cadastre. The task of connecting the virtual informal city with the rest of the virtual city is a bigger challenge in 3D than in 2D due to complexities in dealing with parcels where owners and occupants are different but may share the same space. Infrastructure is also organized differently in these areas. In the formal city, for example, public infrastructure networks consisting of fixed pipes, cables, roads, and rails are regularized and stable. In the informal city, infrastructure networks are often self-built and change constantly as the settlement expands. A 3D cadastre can inform planners of the gaps between the characteristics of the population demanding shelter and the effective supply

FIGURE 3
Improved Housing Units in an Informal Settlement in Caracas, Venezuela



Source: © Martim Smolka; rendering by Diego Erba.

FIGURE 2
Representations of the Virtual 3D Formal City and the Virtual 3D Legal City



Note: The existing buildings on the left are incorporated into an expanded legal city on the right.
 Source: Prepared by Diego Erba and Anamaria Gliesch-Leebmann.

of land and its attributes, thus helping define policies to address unplanned informal settlements.

3D Dynamic Cities

Changes taking place in cities can be visualized and measured in several ways, for example through studies of densification, migration, and expansion of infrastructure networks. These studies assume that social, economic, and environmental variables are constantly changing although the land is static. However, other forces that produce change in the city can cause dislocations of different intensities that can be measured in space (3D) and time (4D). For example, the continental plates are moving South America, its cities, public and private properties, and infrastructure networks slowly toward the west at the rate of 2 centimeters (cm) per year. These movements, which seem insignificant, have consequences for urban policy if one considers that in 50 years a property could be moved as much as 1 meter from its current position.

Even more extreme movements are the consequence of the dynamic nature of our planet. The earthquake in February 2010 impacted the Chilean region of Bio-Bio at many different scales. Measurements by the Transportable Integrated Geodetic Observatory (TIGO) in the city of Concepción recorded that the entire territory moved initially toward the northwest and then ended with a displacement of 3 meters toward the southwest, all within 30 seconds. During this event, the height



© Diego Eina

Port au Prince, Haiti, after the earthquake of January 12, 2010.

of land shifted by 50 cm. The telluric movement carried away properties and destroyed urban infrastructure and buildings, and the damage was compounded by the subsequent tsunami. A similar pattern was observed during Chile's 1960 earthquake, the most severe ever registered in the world, when the ground moved with such velocity that some properties disappeared into the sea and other land areas emerged.

The January 2010 earthquake in Haiti produced an estimated 20 million cubic meters of debris in 35 seconds, even though significant land displacements were not registered. From the point of view of the cadastre, however, these two disasters had very different impacts. If the urban information had been structured in thematic layers and integrated in a GIS platform, the earthquake in Haiti

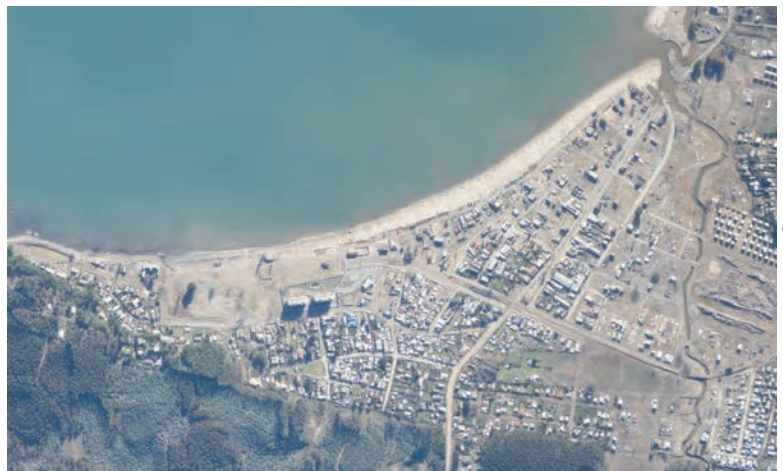
would have affected the construction layer and several representative building types would have disappeared. In Chile, the construction layer was modified mainly by the tsunami, but the land itself was affected by the spatial displacement and shifts resulting from the telluric movement. Fast-moving natural disasters like these change the environment and people's lives radically, and have important implications for government priorities, including definitions and implementation of land policy, both before and after such events.

Predictable climate change events, underground contamination, air pollution, and other such data can be mathematically modeled before they happen. By connecting these models with the spatial databases of a 3D cadastre, it is possible to create prospective 3D scenarios of the potential impacts and identify the neighborhoods and properties that could be affected. Unpredictable phenomena such as earthquakes and sudden flooding can be represented much more quickly if the measurement instruments tracked by environmental institutions or government agencies are connected to the spatial databases of 3D cadastres. The spatial representation of the impact can be made available soon after the event.

In sum, the 3D representation can help define preventive land policies to address predictable changes and also enable the readjustment of current land policies after unpredictable natural events.

3D Networks and Infrastructure

Infrastructure and transport networks move through 3D parcels in different ways and allow the city to remain active and fluid. Some of these



© Regional Government of Bio-Bio, Chile.

Aerial views of Dichato, Chile, before and after the tsunami on February 27, 2010.

networks are invisible by nature, such as the microwaves of cellular phones; others are invisible because they are located underground, such as infrastructure tunnels and pipes; and others are easily visible because they are built on the surface, such as roadways or utility lines. Figure 4 illustrates some of the complex spatial intersections that occur in the overlapping layers of infrastructure and transportation networks within 3D parcels.

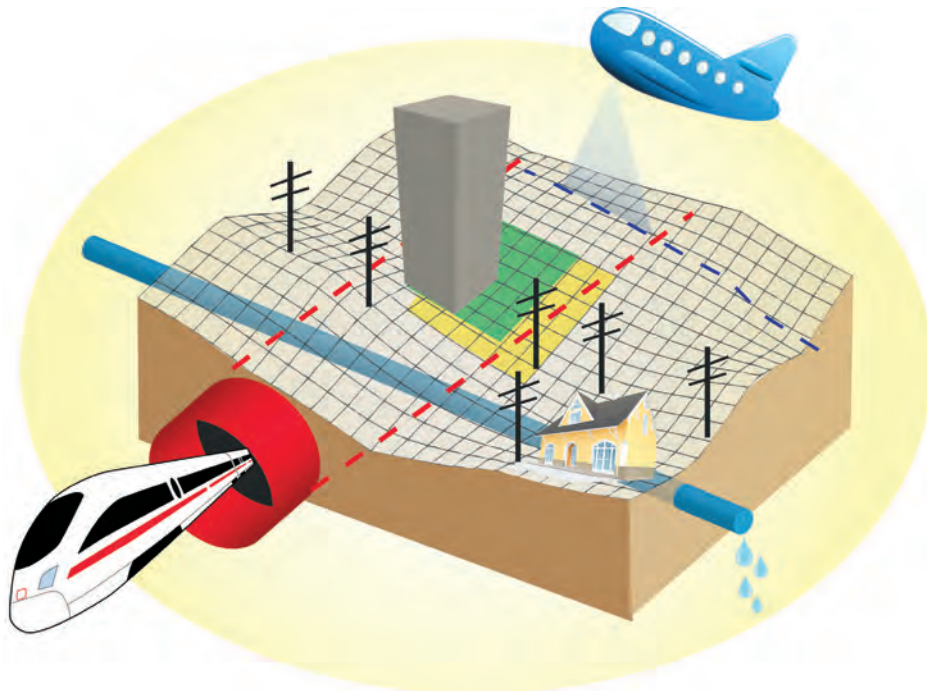
These spatial relationships among networks and public and private properties, environmental reserves, mineral deposits, water bodies, and other features have been treated inefficiently through 2D cartographic norms, but they require the development of specific, new 3D norms to enforce the social function of property with equity and justice. For example, Article 1.286 of Brazil's Civil Code states that a landowner is obligated to provide a right of way through her property for cables, pipes, and other underground conduits that serve the public at large and could not be built elsewhere. The law also outlines the need to determine the amount of area affected by public works projects in each parcel and its corresponding value in order to calculate the compensation due to the owner. 3D cadastral records can be an important contribution to facilitating such transactions.

3D Land Market Value

One of the functions of a territorial cadastre is to provide information to determine the value of the parcels with respect to property taxation and urban planning policies. In Latin America, land values generally have been based on ad hoc valuation methods (such as the replacement value of buildings) that use construction data and land values for each cadastre sector (Erba 2008). This practice does not always produce reliable valuations because it is difficult to keep the cadastral databases up-to-date, and the implementation of the valuation methods may be arbitrary from place to place.

An alternative valuation method now being implemented across the region is the use of spatial econometric models to determine property values with the desired level of statistical precision. This is important because land values change across urban space and depend on variables such as urban regulations, environmental restrictions, scenic views, infrastructure, and other features associated with the property, such as underground or airborne elements.

FIGURE 4
Urban Infrastructure and Transportation Networks in Space



Source: Prepared by Diego Erba and Anamaria Gliesch-Leebmann.

The most modern GIS platforms developed for 3D cadastral even allow the assessor to “stand” inside a building at any given altitude before the building is constructed. The software allows the assessor to see the view that will be available from the window of the dwelling, identify relationships to other buildings, perceive the natural landscape, and note other relevant characteristics of the property. Such data help determine the relevance of externalities to the value of the property, an aspect often neglected in valuations based on traditional replacement value methods.

Figure 5 shows a perspective of the surface gradient of land values per square meter obtained from sample points corresponding to properties for sale. The surface has the same coordinate reference system (x, y) as the entire city. Even when the spatial third dimension (z) is not related to the geographic space, it is possible to put the surface under the legal virtual city (as shown in figure 2) and analyze the spatial correlation between the land value per square meter and relevant urban regulations. Such an application is another possible contribution to the development of land policies based on 3D cadastre techniques.

FIGURE 5
Land Values per Square Meter on a Continuous Surface



Note: The colors emphasize the variation of the land value, which is represented by the movement of the surface. This illustration shows the city of Várzea Grande, Mato Grosso, Brazil.
 Source: Aeroimagem S/A (www.aeroimagem.com); prepared by Everton da Silva and João Norberto Destro.

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Conclusions

While the technologies used to measure, represent, and store information are now evolving toward 3D platforms, urban legislation and land policies continue to approach the city as a flat land surface. To visualize the buildings and the restrictions imposed on properties in 3D is a considerable advancement for those responsible for urban decision making. Nevertheless, there is a long way to go before 3D information is integrated as part of urban legislation and property titles.

The consolidation of a 3D cadastre, which registers how 3D parcels intersect with the corresponding legal norms and regulations, would contribute to more effective urban and environmental planning, infrastructure network design, and the prevention of informality by permitting the construction of future scenarios showing the impacts of land policies in space. Changing the term *area* to *space* would be a first step in giving urban and environmental legislation a 3D connotation, and would be a simple and relevant way to start the process of introducing this new paradigm. Structuring a 3D property registry is still under development, but when it is established landowners will understand that they own cubic feet instead of only square feet. **□**

China's Property Tax Reform: Progress and Challenges

Joyce Yanyun Man

China has experienced rapid economic growth since 1978, when it adopted a policy of opening up to the world and instituting economic reform. It has become the second largest economy measured by the country's GDP, and its tax revenue has experienced an average annual growth of about 20 percent since the fiscal reform of 1994.

However, many subnational governments in China have experienced fiscal stress and incurred large local debt in recent years because of numerous unfunded central mandates and the large fiscal gap between expenditure responsibilities and revenue capacity. For example, in 2008 subnational government in China accounted for 79 percent of total government expenditure, but only 47 percent of total government revenues (Man 2011).

Unlike many developed countries, China's local governments (provincial, prefecture, county, and township) have not been granted any legal authority for taxing or borrowing, and the property tax plays a very limited role in the local public finance structure. As a result, many local governments turn to extra-budgetary revenue sources, fees for leasing land use rights, other fees and surcharges, and indirect borrowing from banks to finance infrastructure investment and local economic development.

During the period from 1991 to 2008, the land leasing fees (also known as land transfer fees) increased from 5.7 percent of total local budgetary revenue to 43.5 percent. The overreliance on land leasing fees has been criticized as an important factor in pushing up housing prices and in the growth of corruption cases and land disputes in China.

Shanghai has started to collect property taxes on newly purchased second homes of residents and first homes of nonresidents.



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Problems with the Current Tax System

The current land and property tax system in China generates a limited amount of tax revenue, even though five types of taxes are levied on land-related property at various stages of production (table 1). Local governments collect the Farmland Occupation Tax and Land Value Added Tax (LVAT) at the stage of land acquisition and transaction. At the possession stage, the Urban Land Use Tax and Real Estate Tax are collected, while the Deed Tax is levied when the ownership of the property is transferred.

This tax system has many problems and warrants structural reform. First, various taxes on land and property account for only 15.7 percent of local tax revenues. It is an unstable and inadequate revenue source for the Chinese local governments. Local government officials have relied upon other revenues sources, including leasing state-owned land for a large lump-sum fee from developers, to finance infrastructure development and capital projects. In 2010, Chinese local governments collected 2.7 trillion RMB from land leasing fees in addition to 8.3 trillion RMB in taxes and other budgetary revenues. The ratio of leasing fees to tax revenue was 32.5 percent, compared to 4.5 percent in 1999.

Second, China's current property tax structure focuses more tax burden at the transaction stage than the possession stage. For example, revenues

collected from the annual urban land use tax and the real estate tax at the possession stage accounted for only 6.44 percent of local tax revenues in 2008, while about 9.25 percent of local tax revenue was raised at the land development and property transaction stages.

Third, owner-occupied residential property was not included in the tax base for the current real estate tax, thus significantly restricting the government's ability to capture value from the booming housing market that was fueled by the privatization of public housing, income growth, and massive urban infrastructure investment. By 2010, homeownership rates reached 84.3 percent of the formal urban housing stock, and housing values have experienced substantial increases in the past five years in many big cities (Man, Zheng, and Ren 2011). But the exclusion of the residential properties from real estate tax has resulted in wealth disparity and excessive demand for housing for investment and speculative purpose, raising vacancy rates in many coastal cities.

Finally, unlike the property tax system in many developed countries, the real estate tax in China is not levied on the assessed value of the property. Instead, it is based on the original price minus 10 to 30 percent of depreciation at a rate of 1.2 percent or levied at 15 percent of the actual rental income for leasing property. Government officials have little experience in the mass appraisal of the

TABLE 1
Taxes on Land and Property in China, 2008

Tax	Date Implemented	Tax Base	Tax Rate 2007	Collection Stage	Share of Local Tax Revenue
Urban Land Use Tax	1988	Taxable land size (only on domestic taxpayers before 2007)	30 RMB/m ² to 0.6 RMB/m ²	Possession (recurrent)	3.51%
Real Estate Tax	1986	Real estate for business use	1.2% of original value or 12% of rental income	Possession (recurrent)	2.93%
Land Value Added Tax (LVAT)	1994	Land appreciation value	Progressive tax rate (30–60% on the LAV)	Transaction (nonrecurrent)	2.31%
Farmland Occupation Tax	1987	Farmland size	1–10 RMB/m ² (5–50 RMB/m ² after 2008)	Land Development (nonrecurrent)	1.35%
Deed Tax	1997	Self-reported value of land and house transfer	3% to 5%	Transaction (nonrecurrent)	5.62%

Source: National Bureau of Statistics (2009); calculated by Man (2011).



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market value of existing property, a fundamental skill for establishing a modern property tax system.

Recent Developments in Property Tax Reform

The Chinese central government has been exploring the possibility of reforming its current land and property tax system since 2003, when it first officially proposed to establish a modern property taxation system. Six cities were selected to conduct pilot projects in 2006, and that number was expanded to 10 cities a year later.

In 2010 the State Administration of Taxation (SAT), which is in charge of this pilot project, ordered that every province must choose at least one city to experiment with property value assessment in order to verify the housing sales price self-reported by home purchasers for the deed tax. These experiments have played an important role in the technical and information-based preparation of mass appraisal for future property value assessment. On January 28, 2011, the cities of Shanghai and Chongqing were permitted to collect property

taxes on newly purchased second homes or luxury residential property, respectively.

Major Achievements

China's property tax reform aims to establish a system to tax the existing property (including both land and housing structures) based upon its assessed value on an annual basis to make the tax a significant revenue source for local governments. This system will utilize various assessment methods such as market comparison, cost, and income approaches and will be applied to business and industrial property as well as residential property, including owner-occupied housing.

Different versions of computer-assisted mass appraisal (CAMA) have been studied and subsequently implemented by some pilot cities, such as Hangzhou, Dandong, and Chongqing. The SAT has been training officials from local tax bureaus in every province about CAMA system development and its applications. It has also tried to establish technology standards for each assessment approach.

Single-family residences and newly purchased luxury apartments are targeted in Chongqing's pilot project on property value assessment.

This Mediterranean-style single-family house and station wagon in the Beijing suburbs illustrate a trend toward new development on small parcels of expensive land.



© Jim Pruitt/Stockphoto.com

In 2005, the SAT compiled a Real Property Assessment Valuation Regulation Trial that specified 12 chapters and 40 provisions covering data collection, standards, and the CAMA system. All the pilot cities have finished the simulation assessment and have calculated the tax burden and tax revenue according to different tax rate scenarios. In 2011 at least one city in each province had been selected to conduct property value assessment of newly purchased property for the collection of the deed tax.

The most important development occurred in early 2011, when Shanghai started to collect taxes on newly purchased second homes of residents and first homes of nonresidents based on transaction value, after the exclusion from the tax base of 60 square meters per person. The city of Chongqing is targeting the existing single-family residence and newly purchased luxury apartments of residents or newly purchased second homes of nonresidents. The program excludes 180 square meters for the single-family residences and 100 square meters for apartments in Chongqing.

About 8,000 parcels are reported to be levied a property tax in these two cities combined, although after this one-year experiment only a small amount of tax revenues has been collected, which was intended to finance low-income housing. Although

the tax base, tax rate, and the collections are all very small in the two cities, these efforts represent a big step forward for property tax reform in China.

Future Challenges

China's property tax reform still faces enormous challenges, although it is now much better understood by Chinese citizens and the media. First, it encounters resistance from various influential interest groups. The biggest opponents of a property tax are local government officials, in addition to real estate investors and speculators. Many local governments believe that the adoption of such a tax will lower housing values and consequently lower the demand for land, thereby substantially reducing the land leasing fees obtained from the leasehold of state-owned land. Furthermore, local government officials in China are evaluated on their role in spurring local GDP growth, and infrastructure investment projects are often used as a stimulus to boost local economic development. Officials want unlimited access to land leasing fees because they can be raised and spent with little scrutiny, and they can generate a large amount of revenue for use during an official's tenure.

A second challenge is the slow progress on legal and assessment preparations for a property tax

system. Property tax laws and regulations need to be established, including assessment laws and standards for assessors. Up to 100,000 assessors will have to be trained and certified to these standards. Third, consensus is still lacking with respect to the specifications of the tax base, exclusions, and exemptions; the assignment of responsibilities for administration, rate setting, and assessment; and the allocation of tax revenues. Fourth, general unfamiliarity with the property tax leads to continued misunderstanding and misperceptions about the tax.


At the same time, more urban dwellers realize that an annually collected tax on the assessed value of real property, both business and residential, can serve as an efficient and sustainable revenue source for local governments and help to reduce their reliance on land transfer fees and charges that contribute to higher house prices. Following the central government policy of house purchase restrictions and tighter monetary policy, fees from land leasing in 2011 have started to fall in many cities.

According to a recent report by the China Index Institute (2012), land transfer fees in 130 cities have decreased by 11 percent compared to 2010. In Shanghai and Beijing, they decreased by 16 and 35.7 percent, respectively. This rapid decrease may also offer opportunities for local governments to look for more sustainable ways to seek a balance between promoting economic growth and providing public goods and services. In the long run, establishing a property tax system to substitute gradually for the land transfer fees can offer an efficient, equitable, and sustainable way to finance local development and government spending.

The property tax has been perceived as an effective way to lower housing prices, dampen property speculation, and reduce vacancy rates. Many researchers believe that local governments tried to limit land supply to bid up land prices and maximize revenue, resulting in the rapid increase in housing prices and lack of affordable housing in urban China. Levying taxes on residential property can increase the opportunity cost of holding property vacant or idle and reduce incentives for speculative behavior. The tax is also viewed as an effective way to narrow the gap in income and wealth among urban residents and discourage speculative investment in the housing sector.

Conclusions

The property tax reform in China is making progress in research and in experiments with applications, and it has begun to accumulate momentum toward better understanding and acceptability among citizens and local governments. But the successful establishment of a property tax as a major revenue source in a modern local public finance system requires not only assessment techniques and tax design but also political determination and administrative reform. This reform could lead to a fundamental change in intergovernmental relations and the role of government in China's political and economic structure.

The Lincoln Institute began to support research on property taxation in partnership with the Chinese government in 2004, in conjunction with the Development and Research Center of the State Council (DRC), Ministry of Finance (MOF), and State Administration of Taxation (SAT). In 2007 the Peking University–Lincoln Institute Center for Urban Development and Land Policy (PLC) was established in Beijing, in part to help organize international conferences and training programs for government property tax officials in the pilot cities. The center continues to support international and domestic experts in conducting research and demonstration projects on property taxation and related issues. 

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Jay Espy



Jay Espy joined the Elmina B. Sewall Foundation as its first executive director in January 2008. Based in Brunswick, Maine, the foundation focuses on the environment, animal welfare, and human well-being, primarily in Maine.

For the prior two decades, Espy served as president of Maine Coast Heritage Trust, a statewide land conservation organization. During his tenure, the Trust accelerated its land protection efforts along Maine's entire coast by conserving more than 125,000 acres and establishing the Maine Land Trust Network, which helps build capacity of local land trusts throughout Maine. He also led the Trust's successful Campaign for the Coast, raising more than \$100 million for conservation and doubling the amount of protected land on Maine's coast and islands.

Espy received his A.B. from Bowdoin College and master's degrees in business and environmental studies from Yale's School of Management and its School of Forestry and Environmental Studies. He serves on the board of the Maine Philanthropy Center and the Canadian Land Trust Alliance. He is a former chair of the Land Trust Alliance, a national organization serving land trusts throughout the United States. In October 2010 he was named the Kingsbury Browne Fellow for 2010–2011 through a joint program of the Land Trust Alliance and the Lincoln Institute. Contact: jespy@sewallfoundation.org

LAND LINES: *How did you first become involved in the field of land conservation?*

JAY ESPY: Early in my senior year at Bowdoin College a wonderful placement counselor pointed out that some real-world experience might be useful in helping me secure gainful employment. I landed an internship documenting seabirds in Maine's Casco Bay as part of an oil spill contingency planning project. This experience kindled an intense passion for the Maine coast and set the stage for my professional career. Following a stint working for an environmental consulting firm, graduate study in business, forestry, and environmental science at Yale, and several more internships, I was thrilled to accept an entry-level job at Maine Coast Heritage Trust (MCHT) in Topsham. At the time MCHT was a small statewide land trust and a great "school of hard knocks" for an aspiring 20-something conservationist with virtually no credentials.

LAND LINES: *What are some of the most significant land conservation projects in which you have been involved?*

JAY ESPY: In the late 1980s a 12,000-acre parcel of coastal land in far Down East Maine near the Canadian border was put up for sale by a major corporation divesting all of its timberland holdings in the northeastern United States and Maritime Canada. This was the largest remaining undeveloped block of coastal land in Maine, and one of the largest anywhere on the eastern seaboard. MCHT had never before faced such an exciting or daunting challenge.

In partnership with the State of Maine, The Conservation Fund, and the Richard King Mellon Foundation, MCHT led an effort to acquire the property and to work with local and state officials on a plan to conserve the land while incorporating appropriate working forest management, recreational trail development, and affordable housing in the Town of Cutler. Although we didn't know it at the time, we were doing "community conservation" by engaging a wide range of constituents with varying interests. This project also put MCHT in the business of landscape-scale conservation. Dozens of projects have since been completed in that region, known as Maine's Bold Coast. More than 20 miles of breathtaking shoreline are now accessible to the public and provide economic opportunities for the community.

I feel privileged to have helped protect many other lands, both large and small. Marshall Island, a 1,000-acre gem 15 miles offshore from the Blue Hill peninsula, was once slated for major development, but now has an extensive coastal trail system developed by MCHT. Aldermere Farm in Camden and Rockport is an iconic saltwater farm. Albert Chatfield began raising Belted Galloway cattle here in the 1950s, and the farm has been home to an award-winning breeding herd ever since. Following donation of the property in 1999, MCHT has greatly expanded farm programs for local youth and the community in general and protected additional nearby lands that are being used to support the growing local food movement.

LAND LINES: *When did you become aware of the Lincoln Institute's work in land conservation, and how have you been involved in our programs?*

JAY ESPY: The timing of my entry into the conservation field was most fortuitous. Within months of joining MCHT, I was invited to a gathering of conservation professionals at the Lincoln Institute, co-hosted by the Land Trust Alliance (then known as the Land Trust Exchange). I had previously met Kingsbury Browne very briefly at a conference in Washington, DC, but at that gathering I had the chance to spend a full day with him and some of the other revered leaders of the modern land conservation movement.

Over the course of many years, the Lincoln Institute became a "watering hole" for conservationists, many of them originally assembled by Kingsbury, and they became valued mentors to me as I learned the trade. The Institute has continued to be a place

where creative minds gather to innovate and where cutting-edge research and communication for the broader conservation community are encouraged. I am honored to be part of that legacy as a Kingsbury Browne Fellow.

LAND LINES: *What do you see as future trends in land conservation?*

JAY ESPY: The conservation field is growing, changing, and maturing in what I believe is a very healthy way. Not long ago many of us in the field thought land conservation was all about the land. I well remember early land trust brochures full of pictures of beautiful landscapes, but entirely devoid of people. Fortunately, that's no longer true.

Today, most of us in the movement understand that land conservation is about land and people. It's about how our communities benefit from healthy ecosystems; how outdoor recreational opportunities close to home combat youth inactivity and obesity; how protected farmland contributes to food security and the availability of nutritious local food; how outdoor spaces incorporating local arts and entertainment contribute to vibrant downtowns; how clean water, forestland, and a host of other sustainably managed natural resources support economic development and jobs; and how well-managed land allows each of us individually and collectively to live richer, fuller lives.

All across the country, the silos that have separated the work of conservation, public health, arts, education, hunger, housing, food production, and economic development are coming down. I'm encouraged by this trend. Our work today will only stand the test of time if it has direct and tangible benefit to people over many decades. Collaborative engagement of those with wide and varied interests seems an essential ingredient in any successful recipe for enduring conservation.

LAND LINES: *How can the challenges of funding conservation become opportunities?*

JAY ESPY: We do face many challenges on the funding front. Public funding from traditional federal and state government sources has been declining, private foundations have seen the corpus of their endowments erode, and individual donors have

been understandably more conservative with their philanthropic investments as the markets have seesawed. As a result, fewer of the mega-scale land deals requiring tens of millions of dollars that we saw in the late 1990s and early 2000s are being launched today.

That said, there is still a great deal of very important conservation work being funded around the country. Public support for local conservation remains high, with most local bond initiatives continuing to pass by wide margins. Foundation and individual giving for conservation has not tanked as many feared. Funders remain supportive, but have become more discerning. Also, conservation projects that address multiple human interests and engage multiple partners appear to be attracting new, nontraditional sources of support. I recently spoke with a health funder who views securing more land for public recreation as a critical preventative health-care measure. Funding for farmland conservation has also grown substantially in recent years, fueled in part by the explosive popularity of the local food movement.

LAND LINES: *Can you share some examples of innovative land conservation successes?*

JAY ESPY: In a remote area of eastern Maine, the Downeast Lakes Land Trust has been working for more than a decade to protect large swaths of forestland with extensive shore frontage near the community of Grand Lake Stream. These lands and waters have supported the timber and recreation-based economy for more than a century. With the decline in the paper and pulp industry, several large commercial timber holdings have been sold.

Rather than simply wait for the inevitable development of seasonal vacation homes and resulting loss in local culture, the community has worked in remarkable ways to acquire tens of thousands of acres and miles of shore land for use as a revenue-generating forest, wildlife preserve, and remote recreational areas. Local business owners, fishing and hunting guides, representatives from state and federal agencies, members of the Passamaquoddy Indian Tribe, and elected officials from the local to the national levels have all joined forces with the land trust to acquire these properties and manage them for sustainable

timber revenue, as well as for other traditional uses, including hunting, fishing, camping, and paddling.

In the central Maine town of Skowhegan, an enterprising young woman has acquired an old county jail, which she is converting into a grain mill. Once operational, the mill will process approximately 600 tons of grain annually, an amount requiring roughly 600 acres of farmland cultivated in grain crops. This area of Maine was once a thriving wheat-growing region, and is purported to have supplied the Union troops with a substantial portion of their bread during the Civil War. Located in the heart of town, the parking lot of the old jail already serves as the site of a successful local farmers market. A commercial kitchen and several food and crafts business are co-locating in the jail, helping to create a "food hub."

Skowhegan is the county seat of one of the most impoverished counties in Maine. Could the food hub start to change the fortunes of this region? Could a growing demand for grain stem the tide of farmland loss and result in more farmland acres being conserved and cultivated? Signs suggest the answer is to both questions is "yes." I think what's happening in Skowhegan is a wonderful example of the new face of conservation. It's not yet readily recognizable, but I suspect we'll get to know this community-based approach better in the years ahead.

LAND LINES: *What are your expectations about the role of conservation in the current volatile economy?*

JAY ESPY: I'm quite optimistic because adversity has a way of bringing people together. With less, we're learning how to work collectively to do more. As more people participate in conservation, develop relationships with and around land, and experience the positive impact those relationships bring to their lives, I'm convinced we will see even more widespread, meaningful, and durable conservation achievements. Land, people, and community are all deeply intertwined. Ironically, these trying times may be accelerating the inevitable transformation of conservation into an endeavor that benefits even more people and more aspects of community life. **L**

Value Capture and Land Policies

Attention to value capture as a source of public revenue has been increasing in the United States and internationally as some governments experience declines in revenue from traditional sources and others face rapid urban population growth and require large investments in public infrastructure.

Privately funded improvements by landowners can increase the value of their land and property. Public actions, such as investments in infrastructure, the provision of public services, and planning and land use regulation, can also affect the value of land and property. Value capture is a means to realize as public revenue some portion of that increase in value through various revenue-raising instruments.

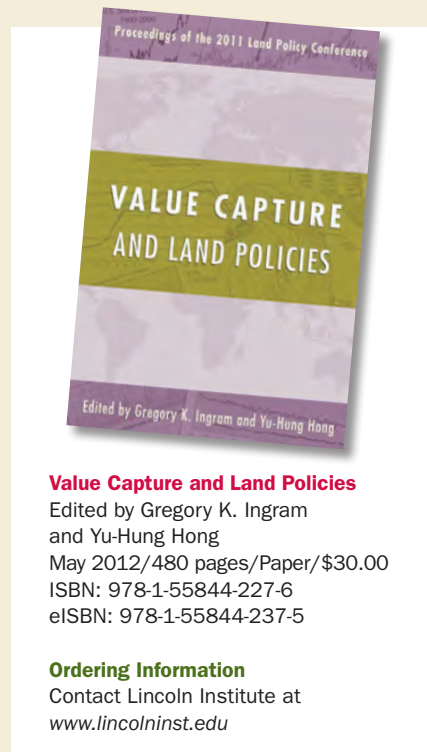
This book, based on the Lincoln Institute of Land Policy's sixth annual land policy conference in May 2011, examines the concept of value capture, its forms, and applications. The first section, on the conceptual framework and history of value capture, reviews its relationship to compensation for partial takings; the long history of value capture policies in Britain and France; and the remarkable expansion of tax increment financing in California.

The second section reviews the application of particular instruments of value capture, including the conversion of rural to urban land in China, town planning schemes in India, and community benefit agreements. The third section focuses on ends instead of means and examines the use of value capture by community land trusts to provide affordable housing, the use of land development to finance transit, and the use of various fees to fund airports. The final section explores potential extensions of value capture mechanisms to tax-exempt nonprofits and to the management of state trust lands in the United States.

Contents

Introduction

1. Land Value Capture: Types and Outcomes, *Gregory K. Ingram and Yu-Hung Hong*



Value Capture and Land Policies

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 Commentary, *Henry E. Smith*
4. The Unearned Increment: Property and the Capture of Betterment Value in Britain and France, *Philip A. Booth*
 Commentary, *Louis G. H. Albrechts*
5. Special Assessments in California: 35 Years of Expansion and Restriction, *Dean J. Misczynski*
 Commentary, *Carol E. Heim*

Land Value Capture Instruments

6. Collecting Land Value Through Public Land Leasing, *John E. Anderson*
 Commentary, *Guanzhong James Wen*
7. A Better Way to Grow?: Town Planning Schemes as a Hybrid Readjustment Process in Ahmedabad, India, *Bishwapriya Sanyal and Chandan Deuskar*
 Commentary, *Bipasha Baruah*

8. To What Extent Are Property-Related Taxes Effective Value Capture Instruments?, *Lawrence C. Walters*
 Commentary, *Jay K. Rosengard*
9. Community Benefits Agreements in a Value Capture Context, *Laura Wolf-Powers*
 Commentary, *Julian A. Gross*

Specific Applications

10. Science Parks and Land Value Capture, *Michael I. Luger and Justyna Dabrowska*
 Commentary, *Weiping Wu*
11. The Affordability Challenge: Inclusionary Housing and Community Land Trusts in a Federal System, *Richard P. Voith and Susan M. Wachter*
 Commentary, *Rachel G. Bratt*
12. Transit Value Capture: New Town Codevelopment Models and Land Market Updates in Tokyo and Hong Kong, *Jun Murakami*
 Commentary, *Zhirong Jerry Zhao*
13. Airport Improvement Fees, Benefit Spillovers, and Land Value Capture Mechanisms, *Anming Zhang*
 Commentary, *Jeffrey P. Cohen*

Potential Extensions

14. Assessing the Nonprofit Property Tax Exemption: Should Nonprofit Entities Be Taxed for Using Local Public Goods?, *Joseph J. Cordes*
 Commentary, *Woods Bowman*
15. Experimenting with Land Value Capture on Western State Trust Land, *Susan K. Culp and Dan W. Hunting*
 Commentary, *Amy W. Ando*

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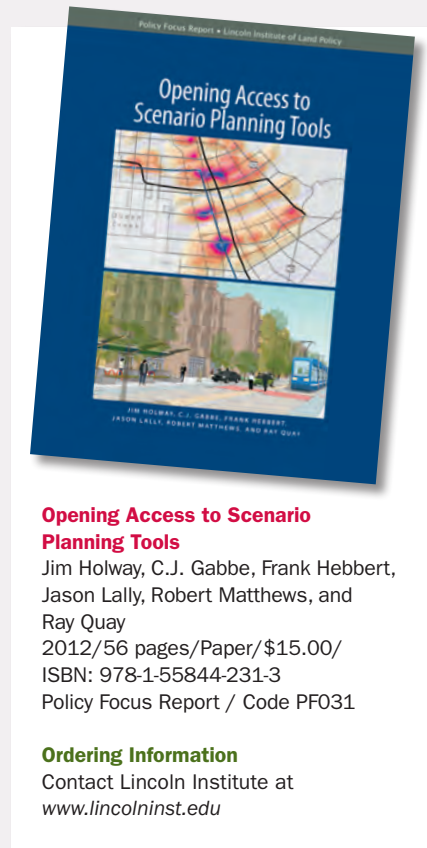
Opening Access to Scenario Planning Tools

In the face of increasing complexity and uncertainty, planners, public officials, and community residents need new tools to anticipate and shape the future. This report examines the current state of scenario planning and scenario planning tools that can help communities and regions prepare for that future through a variety of visioning, land use, transportation, and other planning efforts. It approaches this topic as an opportunity for using open source software and processes to foster the development, better understanding, and use of these tools.

Decisions about the future are often controversial due to competing economic interests, different cultural values, and divergent views about property rights and the role of government. Broader and more effective civic engagement is needed to ensure community support for decisions about development and other land-related policies, and public investments. The traditional predict-and-plan paradigm is inadequate to address all of these challenges. We need to move toward developing and implementing planning tools and processes that foster anticipation and adaptation.

Three concepts will be critical to the scenario planning and tool-building process: collaboration, capacity building, and creation of an open environment for engagement. Collaborative problem solving facilitates resolution of interrelated issues that cannot be resolved by one organization alone. Capacity building is needed to enable individuals and organizations to apply scenario planning methods and tools effectively to their specific planning concerns. An open environment for information sharing and education will help accelerate the use and improvement of scenario planning tools in multiple settings.

The emergence of new and improved scenario planning tools over the last 10 years offers promise that the use of scenario planning can increase and that the goal of providing open access to the full potential



Opening Access to Scenario Planning Tools

Jim Holway, C.J. Gabbe, Frank Hebbert, Jason Lally, Robert Matthews, and Ray Quay
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of scenario planning tools is within reach. This report recommends seven immediate actions that could be implemented quickly to facilitate this goal. A group of tool developers, planners, and other users convened by the Lincoln Institute of Land Policy and the Sonoran Institute, including the co-authors of this report, are already working to advance these efforts. A new website, www.ScenarioPlanningTools.org, will be the online host for this initiative.

- **Create an online platform** to foster collaboration in the development and application of scenario planning tools.
- **Develop a curriculum** on scenario planning for the next generation of professional and citizen planners.
- **Establish a model process** for conducting scenario planning and show how it can be used with existing community planning processes.

- **Illustrate different uses of scenario planning tools** in various stages of the planning process to facilitate increased use of scenario planning.
- **Establish data standards** to improve information sharing, starting with development and place types for land use patterns.
- **Initiate a model collaborative project** to demonstrate the potential for integrated tools, models, and modules.
- **Advance new concepts** of anticipatory governance by using foresight and anticipation to address uncertainty and future challenges.

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Nearly 750 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 the papers that have been posted since December 2011 at www.lincolinst.edu/pubs.

Leah Brooks and Byron Lutz
Vestiges of Transit: Path Dependence and the Modern City

Richard England
Preferential Assessment of Rural Lands in the United States: A Literature Review and Reform Proposals

Justin Hollander, Colin Polsky, Dan Zinder, and Dan Runfolo
A Spatial Analysis of Housing Vacancy in the United States, 2000–2011

Koleman Strumpf
Tax Flights

Lincoln Lecture Series

The annual lecture series highlights the work of scholars and practitioners who are involved in research and education programs sponsored by the Lincoln Institute. The lectures are presented at Lincoln House, 113 Brattle Street, Cambridge, Massachusetts, beginning at 12 p.m. (lunch is provided).

Consult the Lincoln Institute website for information about other dates, speakers, and lecture topics. The programs are free, but pre-registration is required at the website (www.lincolninst.edu/news/lectures.asp).

TUESDAY, APRIL 10

Alan Ehrenhalt, Executive Editor of *Stateline*, Pew Charitable Trusts
The Great Inversion: City and Suburb Trading Places

WEDNESDAY, MAY 2

Gabriel Ahlfeldt, Lecturer in Urban Economics and Land Development, London School of Economics
One Hundred Years of Land Values

The education programs listed here are offered as open enrollment courses for diverse audiences of elected and appointed officials, policy advisers and analysts, taxation and assessing officers, planning and development practitioners, business and community leaders, scholars and advanced students, and concerned citizens. For more information about these and other programs, visit the Lincoln Institute website at www.lincolinst.edu/education/courses.asp. In addition, the website hosts many online courses on land use and taxation policy that are offered in both English and Spanish.

Programs in Latin America

TUESDAY–WEDNESDAY, APRIL 17–18

Bogotá, Colombia

90th Anniversary of the Betterment Contribution Law in Colombia: Evaluation and Proposals

Martim Smolka, Lincoln Institute of Land Policy; Oscar Borrero, Los Andes University and National University of Colombia, Bogotá

This forum takes place on the occasion of the 90th anniversary of the betterment contribution law in Colombia—Contribución de Valorización, Law 25 of 1921. The objective is to evaluate the technical and legal experiences in the use of this instrument, which has been widely accepted by Colombian citizens and constitutes the oldest Latin American experience with value capture legislation. The forum will discuss the results and implementation of road works financed with the levy. It will also discuss the technical aspects pertaining to the distribution of the value added among real estate properties and the assessment of the capacity to pay of the contributors—the two basic conditions required by Colombian law for the application of the instrument. In addition, the forum will examine international experiences that potentially can be useful in improving the Colombian model. The forum is expected to produce a proposal for reform to the Colombian legislation to update the law to the twenty-first century and better regulate its interpretations, as reflected in the technical models used to allocate the levy.

MONDAY–FRIDAY, MAY 7–11

San José, Costa Rica

Legal Dimension of Land Policy

Martim Smolka, Lincoln Institute of Land Policy; Marcela Román, Consultant for the Cadastre and Registry Regularization Project in Costa Rica

This course examines the role of legal systems on land use planning, regulation of land markets, and urban development processes. It also reviews the most important fundamentals, principles, and institutions from a legal point of view and how they support land policy. It combines conceptual aspects, a review of the Latin American legal reforms, and alternatives of implementing land policy and instruments on specific issues such as public land acquisition, value capture, or social housing.

THURSDAY–SATURDAY, JULY 12–14

São Paulo, Brazil

VII International Congress on Research Journalism

Martim Smolka, Lincoln Institute of Land Policy; Paulo Sandroni, School of Economics and Business Administration, Getulio Vargas Foundation, São Paulo, Brazil; Sonia Rabello, School of Law, State University of Rio de Janeiro, and Rio de Janeiro's Council, Brazil

The seventh annual International Congress on Research Journalism is the premier meeting for Brazilian journalists. Approximately 70 presentations and workshops will be offered to an expected audience of 800 participants. The Lincoln Institute is offering two three-hour long workshops and a panel discussion. The workshops will cover urban land markets and social housing policies and the struggle for urban land occupation. The panel discussion will examine the urban impacts of mega-sports events



Databases Track Land Values and Property Taxation



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During these tumultuous times in housing and economic markets, researchers, students, journalists, public officials, and others have found these Lincoln Institute databases to be invaluable for tracking trends in land values and property taxation across the United States. Both sites are continually updated with new data and other featured information and reports.

Land and Property Values in the U.S. is a free online database that documents trends in residential properties in four dimensions:

- the ratio of rents to prices for the stock of all owner-occupied housing;
- values and price indexes for all land, structures, and housing in residential use;
- values of homes, land and home price indexes for 50 states and the District of Columbia; and
- values and price indexes for land, structures, and housing for single-family owner-occupied housing units in 46 major U.S. metropolitan areas.

The data on this site have been created by Morris A. Davis and his co-authors. Davis, who maintains and updates the data regularly, is an assistant professor at the University of Wisconsin School of Business, Department of Real Estate and Land Economics, and a fellow at the Lincoln Institute of Land Policy. The most recent additions to the site include data sets for the third quarter of 2011.

www.lincolnst.edu/subcenters/land-values

Significant Features of the Property Tax presents data on the property tax in all 50 states and the District of Columbia. Because accurate data provide the critical foundation for sound governmental decision-making, the Lincoln Institute of Land Policy and the George Washington Institute of Public Policy joined in a partnership to provide information and support public policy concerning the property tax in the United States. The interface allows users to access property tax data online in a variety of forms, including tables of the most frequently sought figures, a query system for creating new tables, and a downloadable database.

www.lincolnst.edu/subcenters/significant-features-property-tax

Land Lines

APRIL 2012

2012 Publications Catalog

The Lincoln Institute's 2012 Publications catalog features more than 100 books, policy focus reports, and multimedia resources. These publications represent the work of Institute faculty, fellows, and associates who are researching and reporting on the following topics: property taxation, valuation, and assessment; urban and regional planning; smart growth; land conservation; housing and urban development; and other land policy concerns in the United States, Latin America, China, Europe, Africa, and other areas around the globe.

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