



American Planning Association
Making Great Communities Happen

July/August 2012

PAS MEMO

Checking in on the Land Based Classification Standards: Multi-Dimensional Classification at a Crossroads

By David Morley, AICP

The Land Based Classification Standards (LBCS) is a system for classifying land based on its different physical, economic, and social characteristics. More importantly, though, LBCS allows jurisdictions, agencies, and institutions at the local, regional, state, and national levels to share land-based data.

While many other land-classification systems focus on a single aspect of land use, such as land cover or parcel ownership, LBCS uses five separate dimensions to capture a broader range of information. Furthermore, each of these dimensions has its own set of categories and subcategories. These dimensions, categories, and subcategories make LBCS both flexible and precise, giving it an advantage over other single-purpose classification systems.

Despite the power of LBCS, it has not yet become a true "standard" model for land classification. Although many communities, agencies, firms, and academics have applied LBCS to a variety of land-use planning initiatives, many other planning projects of various scales and emphases in the United States rely on a wide range of older standardized or ad hoc systems.

The purpose of this article is to provide an introduction (or reintroduction, as the case may be) to LBCS for practicing planners and to highlight a few specific applications of this system to contemporary land-use planning challenges. After discussing how LBCS is currently being used, the article will also summarize a basic process for incorporating the standards into a parcel-based data system.

History of LBCS

Since 2009 planners, public officials, and policy advocates have celebrated the federal Partnership for Sustainable Communities as a landmark achievement in silo busting. While the scope of the partnership among the Department of Housing and Urban Development (HUD), the Department of Transportation (DOT), and the Environmental Protection Agency (EPA) is unprecedented, it is not the first time federal agencies have collaborated to empower state and local planning efforts.

In 1965 the Bureau of Public Roads (the precursor to the Federal Highway Administration) and the Urban Renewal Administration (the precursor to HUD) jointly published the Standard Land Use Coding Manual (SLUCM) as an attempt to standardize land-use coding for local, regional, and state land-use planning applications. SLUCM assigned

numeric codes to a detailed listing of land-use categories based on the [Standard Industrial Classification](#) (SIC) system, and the coding scheme used a 4-digit SIC-like hierarchical system. The manual also provided supplemental codes to describe three specific attributes: ownership, residential structure type, and crop type for farm uses.

While the federal government never required grant recipients to use SLUCM, many state and local planning agencies did voluntarily incorporate it into their land-use and transportation planning initiatives. Despite the benefits offered by a standardized system, starting in the late 1970s local use of SLUCM dropped precipitously (American Planning Association 1994). Federal funding cuts meant there was less money for long-range, comprehensive planning and, in many cases, less capacity at the local level for systematically tracking existing and planned land use. SLUCM also suffered from a lack of maintenance; there were no official updates, meaning post-1965 revisions to SIC were never integrated into the manual.

By the early 1990s new federal legislation, such as the Clean Air Act Amendments and the Intermodal Surface Transportation Efficiency Act, and the increasing affordability and prevalence of geographic information systems reemphasized the utility of a standardized land classification system. In response to this growing awareness FHWA approached the American Planning Association (APA) in 1993 to conduct a feasibility study to determine the interest in updating SLUCM.

APA's 1994 [report to the FHWA](#) summarized and analyzed a number of notable federal, state, regional, and local land-classification projects. Based on this analysis, there was no clear successor to SLUCM among existing systems. As a result APA, with the support of the FHWA, HUD, the Department of Defense, the Federal Aviation Administration, and the Bureau of Transportation Statistics, launched the Land-Based Classification Standards (LBCS) project in May 1996. APA released the new standards in 2000 and updated them in 2001.

LBCS Dimensions

As mentioned above, LBCS classifies land characteristics across five dimensions: activity, function, structure type, site development character, and ownership.

LBCS

Land-Based Classification Standards

Land-Use Dimensions



LBCSActivity

- Residential activities
- Shopping, business or trade activities
- Industrial, manufacturing, and waste-related activities
- Social, institutional, or infrastructure-related activities
- Travel or movement activities
- Mass assembly of people
- Leisure activities
- Natural resource-related activities
- No human activity or unclassifiable activity



LBCSFunction

- Residence or accommodation functions
- General sales or services
- Manufacturing and wholesale trade
- Transportation, communication, information, and utilities
- Arts, entertainment, and recreation
- Education, public admin., health care, other inst.
- Construction-related businesses
- Mining and extraction establishments
- Agriculture, forestry, fishing and hunting



LBCSStructure

- Residential buildings
- Commercial buildings and other specialized structures
- Public assembly structures
- Institutional or community facilities
- Transportation-related facilities
- Utility and other nonbuilding structures
- Military installations
- Sheds, farm buildings, or agricultural facilities
- No structure



LBCSSite

- Developed site
- Developed site with a structure -- building
- Developed site with a structure -- nonbuilding
- Developed site that is functional (crops, storage etc.)
- Developed site that is primarily ornamental (landscape)
- Developed site functional and ornamental (park)
- Developed site that is graded
- Site with temporary structure
- Site in natural state



LBCSOwnership

- No constraints -- private ownership
- Some constraints -- easements or restricted use
- Limited restrictions -- leased or tenancy restrictions
- Public restrictions -- local, state, federal ownership
- Other public use restrictions -- regional, special district
- Nonprofit ownership restrictions
- Joint ownership character -- public entities
- Joint ownership character -- public, private, nonprofit, etc.
- Not applicable to this dimension

This illustration summarizes the top-level categories across the five LBCS dimensions.
Credit: APA.

Activity refers to how land is actually used based on its observable characteristics. In many cases this dimension is closely linked to ideas about the effects of land use on surrounding properties or the larger community. For example, if a specific parcel has a building being used as a small office, it would likely have similar effects on public facilities whether it was a tech startup, a nonprofit advocacy organization, or a consulting firm, and "office activity" would be the appropriate classification for this parcel. Similarly, "residential activity" would be the correct classification for residences in single-family homes, apartment buildings, manufactured houses, or any other type of building.

Function refers to the economic function or type of establishment using the land. The economic function served by a parcel is independent of actual activity on the land, and establishments can have a variety of activities on their premises yet serve a single function. For example, a manufacturing establishment may house both office and factory activities. To minimize ambiguity, LBCS users should avoid applying multiple function codes to a single establishment that has supplementary functions, such as supermarket that sells some clothing, hardware, or magazines. However, there are cases where a single parcel has multiple, distinct economic functions, such as a strip center containing a grocery store, an insurance office, and a branch bank. In these instances it is appropriate to assign multiple function codes to a single parcel.

Structure refers to the type of structure or building on the land. This dimension is ideal for capturing the spatial characteristics of land use. While structure usually has implications for activity and function, it can be helpful to disaggregate the form of development from how that development is actually used and to what economic end. For example, a single-family residential structure may be used as an office or a store, and a decommissioned school or factory may be converted to apartments.

Site development character refers to the overall physical characteristics of the land. For most land uses, it simply communicates whether or not the site is developed with buildings or structures. However, this dimension is especially useful for distinguishing parks, which often have a complex mix of activities, functions, and structures, from open space in a natural state.

Ownership refers to the relationship between the use and its land rights. Given that the economic function of a parcel of land often implies a certain ownership structure, this dimension may seem superfluous at first blush. However, because this relationship is not inherent across all functions, this dimension captures situations where the function may obscure ownership. As an example, a parcel developed with a detached single-family home and inhabited by a private household (in the function dimension parlance of LBCS) may be owned by a private party, a housing nonprofit, or a public housing authority. Moreover, this dimension enables accurate classification of easements and similar legal devices that limit or constrain land-use activities and functions.

Not every land-classification project will need to use all five dimensions. Some dimensions, such as site development character and ownership, can be applied irrespective of scale, but others, such as structure or activity, may be impractical or unnecessary for a rough-grained regional land-use analysis. Even though different projects will naturally emphasize different dimensions, any two projects that share at least one dimension will have a shared frame of reference.

Examples of LBCS in Practice

Over the past 11 years various agencies and organizations have used LBCS in their land-classification projects. Some of these projects are ambitious attempts to standardize land-use descriptions used by planning initiatives at different sites and scales across a large jurisdiction. Others are more limited in scope, such as applying LBCS to future land use maps or zoning use tables. The sections below highlight a few representative applications.

Standardizing Land-Use Coding in Philadelphia

In mid-2011 the city of Philadelphia took a major leap forward with the adoption of the [Philadelphia2035 Citywide Vision](#). This vision plan is the first step in a massive effort to replace the city's 50-year-old comprehensive plan with a new set of 18 district plans united by an overarching set of citywide themes and goals. And this effort is part of an even larger initiative aimed at harmonizing the city's new zoning ordinance (adopted in late 2011) with its comprehensive and strategic planning documents.

According to Philadelphia City Planning Commission Senior Planner John Haak, AICP, the planning commission used the LBCS activity dimension as the starting point for an updated land-use coding system. "We found a rough correspondence between 1970s-era planning commission land-use data and the classifications suggested by the LBCS activity dimension," said Haak. "This allowed for general but useful observations in our citywide plan of land-use changes over time."

The existing [land-use map](#) in Philadelphia2035 adheres to LBCS [color-coding principles](#), and the land-use categories correspond to the city's new custom coding system. According to Haak, when developing the new coding system, the planning commission modified the LBCS activity dimension with some categories that relate directly to the North American Industrial Classification System (NAICS) or better accommodate the city's unique residential building stock.

"A key decision for us was to establish a correspondence between the 1990s-era coding still used by the city's property assessment office and our LBCS-inspired activity update," said Haak. "This allows the planning commission to at least begin with a land-use picture based on regularly updated administrative records."

The planning commission is currently in the process of conducting street surveys to refine the coding in advance of district plans that will be developed over the next several years. After each new district plan is adopted, the city's new zoning code will be mapped to these districts. According to Haak, the eventual goal is to replace all ad hoc, project-specific land classification with a single hierarchical system.

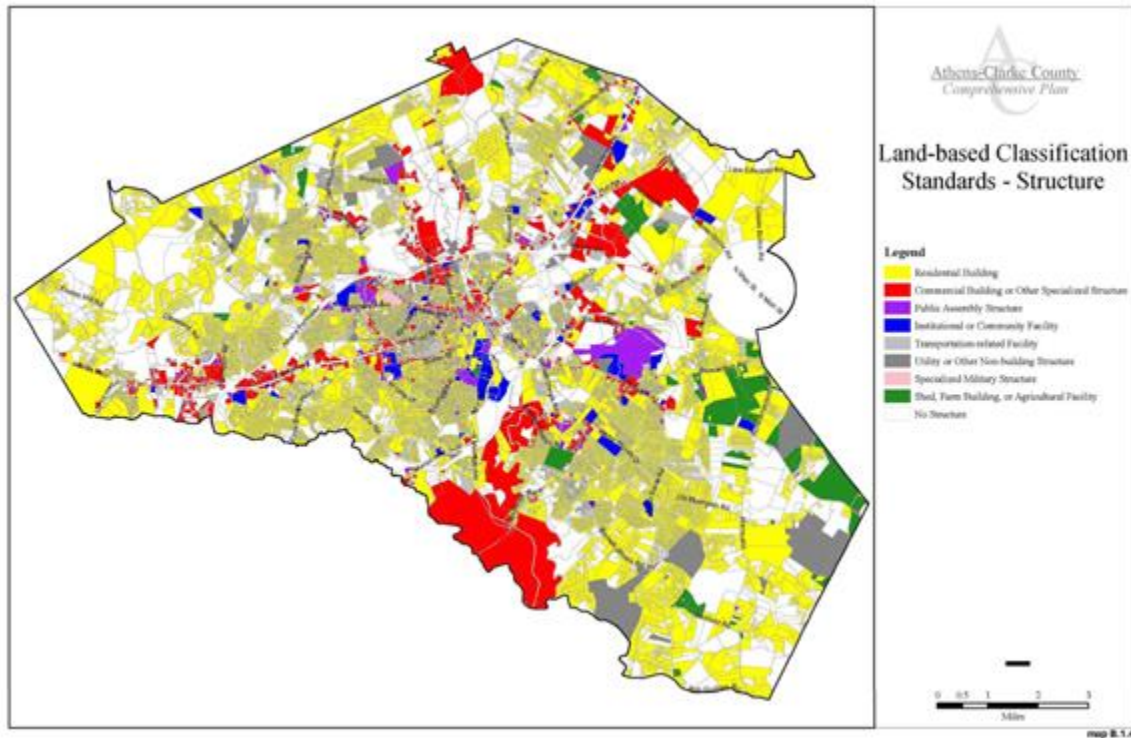
A Multi-Dimensional Parcel Database in Athens-Clarke County, Georgia

The latest version of Georgia's [Local Planning Requirements](#) sanctions LBCS as one of two permissible land-use classification systems that local governments can use in their comprehensive planning processes and documents. The alternative system is an older standard developed by the State of Georgia consisting of nine broad land-use categories. Each city and county in Georgia that chooses LBCS must, at a minimum, use the function dimension in its official comprehensive plan land-use analyses, assessments, and maps.

Since the state's rule change in the early 2000s, a number of communities in Georgia have exercised the LBCS option in their comprehensive planning projects, and at least one, Athens-Clarke County, has gone well beyond the minimum requirements. According to the city-county's latest [Community Assessment](#), staff used zoning and building permit data,

business tax certificates, tax assessor information, aerial photography, and windshield surveys to populate a multi-dimensional database for the jurisdiction's 38,000 parcels.

Athens-Clarke County's database uses four of the five LBCS dimensions: activity, function, structure, and site development characteristics, and its Community Assessment includes thematic maps for each of these dimensions, which display top-level categories for every parcel in the jurisdiction.



Visualizing one of the LBCS dimensions communitywide can give a very different impression than finer grained visualizations. In this example, Athens-Clarke County, Georgia, has mapped the structure dimension, which demonstrates clearly just how much land in this community is dedicated to roads and other transportation-related structures. Credit: Athens-Clarke County, Georgia.

Land-Use Analysis for Economic Development in Horizon City, Texas

The desert town of Horizon City, Texas, is a rapidly growing bedroom community located about 15 miles east of El Paso and 20 miles north of the Mexico border. According to former Horizon planning director Edwin Hamlyn (speaking at the 2011 National Planning Conference in Boston), despite its booming population, the town faces major economic challenges owing to its legacy as the site of a major land debacle.

As Hamlyn explained, the Horizon Properties Corporation bought 100,000 acres of undeveloped arid land in El Paso County in 1960 under the auspices of developing a new metropolis of 1.5 million people. The developer subdivided the parcel into 10,000 square-foot lots and installed roads in a small section as a demonstration town site. Unfortunately, with no water service or utilities, the projected commercial and industrial development never materialized.

When the town embarked on a new [comprehensive planning process](#) in 2010, it turned to the University of Texas at El Paso's Regional Geospatial Service Center (RGSC) to help with geographic information systems (GIS) analysis. According to Hamlyn, the overarching

purpose of the plan was to chart an economically sustainable course for the town's future. Or, to put it another way, the town's low-density residential development wasn't paying its way.

While the town's planning consultant recommended a simple land classification scheme with rough-grained commercial and industrial categories, the RGSC team wanted to capture a more complete picture of existing conditions. To that end, the center conducted a regional land-use analysis using all five LBCS dimensions. One of the most revealing results of the analysis was the finding that approximately 56 percent of the town's land area was undeveloped, and much of this vacant land was saddled with fractured ownership. While the future economic prospects of the town remain uncertain, it now has a much better sense of the specific land-use challenges it faces in attracting new jobs.

Regulating Permitted Uses in Frederick, Maryland

Apart from documenting existing land uses, a number of communities have also turned to LBCS to improve clarity and consistency in use regulation. Many, if not most, contemporary zoning ordinances combine traditional district-based use restrictions with development and design standards that control the form of development. Given this trend toward hybrid zoning ordinances, communities that have codified LBCS categories typically draw on the function or structure dimensions.

In a September 2005 *Zoning Practice* article on classifying land uses, author S. Mark White, AICP, offered Frederick, Maryland, as an example of how one community has incorporated LBCS function and structure dimension cross references into its development regulations for the purpose of minimizing use determinations. Most uses listed in the city's [use matrix](#) include a four-digit LBCS function code and many uses also include a corollary four-digit structure code. Apart from LBCS cross references, Frederick's matrix also includes references to NAICS codes where applicable.

Use	RC	MO	M4	R6	R8	R12	R16	R20	PB	NC	2C	MO	M1	M2	D1B	DR	MO	MU	MSE	ST	PK	LBCS Function	LBCS Structure	NAICS
Residential Uses																								
Accessory Apartments			C	C	C	C	C	C	P	C	C		C	C	P	C	C	P	P	C				
Accessory Detached Dwelling Unit			P	P	P	P	P	P							P	P	P	P						
Duplex					P	P	P	P							P	P	P	P				1000	1200	-
Multi-Family					P	P	P	P							P	P	P	P	P			1000	1200	-
Multi-Family with Accessory Retail							C	C							P	C	C	P				-	-	-
Single-family	P	P	P	P	P	P	P	P	A						P	P	P	P				1000	1120	-
Townhouse					P	P	P	P							P	P	P	P				1000	1140	-
Two-family					P	P	P	P							P	P	P	P				1000	-	-
Accommodations and Group Living																								
Bed and breakfast inn		C	C	C	C	C	C	C	C						C	C	C	M				-	-	721191
Group Home					P	P	P	P							P	P	P	P	P			5540 6540	-	623200 623990
Hotel, Motel, and tourist court									P		P	P	P		P	P	P	P	P			1330	1330	-
Senior Living & Retirement Facilities					C	C	C	C							C	C		M		P		1200-1240	-	623312
Nursing Home/Domiciliary Care/Adult Living Facility		C	C	C	C	C	C	C		C					C	C		M	C	P		1230 1250 6200	-	623110 623111 623112 623312 623311
Rooming House			C	C	C	C	C	C							P	C	P	C	C			1300	-	721310
General Sales or Service																								
Accessory Drive Through Facilities									A	A	A	A	A	A	C		C	A	A	C				
Animal Care Services (including grooming & boarding)											P		P	P					P					
Animal Grooming (Excluding Boarding)										S	P				P			P	P			1720	-	541940
Antiques										P	P				P		P	P	P			2042	-	-
Apparel										S	P				P		P	P				2033	-	-
Arts, crafts, or hobby supplies										P	P				P		P	P	P			2124	-	45112, 45113
Art Gallery, including framing									P	P	P				P		P	P	P			-	4410	43292
Automobile Filling Station										P	P	C	P	P				P	P			2010	2270	4471
Automobile Parts or Accessories															P				P			2115	-	4413
Automobile Sales & Service Center (dealership)										P		P							P			2111	2080, 4411, 4412	

P = permitted by right A = accessory use S = shopping center use only
 C = conditional use T = temporary use
 M = Mixed-Use conditional use

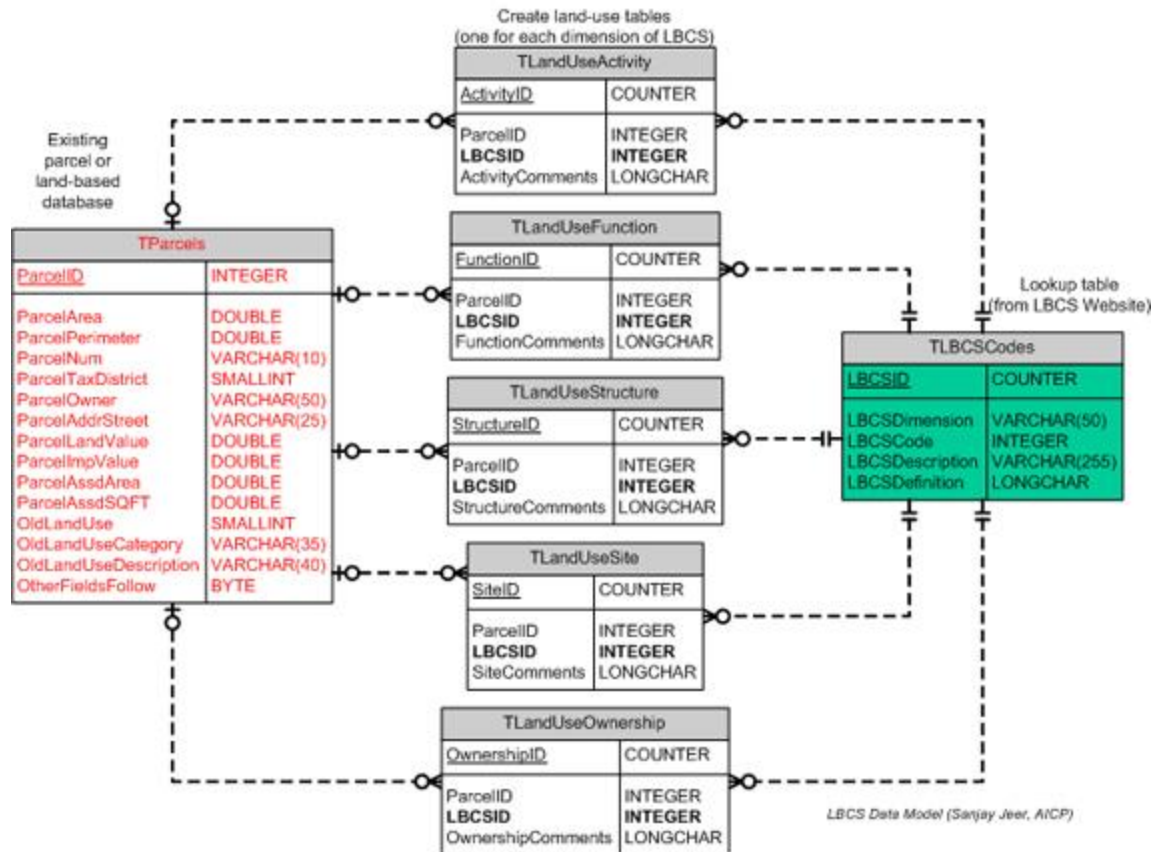
This excerpt from Frederick, Maryland's land-use matrix uses LBCS and NAICS to clarify permitted uses in various zoning districts. Credit: Frederick, Maryland.

Implementing LBCS

There are a variety of ways that communities may choose to implement LBCS, based on usage intent and organizational capacity; however, the LBCS's creators envisioned that most communities would deploy the standards in the context of a property database. At the local level this usually means a parcel-based information system, which may aggregate data collected from a range of sources such as local property assessments, the U.S. Census Bureau, licensing and permitting records, nuisance complaints or code enforcement actions, planning and zoning designations, or public safety service calls.

Classifying land uses across multiple dimensions, in database terms, means adding new fields to a parcel-based land-use table, adding a series of new tables corresponding to each dimension, or keeping parcel data and LBCS data in two different tables. The total number of land-use fields or tables in the database should equal the number of dimensions. This means that every record in the database is classified in not just one land-use field, but several for each dimension. The LBCS website contains a [basic implementation guide](#) for each of these three methods.

LBCS Data Model: One table per LBCS Dimension



See the sample MDB file for a database implementation using this model

This illustration shows how communities may choose to implement LBCS by adding a series of tables corresponding to each dimension to a property database. Credit: APA.

Keeping LBCS dimensions and parcel data in a single table has the benefit of simplicity, but adding tables for each dimension or separating parcel and LBCS data tables makes it easier to capture multiple activities, functions, structures, and ownership types for each parcel. With tables for each dimension or separate parcel and LBCS data tables, you can code a mix of uses without having to resort to a generic mixed-use designation. However, with a two-dimensional GIS map, it is difficult to display multiple uses simultaneously without resorting to a cross-hatch or some other pattern that captures multiple fields in a single display theme.

While there have not been any official updates to LBCS since 2001, the hierarchical structure of the system makes it easy to extend without losing interoperability at higher levels. Each dimension contains four levels of categories, and most categories have built-in expansion slots. For example, in the [function dimension](#) under the top-level category "general sales or services" (2000), there are seven subcategories (with the four-digit designations 2100, 2200, 2300, 2400, 2500, 2600, and 2700). This leaves two expansion slots (2800 and 2900) for broad types of sales or service uses not captured by the existing subcategories. Furthermore, each second and third tier category contains additional expansion slots for more specific uses not currently included in LBCS.

To make this more concrete, let's assume that a specific community wants to draw distinctions between alternative financial institutions like payday loan stores or check cashing services and traditional banks. Under the top-level category "general sales or services" (2000) there is a subcategory named "finance and insurance" (2600). Under this subcategory there are five third-tier categories, including one named "bank, credit union, or savings institution" (2610). Our hypothetical community may choose to add a new third-tier category named "alternative financial institutions" (2660) with fourth-tier categories named "check-cashing stores" (2661), "payday loan stores" (2662), and "title loan stores" (2663).

Because many current applications and land-based data systems use SLUCM, SIC, or NAICS, the LBCS website includes conversion tables to help users migrate their data. [One table](#) correlates SLUCM codes with SIC and NAICS, and a [second table](#) translates NAICS codes to LBCS function dimension categories.

Concluding Thoughts

Despite having clear advantages in terms of specificity and flexibility over single-purpose classification systems, LBCS has yet to be deployed widely. This adoption gap may be due to a simple lack of awareness on the part of many planners. However, for some communities, LBCS may be seen as a solution to a nonexistent problem.

The fragmented nature of local government can make it difficult for local planners to convince public officials to adopt a standardized system. If neighboring jurisdictions, or even agencies within the same jurisdiction, are not in the habit of routinely sharing data, it can be hard to see the benefits of an interoperable system. If a locally developed ad hoc system seems to be working well, why go through the hassle of learning a new system?

From a different perspective, LBCS also faces competition from NAICS. Since its adoption as a replacement for SIC in 1997, NAICS has become a de facto classification standard for economic analyses. When applied to land use, NAICS works like an expanded function dimension. While it is relatively easy to match NAICS codes to LBCS function categories, this translation is beneficial only if the community intends to classify multiple LBCS dimensions or if it intends to compare data with other entities that already use LBCS.

Perhaps the biggest barrier to widespread LBCS implementation is the lack of an official forum for users to discuss specific approaches and classification challenges. In an effort to fill this void, APA recently launched an [LBCS users' group](#) on the social networking site LinkedIn. If the group catches on, early adopters will be able to share lessons learned with new users, and APA will have a mechanism for tracking trending topics and narrowing the focus for potential future updates.

ABOUT THE AUTHOR

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