Esri Demographic
Update Methodology: 2010/2015

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An Esri White Paper

Contents	Page

Contents   **Page**

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Current Trends   Whether the Great Recession has ended remains debatable in the second quarter of 2010, though many economists believe that the recession, begun in December 2007, probably ended sometime in the third or fourth quarter of 2009. Recovery also remains debatable. Fears over a "double-dip" recession persist. Data is contradictory:

- Gross domestic product (GDP) rose by 2.7 percent in the first quarter of 2010, a real improvement over the first quarter of 2009, which saw a decline of 6.4 percent, but less than expected and less than the fourth quarter of 2009, in which the GDP rose by 5.6 percent.[1]

- Stock markets remain volatile. Within two weeks in June, the Dow Jones® industrial average dropped to a seven-month low of 9,816, then climbed to 10,450—significant, but hardly comparable to the flash crash of May 6, when the Dow lost almost 1,000 points in less than 10 minutes.

- Unemployment claims dropped by a quarter of a million at the end of May 2010. That month also posted the largest increase in jobs since March 2000, a gain of 431,000. However, almost all the new jobs (411,000) were temporary census jobs. Private employers added only 41,000 jobs, down from 218,000 in April. Other government jobs (state and local) declined by 21,000.[2] Weekly jobless claims increased again in mid-June.[3]

- Consumer confidence increased from March through May, rising to 62.7, but retail sales fell by 1.2 percent in May—the first time in eight months and contrary to expectations.[4]

- Sales of new and existing homes exceeded expectations in March and April, posting year-over-year April increases of 48 percent for new and 23 percent for existing homes.[5] Since April was the last month to take advantage of the tax credits for home buyers, the outlook for the rest of the year is more guarded. Sales in May dropped by 2.2 percent for existing homes and 33 percent for new homes (a record drop). Housing inventories remain high.

[1] http://money.cnn.com/2010/04/30/news/economy/gdp/index.htm?postversion=2010043010;
    http://money.cnn.com/2010/05/27/news/economy/gdp/index.htm.
[2] http://money.cnn.com/2010/06/04/news/economy/jobs_may/index.htm.
[3] http://www.dol.gov/opa/media/press/eta/ui/eta20100816.htm.
[4] http://money.cnn.com/2010/05/25/news/economy/consumer_confidence/index.htm.
    Note: Consumer confidence fell to 52.9 in June—http://money.cnn.com/2010/06/29/news/economy/
    consumer_confidence/index.htm?source=cnn_bin&hpt=Sbin.
[5] http://money.cnn.com/2010/05/26/news/economy/new_home_sales/index.htm.

■ Foreclosures declined by 3 percent in May, but the activity level remained at more than 300,000 filings for the fifteenth straight month. Bank repossessions increased.[6]

What, exactly, is happening? The economy appears to be recovering, but growth is tepid and inconsistent across the country:

■ Population growth has resumed or increased in about one-third of counties, but more than half of the counties are still experiencing loss of population.

■ Curiously, the housing inventory increased in more than 85 percent of counties from 2009 to 2010. Vacancy rates also increased in more than 85 percent of counties.

■ The freefall in median home value that hit two-thirds of counties from 2008 to 2009 has stabilized and reversed in almost one-fourth of counties in 2010. Recent gains in these counties are moderate, an average of 2.4 percent.

■ Ninety-five percent of counties experienced a loss of jobs from 2008 to 2009. One year later, more than half of the counties are currently showing some gain in employment, with a collective increase of 1.7 million, or 2.8 percent. The other half of the counties experienced a collective loss of 2.3 million jobs, for a net loss of almost 600,000 jobs.

■ Unemployment rates increased in 97 percent of counties from 2008 to 2009. Almost 40 percent of counties now have declining rates of unemployment, officially. (These rates do not include workers that have dropped off the unemployment rolls or left the labor force.)

■ The effects of a recession on annual household income are not immediate.[7] From 2008 to 2009, 37 percent of counties experienced a decline in median household income. The decreases generally ranged from $1 to $250. Last year, more than 98 percent of the counties lost income. The decrease in median household income ranged from $1 to $1,700.

Some improvement is evident, but so is the continued loss, especially in jobs and income; for every step forward, there are two steps backward. At the county level, the changes appear to be variable. By metropolitan level, a clearer pattern of change emerges. Table 1 shows the initial harbingers of the recession—population change and home value—and two key consequences, employment and household income.

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[6] http://www.realtytrac.com/contentmanagement/pressrelease.aspx?channelid=9&itemid=9427.

[7] Household income remains consistent with Census 2000 definitions: income in the *previous* year. The 2010 income updates actually represent income in 2009.

Table 1
Change 2008–2010 by Metropolitan Status

Annual Change (%)	Counties by Metropolitan Status		
	Metropolitan	Micropolitan	Nonmetropolitan
Population			
2009–2010	0.6	0.1	-0.6
2008–2009	0.2	-0.1	-0.6
Median Home Value			
2009–2010	-2.9	-1.7	-2.2
2008–2009	-12.8	-2.0	-1.1
Employment			
2009–2010	-0.6	0.4	0.6
2008-2009	-3.9	-4.0	-4.3
Median Household Income			
2009–2010	-0.7	-0.4	-0.5
2008–2009	-0.4	0.4	0.7
Number of Counties	**1,100**	**688**	**1,353**

Deceleration in home value appreciation and population growth presaged the Great Recession as early as 2006–2007. These changes initially affected the hottest markets—primarily metropolitan markets in the South and West. Over the next three years, the decline snowballed from smaller rates of growth to loss and spread into micropolitan and nonmetropolitan counties. The depreciation in home value has slowed significantly among metropolitan counties. The smaller micropolitan and nonmetropolitan counties were less affected by the swings in the housing market: less appreciation during the housing bubble and less deflation on the downside. Home price fluctuations in less populous markets have been significantly milder than in metropolitan areas, but in the last year, prices fell at twice the rate of those in 2008–2009. Micropolitan areas maintained an annual loss of almost 2 percent over the last two years, while metropolitan areas improved from -12.8 percent between 2008 and 2009 to only -3 percent. Home value is gradually stabilizing, and population growth is improving, with a slight increase among metropolitan counties and a shift from minus to plus among micropolitan counties. Nonmetropolitan counties continue to lose population.

The economic crisis that ensued from the collapse of the housing market is still affecting all counties. In 2009, rising unemployment augmented the rise in foreclosures, depressed population growth further, and diffused that trend to 80 percent of counties and 82 percent of metropolitan markets. In 2010, employment is still decreasing among metropolitan counties, but there have been slight gains in employment among the micropolitan and nonmetropolitan markets. The shift is moderate and insufficient to stem rising unemployment rates.

The consequence of unemployment—income loss—is also evident now. Median household income is declining among all counties; however, it is more pronounced

among metropolitan counties. Only metropolitan areas experienced an income decline in the first full recession year. In 2009, median household income fell in metropolitan, micropolitan, and nonmetropolitan areas. The rate of decline in metropolitan areas still exceeds micropolitan and nonmetropolitan areas by 0.3 and 0.2 percentage points, respectively. This is likely a result of the concentration of job losses and business failures in metropolitan areas where financial, retail, service, and construction sectors, all heavily impacted by the downturn, are clustered. At the national level, median household income fell by half of a percentage point to $54,442.

By region, the distinctions are less pronounced, as shown in table 2. Population growth has resumed in each of the regions; however, the current change in home value remains negative across the regions—improving, but still negative.[8] Employment is now showing improvement in the Northeast, South, and West. The Midwest is still experiencing significant job losses. Much of this year's job loss came from this area, which shed over 564,000 positions, led by Illinois, Ohio, Missouri, and Michigan. In the South, states are recovering much better relative to 2009; some states are starting to post gains. The net increase in job creation is nearly 60,000 workers, primarily from Texas and the Carolinas. Florida and Georgia are still experiencing difficulties jump-starting their economies.

Household income is increasing again in the Northeast, but the other regions are now feeling the recessionary effects.

Table 2
Change 2008–2010 by Region

Annual Change (%)	Region			
	Northeast	Midwest	South	West
Population				
2009–2010	0.1	0.1	0.8	0.6
2008–2009	-0.4	-0.4	0.4	0.6
Median Home Value				
2009–2010	-2.6	-1.3	-2.6	-3.8
2008–2009	-6.0	-6.6	-10.8	-19.4
Employment				
2009–2010	-0.1	-1.8	0.1	-0.2
2008–2009	-3.8	-3.7	-3.9	-4.3
Median Household Income				
2009–2010	0.7	-0.9	-0.6	-1.1
2008–2009	-0.1	0.0	0.1	0.0

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[8] Regions are a geographic classification; metropolitan areas represent a demographic grouping. The distinctions in demographic measures are likely to differ. The Northeast and West have the highest concentrations of population in metropolitan areas—almost 90 percent. The Midwest and South have less than 80 percent of their populations in metropolitan areas.

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Past Trends: Decade in Review

The past decade includes the extremes of a growth cycle: phenomenal growth and a spectacular crash. What is the balance—net gain, net loss—or did we break even? From 2000 to 2010, changes include some interesting increases:

■ Total population: An average annual increase of less than 1 percent
■ Housing units: +14 percent
■ Vacant housing units: +52 percent
■ Median home value: +41 percent
■ Civilian employment: +5 percent
■ Unemployment: +107 percent
■ Median household income: +29 percent

It's not difficult to see the problems inherent in a 52 percent increase in vacant housing or a 107 percent increase in the number of unemployed workers compared to a gain of less than 5 percent in jobs. However, it's difficult to assess an increase of more than 40 percent in home value or almost 30 percent in household income without a comparison. The following chart compares change in select indicators in the current decade, 2000–2010, to the previous decade, 1990–2000. Both decades began with comparatively mild recessions. The singular differences between the two periods are the housing bubble and the Great Recession.

Chart 1
Percent Change in Select Indicators by Decade
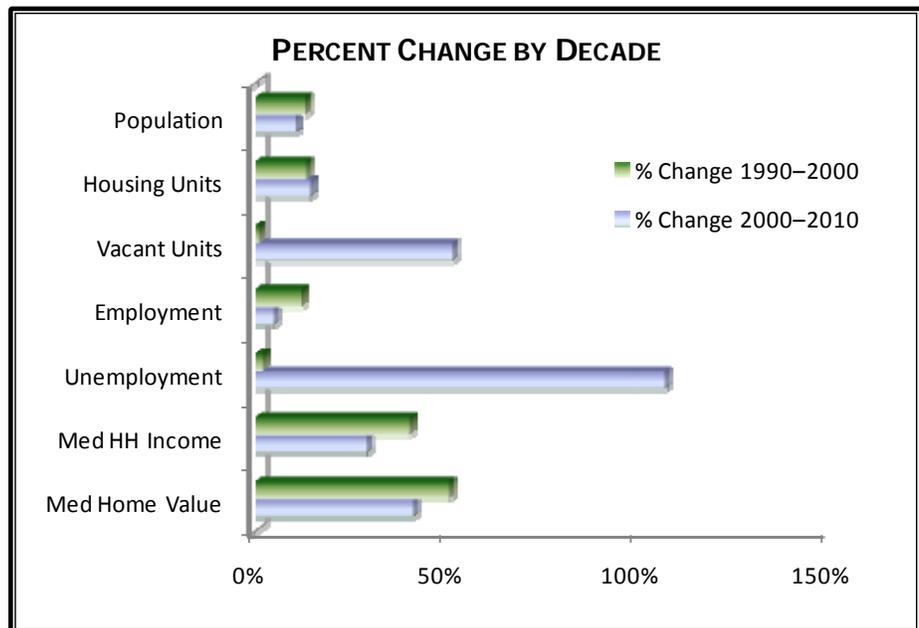
Although the net gain from 2000 to 2010 is less than the growth in the 1990s, there is variation. Home price fluctuations have hit historic extremes, both positive and negative, during the last decade. The net gain is 41 percent since 2000, comparable to the gain between 1990 and 2000. Median home value for 2010 stands at $157,910, reflecting an average annual change of 3.4 percent since 2000. Neither the growth induced by the

housing bubble nor the recession has affected all areas equally. Massive swings in home prices occurred among the fastest-growing states in both periods, measured by rate (Arizona, Nevada) or absolute numbers (California, Florida). These states also had skyrocketing foreclosure filings after 2007.[9] Prior to 2007, the states experienced year-on-year appreciation reaching 20 to 30 percent, before the crash. Fueled by early gains this decade, California and Florida maintained reasonable 10-year appreciation of 5 and 3 percent annually, respectively. Michigan is the only state that showed virtually no appreciation in the last 10 years—incomparable to the 90 percent gain during the 1990s. Michigan was impacted not only by the housing crisis but also by the auto industry's troubles. The Detroit Metropolitan Area alone experienced a home price drop of almost 15 percent. In fact, the city of Detroit recently announced plans to downsize, a reversal program in which acres of abandoned properties will be demolished and the land restored to fields and farmland.[10]

Employment provides a less favorable comparison between 2000–2010 and 1990–2000. The net gain in jobs for the 2000–2010 decade was just 6.3 million. The increase in unemployment was 8.5 million workers, or an increase in the unemployment rate of 5 percentage points. Contrast this performance with the 1990s, when the private economy produced more than twice as many jobs (14 million) and the rate of unemployment improved a half of a percentage point from 6.3 percent to 5.8 percent. The downturn in employment is wholly the result of the recession. Through July 2007, employment had increased by almost 11.9 million jobs.

A comparison of the last two decades suggests that the shape of the income distribution has already experienced more permanent change. During the 1990s, median household income grew at 3.4 percent a year; average household income grew even faster at 3.9 percent. Since averages are readily influenced by extremes in the distribution, the conclusion is that the rich were getting richer while the poor were getting poorer. However, Esri estimates for the last decade show a significant change. Median household income grew at only 2.5 percent a year, barely keeping up with inflation, while average household income trailed, at a rate of 2.1 percent a year.

The Economic Outlook

Restraint is the best outlook in the face of weak job growth, growing debt, and persistent concern over a double-dip recession. Declaring a recession is the purview of the National Bureau of Economic Research (NBER). It tracks quarterly GDP estimates, industrial production, manufacturing and trade sales, gross domestic income, personal income, and employment from the Current Employment Statistics payroll and Current Population Survey. All the indicators had turned around by the end of 2009, with the exception of employment. The monthly payroll survey and the household-based employment survey have just started to show signs of growth in 2010.

There are other signs of improvement in the labor market. The number of temporary jobs has been rising since the third quarter of 2009. Typically, firms squeeze more output from their existing workforce when business is slow. As orders pick up and inventories reach lower levels, businesses can take a cautious, cost-effective approach by hiring temporary workers during the beginning stages of a recovery. Another positive sign is the four-week

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[9] The notable exception to this association is Texas, which has been not only one of the fastest-growing states by rate or number but also one of the states least affected by foreclosure filings.

[10] http://www.washingtontimes.com/news/2010/mar/09/detroit-looks-at-downsizing-to-save-city/.

moving average of filers, both new and continuing, for unemployment insurance benefits: it has been on the decline since mid-2009.

While the economic indicators, as well as the recent surge on Wall Street, suggest improving conditions, "Main Street" may disagree. Based on the jobs and homes lost during the recession, it is hard to dismiss such a perception. Before the 2008 downturn, the overall average monthly job loss of all post-World War II recessions was 160,000 positions. Assuming the 2008 recession ended September 2009, the number of jobs lost in a typical month swells to a record high of 385,000. This makes the Great Recession the deepest contraction in monthly employment, as shown in chart 2.

Chart 2
Average Employment Change by Economic Cycle
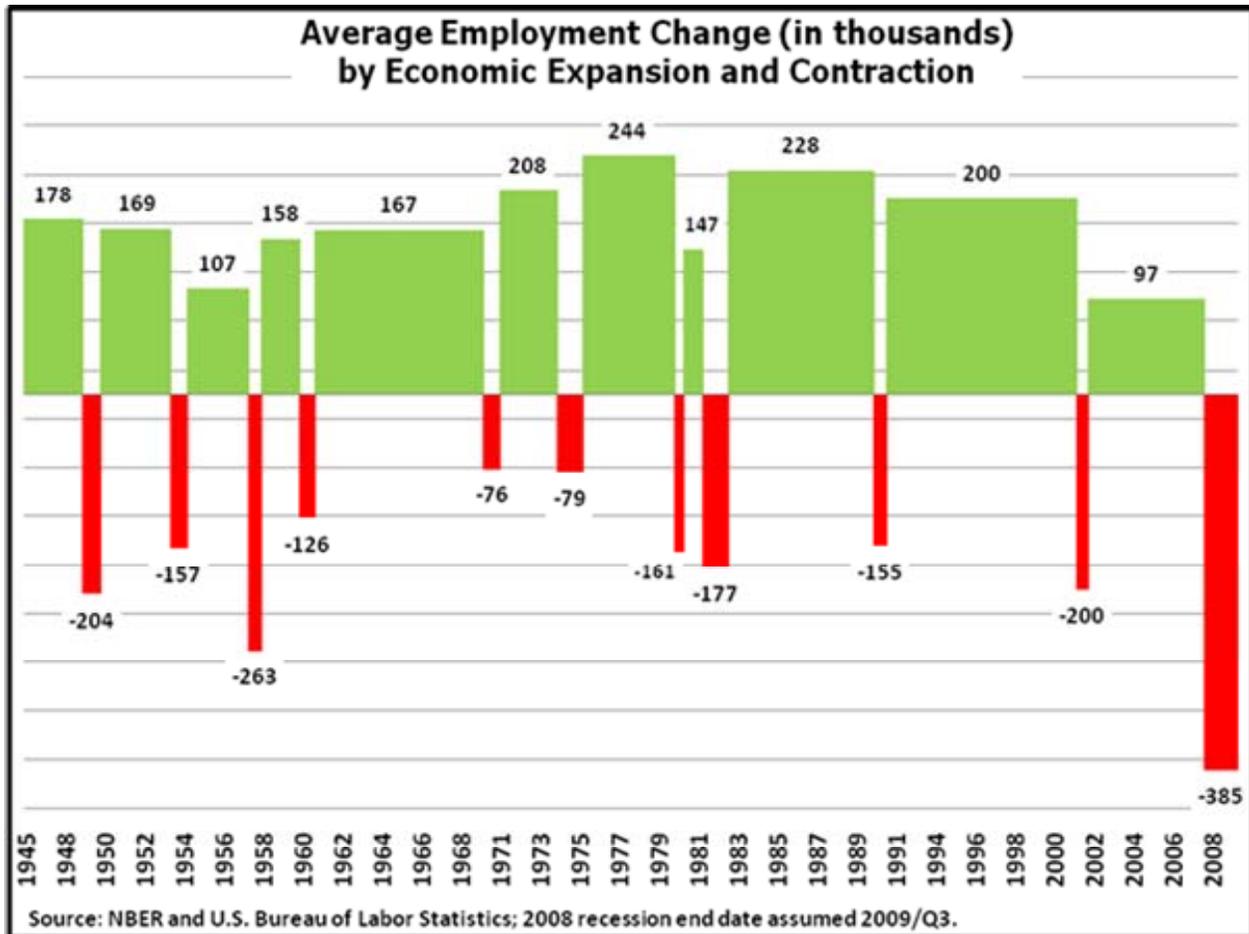
While the worst may be behind us, the dust is still settling. One thing is certain: the public will face some hard decisions on how best to pay for the government expenditures earmarked to reignite private demand.

Federal spending has not abated since the financial crash. For example, the Federal Deposit Insurance Corporation (FDIC) is still working to recapitalize failing banks; the

flow of money needed to cover losses by Fannie Mae and Freddie Mac continues. The list goes on. Before the federal government can address the pending insolvency of entitlement programs like Social Security and Medicare, there is a more immediate crisis ending: the insolvency of state governments. Many state and local governments are facing massive deficits due to dwindling tax revenues. The bailout money provided by Congress funded many state and local programs, including public schools, last year. Now state and local governments must face their inability to finance daily obligations and service their own entitlement programs, including state health care and pensions.[11] Some states are considering alternative sources of revenues such as allowing slot machines or taxing Internet retail sales transactions. In the end, the recession has exposed the shaky foundations of many state budgets.

Current and future taxpayers face a growing mountain of debt due to the steps taken by the federal government to avert the financial crisis. The U.S. accumulated a record annual deficit of $1.4 trillion in 2009. The White House's Office of Management and Budget (OMB) projects another record breaker in 2010. OMB estimates a debt level of $13.7 trillion, or 94 percent of the GDP, which represents a new 60-year high. OMB also projects continued growth in the public debt through 2015, when it tops out at nearly $20 trillion, or 103 percent of the GDP. The Moody's rating agency has issued a warning: if reductions are not made, the U.S. government is at risk of losing its high credit rating.[12] Such a downgrade would make additional borrowing more costly, compounding the debt problem. The federal government may hope to grow its way out of the problem but ultimately will face difficult choices on whether to reduce spending, increase taxes, or some combination of both. There is another, more sinister way to tackle debt: inflate it away. This concern is another reason investors are making moves to safeguard their portfolios from the potential erosion of purchasing power.

The economy has slowly responded to efforts by the Federal Reserve, the U.S. Treasury, and Congress to counter the downturn. The real question is, how sustainable is the current nascent recovery? The housing market no longer appears to be in freefall, but foreclosures remain high. Sales in the past year have been fueled by the bargain appeal of bank repossessions and by tax incentives.

Despite predictions that foreclosure activity would peak around the third quarter of 2009, various data sources suggest that the crisis is far from over. The Federal Housing Administration's (FHA) April 2010 Outlook confirms that 8.5 percent of its loans were seriously delinquent as of March 2010, an 80 percent increase year-on-year. RealtyTrac estimates that about 2.8 million homes were foreclosed in 2009 but projects an astounding 4.5 million foreclosure filings in 2010.

President Barack Obama's foreclosure prevention initiative, Home Affordable Modification Program, introduced in early 2009, has steered over 100,000 loans toward lower interest rates or lengthened repayment terms. The program has helped a very small portion of homeowners at risk. With unemployment rates at historically high levels, even loan modifications have been insufficient to bail out the one in five homeowners estimated to owe more than their properties are worth. This program was made permanent in early 2010.

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[11] Merrick, Amy. "States Sink in Benefits Hole," *Wall Street Journal,* February 18, 2010.

[12] Jolly, David, and Catherine Rampell. "Moody's Says U.S. Debt Could Test Triple-A Rating," *The New York Times,* March 15, 2010.

Tax incentives for home buyers have been more effective in the past year. This popular program has helped the U.S. housing market begin the process of stabilization—showing a moderating decline in the last year. U.S. home value is expected to decline another 2.7 percent between 2009 and 2010. This is an improvement over the 11.3 percent drop in the previous year. In the last year, 164 metropolitan markets showed gains in home value, compared to only 23 in the prior year. However, the end of the tax incentive program in April 2010 and the steady flow of foreclosure filings will continue downward pressure on home prices until the economy picks up and businesses begin hiring again.

Assuming a slow but steady rebound, Esri's five-year forecast of the U.S. labor market shows improvement. Between 2010 and 2015, the economy will create an additional 8.3 million new jobs, bringing the total to 144 million workers. The pool of unemployed workers is projected to shrink to roughly 14 million people and the unemployment rate to drop 2 percentage points to 8.8 percent.

Challenges certainly loom ahead. During such a slow rebound, how will market participants respond to the possibility of higher tax rates in the future to finance the debt? The first test comes in January 2011, when former president George W. Bush's tax cuts on personal income, estates, dividends, and capital gains expire. Will consumer spending and business investment recede, triggering another downturn? If so, the five-year outlook will look different from what we currently predict.

Two-thirds of the national economy is driven by consumer spending. Consumer spending reflects the personal effects of the Great Recession. Just how much do these macro-level forces affect the individual household? The 2007 Survey of Consumer Finance estimates the impact: The average family has 61 percent of its assets in real estate and stocks. Since 66 percent of homes are owned, almost every American has experienced major losses in assets. According to the Consumer Confidence Index (CCI) from the Conference Board, consumer confidence hit a low rating of 25 in February 2009 and recovered to 62.7 in May 2010. A key economic indicator, the CCI measures consumers' optimism about the state of the economy, which translates into their patterns of saving and spending. Until the CCI reaches 90, a level of economic stability, households will watch their budgets closely. One thing is clear—this recession has changed us all.

Geography Changes in 2010

Change is inevitable with any geographic area—political or statistical. Identifying the changes in the areas for which data is tabulated and reported is critical to the analysis of trends. In the past year, there have been minor changes to metropolitan areas by OMB, boundary revisions for Designated Market Areas (DMAs) by Nielsen Media Research, and the usual adjustment of ZIP Codes by the U.S. Postal Service (USPS).

Metropolitan changes include the latest revisions to Core Based Statistical Areas (CBSAs), released in December 2009. Changes include two new micropolitan areas: Marble Falls, TX (CBSA Code 31920), and Weatherford, OK (CBSA Code 48220). There are also three name changes that include code revisions: North Port-Bradenton-Sarasota, FL Metropolitan Statistical Area (CBSA Code 35840, formerly 14600); Crestview-Fort Walton Beach-Destin, FL Metropolitan Statistical Area (CBSA Code 18880, formerly 23020); and Steubenville-Weirton, OH-WV Metropolitan Statistical Area (CBSA Code 44600, formerly 48260), plus 10 other name changes. There are 942 Core Based Statistical Areas, 366 metropolitan areas, and 576 micropolitan areas.

DMAs represent the 2009–2010 markets defined by Nielsen Media Research. Most DMAs correspond to whole counties, but there are a few exceptions where counties are split into different DMAs. Finally, ZIP Codes, which are defined solely to expedite mail delivery, are updated to reflect USPS's October 2009 inventory.

Esri presents the 2010/2015 demographic forecasts, including population, age by sex, race by Hispanic origin, age by sex by race and by Hispanic origin, households and families, housing by occupancy, tenure and home value, labor force and employment by industry and occupation, marital status, educational attainment, and income (including household and family income distributions, household income by age of householder, and per capita income).[13] Updates of household income are also extended to provide after-tax (disposable) income and a measure of household wealth: net worth. Changes in the update base from the Census Bureau's Count Question Resolution (CQR) revisions, updated boundaries, and improvements to forecasting techniques may obfuscate comparison to 2009 or earlier updates.

2010 Demographic Updates

Forecasts are prepared initially for counties and block groups (BGs). From the county database, forecasts are aggregated to CBSAs, states, or higher levels. From the block group database, forecasts can be retrieved for census tracts; places; county subdivisions; ZIP Codes; congressional districts (currently, the 111th Congress); DMAs; or any user-defined site, circle, or polygon.

Summary Totals

By County

The change in total population is a function of changes in household population and the population in group quarters, which are subject to different trends. The addition of a prison, for example, produces a sudden increase in the group quarters' population that is unlikely to yield an attendant change in the household population or the projected population growth of a county. A military base closing effects an immediate decrease in the household population with the reduction of not only military personnel but also their families and civilian personnel; however, this drop is unlikely to continue. To address local changes specifically in the military, Esri analyzed the 2005 Defense Base Realignment and Closure (BRAC) plan. The Department of Defense (DoD) has undergone four BRAC rounds since 1988 and is currently implementing its fifth round— the 2005 round. The recommendations became effective on November 9, 2005, and DoD has until September 15, 2011, to complete the implementation of all BRAC recommendations. To summarize, the plans include more than 800 closures or realignments, with the relocation of approximately 123,000 personnel.[14] The disparity of trends in household versus group quarters' population is best accommodated by separate projections. The group quarters' population is the Census 2000 count of group quarters, with CQR revisions and updates culled from a variety of federal, state, and local sources.

Forecasting change in the size and distribution of the household population begins at the county level with several sources of data. Esri begins with a time series from the U.S. Census Bureau that includes county estimates through 2008.[15] Because testing has

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[13] Forecasts represent the midyear population, on July 1, unless otherwise specified.

[14] Military Base Realignments and Closures: "DOD Faces Challenges in Implementing Recommendations on Time and Is Not Consistently Updating Savings Estimates," page 1, http://www.gao.gov/new.items/d09217.pdf.

[15] U.S. Bureau of the Census, Population Division, Table CO-EST2008-ALLDATA.

revealed improvement in accuracy by using a variety of different sources to track county population trends, Esri also employs a time series of county-to-county migration data from the Internal Revenue Service, building permits and housing starts, and residential postal delivery counts. Finally, local data sources that tested well against Census 2000 data are reviewed. The end result balances the measures of growth from a variety of different data series.

By Block Group   Measuring the change in population or households at the county level is facilitated by the array of data reported for counties. Unfortunately, there is no current data reported specifically for block groups. Past trends can be calculated from previous census counts but nothing that is current. To measure current population change by block group, Esri models the change in households from three primary sources—the InfoBase-X® database from Acxiom Corporation, residential delivery statistics from USPS, and residential construction data from Hanley Wood Market Intelligence—in addition to several ancillary sources.

USPS publishes monthly counts of residential deliveries for every U.S. postal carrier route. This represents the most comprehensive and current information available for small, subcounty geographic areas. USPS establishes carrier routes to enable efficient mail delivery. Carrier routes are a fluid geographic construct, redefined continuously to incorporate changes in the housing inventory and occupancy as well as administrative changes in staffing and budgets of local post offices. These frequent changes in the carrier routes are not the only difficulty.

Converting delivery statistics from postal carrier routes to census block groups is a complex challenge. Carrier routes are defined to deliver the mail, while block groups are constructed to collect and report census data. Comparing two different areas that are defined for wholly different purposes provides a significant conversion issue. Carrier routes commonly overlap multiple block groups. In many cases, a carrier route encompasses disjointed areas that can be distant from each other, but block groups are rarely divided into multiple polygons. These overlaps require an effective method of allocating the postal delivery counts across multiple block groups.

One way to distribute delivery statistics among component block groups is to create a correspondence using boundary files. Changes in postal carrier routes can be tracked through quarterly updates of carrier route boundaries, and then delivery statistics can be assigned to block groups with Census 2000 block data. Another way also employs boundary files but assumes a uniform distribution of households within the area. Using standard geodemographic tools, it is possible to estimate the change in households from carrier route delivery statistics and apply that change to any block group(s) in the area. But the estimated change is simply being redistributed from one summary area to another.

Esri has developed another way to link a carrier route to the correct block group(s)— using the actual locations of mail deliveries. Its proprietary Address Based Allocation (ABA) was developed in 2005 to solve the complex challenge of converting delivery counts from carrier routes to block groups.[16] This allocation method uses the addresses from Acxiom's InfoBase-X household database. Addresses in the database are geocoded

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[16] Patent pending.

with carrier route and block group codes using an enhanced geocoding technique and locator database, and they serve as the foundation for the conversion. This approach is unbounded by geographic borders or arbitrary assumptions about the distribution of households or postal deliveries.

ABA results have been tested extensively. The tests include benchmarking against Census 2000. Manual reviews confirm the capability of the method to identify areas with high growth. The ABA allocation method reveals sprawls and new developments across the country since Census 2000. Assessments based on other data sources verify the efficacy and precision of ABA. For the small portion of block groups where addresses are not available from the InfoBase-X database, delivery statistics are allocated from a correspondence file. The correspondence between census block groups and postal carrier routes is developed using quarterly updated data from Tele Atlas®.

The effectiveness of ABA relies on the precision of block group assignment to InfoBase-X addresses. Esri improved the geocoding accuracy of the InfoBase-X file by applying ArcGIS® 9.3.1 with the Dynamap®/Address Points database from Tele Atlas, which provides coordinates that are accurate to the building. It offers a new development in large-scale geographic databases, where addresses are represented as points rather than approximations estimated from address ranges or street segments. The database currently covers the most densely populated areas in the United States with continuously increasing geographic coverage. Addresses that fall outside the coverage were geocoded with the conventional approach based on street address ranges.

Post office delivery or address counts provide less coverage in rural areas. Sparsely populated areas tend to have post office box ZIP Codes because there are few rural addressing systems and little comparability to urban street delivery. The same problems characterize rural addresses in the InfoBase-X database. To track new housing developments, especially in previously unpopulated areas, Esri licensed a new data source in 2006 from Hanley Wood Market Intelligence—new and planned residential construction in the top 75 U.S. housing markets, including new markets added through 2009.

The new residential construction database from Hanley Wood Market Intelligence adds a unique component to Esri's strategy for producing accurate demographic forecasts. This database identifies individual construction projects—for instance, a complex of single-family homes or townhomes or a condominium building with its exact location by latitude and longitude. It also pinpoints conversions of apartments into condominiums. The construction information includes the following:

■ Total number of units planned
■ Inventory of units under construction, sold, and/or closed
■ Type of housing—detached homes, townhomes, condominiums, etc.
■ Target markets—families, seniors, empty nesters, etc.

The use of this type of information in demographic forecasts has traditionally been confined to small-scale implementation, such as producing forecasts for a specific county. Esri partners with Hanley Wood Market Intelligence to introduce this information in a large-scale forecasting effort. The new construction database complements and corroborates the postal delivery statistics. More importantly, it tabulates planned

construction to be completed in upcoming years. This information is incorporated in Esri's five-year forecasts. Tracking residential development since 2000 with enhanced demographic and spatial analysis tools provides better information for the five-year forecasts than past trends.

A revised housing unit methodology applies the change in households estimated from address counts, delivery counts, and new housing construction to update household population by block group. The best techniques are derived from a combination of models and data sources. Discrepant trends are checked extensively against independent sources. Finally, totals for block groups are controlled to the county totals. Despite the appeal of microforecasting, there is simply more information available to track population change by county than by household. Ignoring the advantage of county-level data is throwing away information.

By Block   The integration of demographic and spatial analysis has not only enabled the development of more accurate block group totals but also provided the opportunity to assess block totals. Blocks have attracted virtually no interest among data users. As the lowest common denominator in the geographic hierarchy that progresses to block groups, tracts, counties, and states, blocks are too small for the tabulation of most census variables. Only complete-count totals are reported for blocks from the decennial census.

However, blocks are useful in the estimation of data for polygons, which can be any area outside the geographic hierarchy, from places to ZIP Codes to user-defined polygons (including circles and drive-time polygons). All these areas do attract the interest of data users. The most common technique overlays blocks within the polygon and apportions data from the ratio of the aggregated blocks to the component block groups. To date, this technique has applied the relationship between the blocks and the block groups from the most recent census. For most areas, the application provides a good estimate for the polygon. If the relationship between the blocks and the block group has changed significantly since 2000, then the estimate cannot incorporate that change unless both blocks and block groups are updated.

Esri has developed a current database of the block weights used to retrieve information for polygons by extending the application of its Address Based Allocation technique to the block level and incorporating later data for blocks, including any revision of Census 2000 counts and any special census counts. Updating the relationship between blocks and block groups for areas that are experiencing change is critical to capturing current trends in polygons. Enhanced site analysis does preclude comparisons to previous updates.

New in 2010   Since the last census, Esri has introduced a number of new data sources and developed new models to inject each new source into its updates. The problem with interjecting new databases is verification. Without current census counts to provide a yardstick, it can be difficult to identify, let alone measure, any problems unique to the data source. Address lists, for example, are comprehensive—possibly *too* comprehensive. They can include nonresidential listings, group quarters like nursing homes, duplicates, and incomplete or post office box addresses. Even census counts require review and correction. It is incumbent on the data provider to reconcile the differences among the many data sources that enable current information. The basic question is how to evaluate disparate sources like delivery statistics from USPS, national household databases, national business

databases, housing development databases, changes in street networks, and parcel databases without taking a census.

Advances in navigational databases and street images, combined with the ready availability of satellite imagery, can help—if the analyst can find a way to integrate the disparate data sources and automate the validity check. Esri has applied its own technology and geographic information system (GIS) tools to do just that—enable a ground truth check of its current demographic data. Over the past decade, Esri's data development team has employed Esri® technology and a variety of databases to verify new sources and check any anomalies found in a source, such as a sudden drop or increase in a time series. Ground truth, or a visual image of a site, can quickly dispel any questions on local housing development. The internal tools that have been developed over the years help Esri staff quickly find an area of interest, such as a block or block group, and overlay the geographic components (boundaries, centroids, and attribute data) on various imagery.

This year, the tools have been updated and enhanced to enable ground truth checks on the most volatile areas prior to developing the 2010 updates. A proprietary data collection interface was developed within Esri Business Analyst™. Temporary staff was hired in the fall of 2009 to use the software in a review of select small areas to confirm which sources most accurately reflect ground truth. Esri's data analysts worked with geographers to define the project to test the data.

By combining multiple authoritative sources of information on a map, the team was able to identify areas of agreement quickly among those sources. Given the purpose of assessing demographic data sources, even disagreement among the sources was useful information to have. Most importantly, the project served its purpose by providing a ground truth confirmation of the data to improve the accuracy of Esri's 2010/2015 forecasts.

By Quarter Esri also supplies quarterly updates of population and households. Totals are provided for eight quarters: January, April, July, and October for the current year (2010) and the preceding year (2009). Quarterly updates for July 1 (Q3) of each year are Esri's annual update totals. Data for intervening quarters represents an application of ABA to postal delivery statistics for each point in time. Since the annual updates incorporate not only a time series analysis of postal delivery counts but also several annual data series, the change that is shown by quarter is not a seamless trend line. Quarterly updates are designed to show periodic fluctuations in the data, especially in areas that are subject to seasonal population shifts, rather than the smooth trend lines commonly provided by interpolation.

Population and Household Characteristics Esri's population and household characteristics include the population by age and sex, race and Hispanic origin, age by sex by race and Hispanic origin, marital status, educational attainment, and household type. Population by age and sex include estimates by five-year age groups and by single years from less than 1 year to 84 years.

The population by age and sex is projected via a cohort survival model that calculates the components of population change separately by age and sex. Applying survival rates specific to the cohort carries the 2000 population forward. Changes in the population by age and sex diverge at the household level. For example, an area that is losing population

can age more rapidly with the loss of population in prime migrant ages, 20–34 years, unless there is a college nearby. An influx of college students can offset the loss of youthful outmigrants.

To capture these variations, Esri's model first separates the group quarters' population from the household population and then keys the calculations to the size and characteristics of the population. This stratification identifies several different patterns of change by age and sex that are applied in the cohort survival model. Births are projected from area-specific, child-woman ratios. Migration is computed as a residual, the difference between the survived household population and independent projections of the total household population.

The changing profile of the U.S. population requires measuring the growth of population by race and Hispanic origin. The American identity is shaped by a multitude of races and ethnicities. Tracking the changing patterns of race and ethnicity provide a current portrait of our society. Historical trends in race and ethnicity play an important role in the analysis and forecasting process. Tracking intercensal population change by race was encumbered by the new reporting method in Census 2000. Race was reported as a multiple-choice item—not "one person, one race," as reported in past censuses or estimates. The Census 2000 data is not directly comparable to 1990 Census data or to any earlier estimates or projections.

Comparisons made between single-race reporters in 2000 and 1990 underestimate the change by race. Excluding the rapid growth of the multiracial population minimizes the change by race from 1990 to 2000. Alternatively, combining single-race reporters with races reported in any combination can cut down the 63 racial groups reported in Census 2000. For example, a person who reports "White and Asian" is counted as both "White" and "Asian." This combination of single-race and multiracial reporters overcounts multiracial reporters and overestimates the change by race from 1990 to 2000. To achieve a true picture of population change by race, it is imperative to account for the change in multiracial reporting.

Esri takes an innovative approach in analyzing this data to make effective use of the additional information from Census 2000.[17] The Census Bureau released most race-related data for six single-race groups and one multiple-race group. Esri's data preserves this format and enables a comparison of 1990 and 2000 data for six single races and one multiracial group. Assuming that the probability of reporting more than one race varies by race group and geographic area as shown in Census 2000, Esri estimates the number of likely multiple race reporters from 1990 Census data. The same approach is adopted for the population of Hispanic origin by race.

The most current data sources for race and Hispanic origin are 2008 data available by county and state from the Census Bureau's estimates. Survey data is analyzed in conjunction with Esri's estimate of change from 1990 to 2000 by race and Hispanic origin to establish county population by race and Hispanic origin. Forecasts by block group combine local changes in the distributions by race and projected change for counties. The last step controls block group distributions to county totals by race and Hispanic origin.

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[17] A more detailed discussion of Esri's 1990–2000 race analysis is available from Sangita Vashi's paper, *Trends in the U.S. Multiracial Population 1990–2000*, presented at the 2001 Southern Demographic Association's Annual Meeting.

Over the past decade, the nation has become much more diverse, due in large part to the growth of the Hispanic origin population. Hispanic population growth accounted for nearly half of the entire U.S. population growth over the decade. In just 10 years, the Hispanic population has grown by over 15 million, reaching 50.5 million in 2010. This growth represents a 43 percent increase from Census 2000 counts. Persons of Hispanic origin now make up 16.2 percent of the national population, up from 12.5 percent in 2000. The Asian and Pacific Islander population grew by nearly 37 percent over the decade, adding almost 4 million people. In contrast, the non-Hispanic white population has grown by only 2.6 percent, or 5 million, from 2000, dropping from 69.1 percent of the total population in 2000 to 64.2 percent in 2010.

While some growth in the Hispanic population is attributable to immigration, much of the recent growth is due to natural increase. Fertility rates remain high for the Hispanic origin population but continue to decline for the non-Hispanic white population. Of the children four years and younger in 2010, over 25 percent are of Hispanic origin.

The changing face of our nation is evident in Esri's Diversity Index, which summarizes racial and ethnic diversity in an area. This measure shows the likelihood that two persons, chosen at random from the same area, belong to different races or ethnic groups. The index ranges from 0 (no diversity) to 100 (complete diversity). The Diversity Index has risen from 54.6 in 2000 to 61 in 2010. Today, there is a more than 60 percent chance that two people chosen at random nationally would belong to different races or ethnic origin groups. All states became more diverse over the decade, although the Diversity Index varies widely by state, from 10.5 in Maine to 83 in California.

Southern and western states have seen the largest increases in total population over the decade as well as the largest increases in the share of Hispanic population. The Hispanic origin population in the southern states has increased from 11.6 percent to 15.7 percent—an increase of more than 6.4 million from 2000. The Hispanic share of the Western population has increased from 24.3 percent to 28.8 percent. The Northeast has seen the largest decline in non-Hispanic white population, a loss of nearly 1.2 million from 2000 levels. This regional shift is the result of decline or stagnant growth in the non-Hispanic white populations of New York, New Jersey, Maryland, Rhode Island, Pennsylvania, and Connecticut over the decade.

The most populous state, California, has also experienced a loss of non-Hispanic white population from 2000 to 2010. This loss is primarily due to the diversification of the state's population over the decade. California's share of Asian and Hispanic origin populations has increased by 1.8 percent and 5.2 percent, respectively, from 2000 to 2010. Some of the least diverse states in 2000 have had the largest gains in diversity. In particular, the Northeast states of Maine, Vermont, and New Hampshire all experienced considerable growth in diversity from 2000 to 2010.

The composition of the American household continues the slow change from married-couple families to nontraditional families and single-person households throughout most of the past decade. Between 1990 and 2000, the dominant share of households remained married-couple families in most states, but decreased from 55 percent of all households to 52 percent in 2000. Increased shares of single-parent and single-person units compose the difference. The attendant change in average household size is the decline from 2.63 in

1990 to 2.59 in 2000. Until recently, these changes continued, albeit more gradually than in the 1990s.

The gradual change in household size has made it uniquely suitable to forecasting the change in household population from the change in households. Average household size is traditionally one of the most stable and predictable components of the forecasts. Household forecasts are predicated upon local patterns of change, which are controlled to the more constant trends for states and counties. Nationally, household change stabilized in the 1990s and remains at 2.59 in 2010.

The stability implied by a 2010 value that is virtually unchanged since 2000 masks the more recent effects of the recession on households. Local change is more revealing, since it is susceptible to local trends and affected more by the unique composition of the local population. By county, the 1990–2000 change varied from a low of -2.1 percent to a high of 1.3 percent, compared to a range of -1.9 percent to 0.6 percent for 2000–2010. The magnitude of the change from 2000 to 2010 is more moderate, but the scope of the change has increased. Only 319 counties had an increase in the population per household from 1990 to 2000. From 2000 to 2010, 384 counties experienced an increase. From 2009 to 2010, almost 2,000 counties had more crowded households. An increase in household size can result from higher rates of fertility, an increase in multigenerational households, or economic necessity. The recession has yielded foreclosure filings on 6 million properties and a loss of 5.6 million jobs. Existing households are doubling up. The rate of household formation for recent graduates has declined.

Few block groups represent a cross section of U.S. households. In areas that gained population from immigration in the 1990s, the trend in average household size actually reversed and increased. To distinguish local variation, Esri's model is keyed to the characteristics of households at the block group level. This stratification identifies several different patterns of change by household type that are applied to forecast trends in the characteristics of households—both family composition and tenure. Local change is emphasized in the 2010/2015 forecasts of households and families for counties and block groups. National and state trends are monitored, with sources such as the Current Population Survey and American Community Survey from the Census Bureau, and then applied as controls.

In 2008, Esri added two new characteristics, marital status and educational attainment. Data from the 2000–2008 American Community Survey and 2000–2009 Current Population Survey is evaluated against long-term trends in census data for Esri's estimates of marital status and educational attainment. Intercensal trends identify the progress of important social factors, such as the labor force participation among women, later age at first marriage, and delayed childbearing, that affect patterns of marital status and educational attainment. Generational changes in the U.S. population from the baby boomers to their children, Generation Y, are key factors in Esri's analysis of change. Once regional profiles for marital status and education are established, local area estimates link expected regional change to local changes in the distributions.

The Great Recession has played a significant role in educational choices. Although the national share of high school and college graduates has been increasing for decades, the current economic climate has strengthened the appeal of gaining a degree. In 2009, a record 70.1 percent of all high school graduates were enrolled in colleges or

universities.[18] The share of the population with bachelor's degrees rose from 15.5 percent in 2000 to 17.7 percent in 2010. Although enrollments are up, it is important to note that dropout rates are up, too.[19] The population with some college education has dropped by around 1 percent over the decade but is expected to rise, as record numbers of students are entering college without finishing.

The surge in college enrollment is being fueled by an increase in two-year/community college enrollments.[20] It has been shown that community college enrollments and the health of the economy are closely linked.[21] This is largely due to the relative financial cost of two-year community colleges compared to traditional four-year schools. The opportunity cost of being in college is also a factor in increasing enrollments. When jobs with decent wages and benefits are scarce, students are missing fewer opportunities by spending their time working toward a degree. The population with an associate's degree increased from 6.3 percent in 2000 to 7.7 percent in 2010.

The recession has also affected marital status.* Contrary to popular opinion, recessions do not cause an increase in divorces. History has shown that in times of economic hardship, divorce rates actually decline.[22] Divorce rates dropped from 3.7 (per 1,000) in 2006 to 3.5 in 2008.[23] Getting divorced is an expensive endeavor. When the economy struggles and unemployment increases, couples looking to separate are often forced to delay divorce and continue living under the same roof for purely economic reasons.

Marriage often acts as an economic safety net in times of job loss, health crisis, or home foreclosure. Although the frequency of divorce has been in decline over the decade, especially in the past few years, the number of divorced persons has increased steadily from 9.7 percent in 2000 to 10.6 percent in 2010.

Similar to divorce rates, marriage rates are also known to follow the economy down in a recession. Marriage rates were 7.3 in 2006 and dropped to 7.1 in 2008 (CDC, 2009). Marriage, like divorce, can be an expensive practice, with average wedding costs exceeding $20,000.[24] For couples that would like to marry but do not have the financial means to do so, delaying marriage is more popular than ever.

Marital status for the population 15 years and older is updated for four categories: never married, married (including the separated population), divorced, and widowed. Seven

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* All marriage figures for 2006 exclude data for Louisiana. Divorce figures exclude data for California, Georgia, Hawaii, Indiana, Louisiana, and Minnesota.

[18] Bureau of Labor Statistics. "College Enrollment and Work Activity of 2009 High School Graduates," news release, April 27, 2010. Retrieved June 1, 2010 (http://www.bls.gov/news.release/archives/hsgec_04272010.pdf).

[19] Leonhardt, David. "Colleges Are Failing in Graduation Rates," *New York Times,* September 8, 2009. Retrieved June 1, 2010 (http://www.nytimes.com/2009/09/09/business/economy/09leonhardt.html).

[20] Fry, Richard. "College Enrollment Hits All-Time High, Fueled by Community College Surge," Pew Research Center, 2009. Retrieved June 1, 2010 (http://pewsocialtrends.org/assets/pdf/college-enrollment.pdf).

[21] Betts, Julian R., and Laurel McFarland. "Safe Port in a Storm: The Impact of Labor Market Conditions on Community College Enrollments," *Journal of Human Resources,* vol. 30, no. 4, 1995.

[22] Wilcox, Bradford W., and Elizabeth Marquardt. "The State of Our Unions, Marriage in America 2009: Marriage and Money." The National Marriage Project & the Center for Marriage & Families at the Institute for American Values, 2009. Retrieved June 4, 2010 (http://www.stateofourunions.org/2009/SOOU2009.pdf).

[23] Centers for Disease Control (CDC). "National Vital Statistics Reports," vol. 57, no. 19, July 29, 2009. Retrieved June 4, 2010 (http://www.cdc.gov/nchs/data/nvsr/nvsr57/nvsr57_19.pdf).

[24] Overfelt, Maggie. "Love in the Time of Recession." *CNN.Money,* February 13, 2009. Retrieved June 7, 2010 (http://money.cnn.com/2009/02/13/smallbusiness/wedding_jitters/index.htm).

categories of educational attainment are updated for the population 25 years and older. Educational attainment levels are categorized as less than a ninth-grade level of education, some high school, high school graduate (including GED equivalent), some college, associate degree, bachelor's degree, and graduate/professional degree.

Housing   Esri's housing updates include total housing units, occupancy, tenure, and home value. In 2010, the market remains scarred from the meltdown and the subsequent recession. Almost one-third of counties did show an appreciation in home value in the past year, but home prices continue to decline in most areas. The good news is that depreciation is slowing. Nationally, median home value has declined from $162,280 in 2009 to $157,910 in 2010, a loss of 2.7 percent—down, but improved over the loss of 11.3 percent the previous year. The last widespread decline in home prices occurred in the United States in the early 1990s. That recovery started around the mid-1990s, with homeownership surging at the same time.

In 2010, the U.S. homeownership rate fell to 65.8 percent, below 2000 rates. The rate hovered around 64 percent throughout the first half of the 1990s. From the mid-1990s, the rate climbed rapidly until 2004, then leveled off for the next few years before declining. The housing market crisis began the recent decline in homeownership rates; the recession and unemployment have extended the trend. Given the sluggish pace of recovery and the tight credit market, the rate of homeownership is unlikely to improve soon.

Current data on change in the housing inventory encumbers the application of past trends. From 1990 to 2000, the housing stock increased by less than 1.4 million annually. From 2000 to 2008, the annual increase was more than 1.7 million units; however, the collapse of the housing market has slowed construction. From 2009 to 2010, the housing inventory did increase in 85 percent of counties, but vacant housing units also increased in 85 percent of counties.

Total housing unit updates are created from recorded changes in the housing inventory and estimated changes in occupancy rates since April 2000, applied to Census 2000 base data. Recorded change in the housing inventory is culled from several data sources, including construction data from Hanley Wood Market Intelligence, building permits for permit-issuing places and counties, and data for new manufactured homes placed by state from the Census Bureau. Dozens of independent sources were consulted to retrieve detailed information on housing development data where no building permits existed. Fewer than half of the counties have complete coverage with building permits. Independent estimates of change in occupancy were calculated from USPS residential lists, vacancy durations from the Department of Housing and Urban Development, and data from the Current Population Survey and the Housing Vacancy Survey from the Census Bureau.

The data for tenure represents owner- and renter-occupied housing units. Together, the two components equal total households, or total occupied housing units. A time series model based on data from the Housing Vacancy Survey, combined with changes in the Current Population Survey and the latest census data, guide tenure forecasts. With a blend of top-down and bottom-up techniques, the forecasts take advantage of the latest information from survey data at higher levels of geography while employing local characteristics at the lower levels. The data from the lower levels of geography is

controlled to the higher levels to produce the tenure updates. Changes in owner versus renter occupancy are forecast independently and then controlled to total households.

Esri tracks the change in home value using the House Price Index (HPI) from the Federal Housing Finance Agency (FHFA). The HPI is designed to monitor changes in average home prices based on repeat sales or refinancing of the same properties. The index is derived from mortgage loans purchased or securitized by Fannie Mae or Freddie Mac. FHFA affirms the "significant advantages" of the HPI over Commerce Department surveys or other data collections based on snapshots of sales figures. Employing the repeat-sales methodology renders the index less susceptible to compositional effects, especially with data for smaller geographic areas. If a higher proportion of lower-end homes are sold in the current period than in an earlier period, the survey data will give the misleading impression over time that home prices have fallen.

The FHFA index series is released quarterly for states, metropolitan areas (with county or county group data for larger metropolitan areas), and nonmetropolitan areas within states. In 2008, Esri began to incorporate trends in the purchase-only House Price Index series for states and the United States from FHFA. Traditionally, FHFA has combined loan data from purchases and refinancing to compute the index. For refinanced loans, the appraised value of a home is used in lieu of the sales value to estimate the change in home prices. Esri has applied time series analysis to extrapolate both short-term (2010) and long-range (2015) trends in home value from states and metropolitan areas to block groups. The 2008 update introduced sophisticated new techniques to capture the local relationship between the House Price Index and home value of all owner-occupied units, and the 2010 update continues to use these techniques. Local estimates of home value incorporate supply-demand characteristics, the socioeconomic traits of householders in the area, and HPI trends assessed for larger markets.

Given the rise in unemployment and loss of income, it is clear that foreclosures remain a problem, but some of the real estate activity in the past year is attributed to short sales or distressed properties. Zillow.com estimates that one-fifth of U.S. home sales in December 2009 were bank sales of foreclosed properties. These homes are selling at bargain prices and depressing the demand for nonforeclosed homes on the market. Median home value actually increased by 3.4 percent annually from 2000 to 2010, however. Esri projects that home prices will grow at a rate of 3.3 percent a year between 2010 and 2015.

Labor Force Esri forecasts the civilian labor force and employed population by industry and occupation for 2010 and 2015.[25] While the recession appears to have abated, the job market is still trying to gain traction. At midyear 2009, Esri forecast a job loss of 5.5 million from the year prior, contracting the U.S. workforce to 136.6 million people. One year later, the labor market continues to suffer losses but at a much slower rate. By July 2010, another 588,000 workers have been removed from payrolls, lowering the total workforce to 136.0 million. The total number of unemployed persons continues to grow,

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[25] It is important to remind data users that Esri's civilian labor force estimates represent seasonally *un*adjusted totals as of July 1 to stay consistent with Census 2000, which is used as the forecast base. While press releases of labor force statistics produced by the Bureau of Labor Statistics report seasonally adjusted change each month, removing such calendar influences, Esri's totals reflect actual estimated levels. As a result, Esri estimates and measures of change can yield differences when compared to these official government statistics. For more information on estimation differences, refer to the *Dissimilarities in Sources of Labor Force Information* section below.

J-9936

reaching 16.5 million—representing an increase of 352,000 over last year. As a result, the rate of unemployment has increased two-tenths of a percentage point to 10.8 percent. Eventually, more and more discouraged workers that took a hiatus from the labor force will resume their search for gainful employment as the economy improves. There should be no expectation that the unemployment rate will drop in the short run.

While not expanding as fast as last year, employment in the education and health care industries is still growing, at a rate of 1.5 percent. Employment in the administrative and support and waste management services industry marked the best improvement by industry. Coming from a 13 percent contraction in employment last year, with a loss of over 700,000 positions, the industry has made up some of the loss with nearly 281,000 new hires, representing a 6 percent annual increase. The accommodation and food services industry regained nearly 41,000 positions as consumers spent more of their discretionary income on lodging and food away from home.

On the downside, the construction industry is still reeling from the slowdown in residential and nonresidential building and is responding by shrinking its payrolls by another 526,000 jobs this year. The transportation and warehousing industry, as well as the finance and insurance industry, is suffering the same fate, with declines of 156,000 and 147,000 workers, respectively.

Data Sources Estimates of the civilian labor force integrate recent change in the supply and demand for labor from the Local Area Unemployment Statistics (LAUS), Employment Projections (EP), Occupational Employment Statistics (OES), and Current Employment Statistics (CES) programs of the Bureau of Labor Statistics (BLS), as well as the American Community Survey (ACS) and Current Population Survey (CPS) from the U.S. Census Bureau. Federal statistical surveys are the principal sources for labor force trends. Furthermore, the LAUS program is the premier resource for current and local economic conditions utilized by state and local governments, media outlets, the private sector, and academic researchers.

Methods Employment and unemployment forecasts are developed from the Census 2000 base.[26] Trends are adapted from an LAUS monthly time series, projected to July 2010. LAUS state estimates are based on the concepts and definitions from the program's main input source, the monthly CPS, as well as the CES program from the BLS, and state unemployment insurance systems. Additionally, LAUS substate models incorporate data from the decennial census. Change between Census 2000 and Esri's civilian labor force trends are tied to historical and seasonal patterns in the LAUS state and county monthly time series (not seasonally adjusted).

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[26] In July 2002, the Census Bureau reported a processing error affecting its 2000 labor force estimates for areas surrounding college towns. The error apparently overstated the number of unemployed persons and the unemployment rate while underestimating the employed population and persons classified as not in the labor force. Further research by the Census Bureau uncovered a response pattern to the employment questions that extends beyond the population living in college towns. The Census Bureau estimates that employment responses for roughly 15 percent (or 500,000 people) of the working-age, civilian, noninstitutional GQ population were affected. Furthermore, it surmises that the positive bias in the number of unemployed appeared to artificially increase the 2000 U.S. unemployment rate of 5.8 percent by 0.4 percentage points. Esri addressed the apparent bias at the block group level and realigned the affected Census 2000 labor force estimates before any forecasts were calculated. For more information, refer to Appendix 3 in *U.S. Census Bureau, Housing and Household Economic Statistics Division*. "Comparing Employment, Income, and Poverty: Census 2000 and the Current Population Survey." September 2003. http://www.census.gov/hhes/www/laborfor/final2_b8_nov6.pdf.

Esri's industry and occupation updates capture temporal change from the aforementioned federal statistical sources: the ACS and CPS from the Census Bureau and the CES, OES, and EP programs from the BLS. Esri's national and state industry distributions are updated using trends from the CES. Because the CES measures nonfarm employment trends, the CPS and ACS are used to update agricultural employment. Esri uses the latest industry-occupation matrix from the OES to allocate 2009–2010 employment change by industry to the related occupations. The updated national and state employment targets by industry and occupation are then used to model substate areas.

Concepts The civilian labor force includes members of the population aged 16 years and older who are classified as either employed or unemployed and excludes active duty armed forces personnel. The *employed* population includes the following persons who were:

■ Working during the reference week as paid employees, self-employed, working on a farm, or working as unpaid workers for 15 hours or more on a family farm or business, or

■ Temporarily absent from their job due to vacation, illness, bad weather, labor disputes, or other personal reasons, excluding layoffs

Total employment excludes volunteer workers and caretakers of home or family. The *unemployed* population includes the following persons who were:

■ Neither at work nor temporarily absent from a job
■ Seeking employment during the previous four weeks
■ Available to accept employment, or
■ Waiting to return from a layoff

Dissimilarities in Sources of Labor Force Information It is important for data users to recognize differences that exist across surveys of labor markets. To illustrate: the U.S. unemployment rate reported in the 2000 decennial census was 5.8 percent, while the CPS estimate for the same time period was 3.7 percent (seasonally unadjusted). This gap stems from differences in survey methodology. Census 2000 labor force data comprises sample estimates produced from responses reported in the long-form questionnaire mailed to roughly 17 percent of all households. The CPS produces more timely monthly data, but from a much smaller sample size. Definitions of employment status are similar, but methods of data collection are not. The decennial census is self-reported, while the CPS employs experienced interviewers to ask more probing questions to minimize survey nonresponse or data misclassification. Due to the differences between the decennial census and the CPS, Esri focuses on rates of change to capture current trends and seasonal patterns to produce accurate civilian labor force forecasts.

Income Esri's analysis of historical income data, dating back to 1969, suggests that incomes do decline during a recession, but the full impact is not always felt in the first year after the recession begins. Income declines in subsequent years are often greater than in the first year of a recession. In any given year that the country is in a recession, regardless of the exact timing of the official start or end of it, CPS data shows that real income declines by 1.1 percent, on average. Although economists estimate that the Great Recession likely ended during the third or fourth quarter of 2009, Esri's 2010 income estimates capture the

2009 calendar year income and assume that 2009 was the second full year the nation was in a recession.

Taking inflation into consideration, Esri estimates median household income as of July 2010 to be $54,442. This represents a decline of 0.5 percent over the last year. In nominal terms, the past year represents the worst year-on-year decline since 1969. In comparison, median household income in the previous year was stagnant, showing only a slight decline of $30.

Data Sources   Esri's projection base is the income that was reported in Census 2000. Technically, 2000 income data represents income from 1999, because the Census Bureau tabulated income received in the "last year" before the decennial census. Similarly, Esri's 2010 income updates represent income received in 2009, expressed in 2009 dollars. Projections for 2015 are shown in 2014 dollars, assuming a forecast rate of inflation of 2.1 percent.

Esri uses the definition of money income used by the Census Bureau, which enables the direct comparison of income updates and decennial census data. For each person aged 15 years or older, money income received in the preceding calendar year is tallied from each of the following sources: earnings, unemployment compensation, Social Security, Supplemental Security Income, public assistance, veterans' payments, survivor benefits, disability benefits, pension or retirement income, interest, dividends, rent, royalties, estates and trusts, educational assistance, alimony, child support, financial assistance from outside the household, and other income.

Data for consumer income collected by the Census Bureau covers money income received (exclusive of certain money receipts such as capital gains) before payments for personal income taxes, Social Security, union dues, Medicare deductions, and so forth. Therefore, money income does not reflect the fact that some families receive part of their income in the form of noncash benefits, such as food stamps, health benefits, rent-free housing, or goods produced and consumed on a farm. In addition, money income does not include noncash benefits, such as the use of business transportation and facilities and full or partial payments by business for retirement, medical coverage, or educational expenses.

Income Methods   To estimate income for all households as well as family households, Esri evaluated several federal data sources, including the Current Population Survey and American Community Survey from the Census Bureau, the personal and per capita income data, and the Census of Employment and Wages from the Bureau of Labor Statistics. After Census 2000, Esri conducted a detailed evaluation of data sources employed in past income forecasts and more recent data from the Supplementary and American Community Surveys. Data for 2000 from each source varied from the income that was reported in Census 2000. It was concluded that one point in time is just not a good measure of a data series. For any given year, any estimate of income is likely to vary from the true population value. However, the sources that Esri employed throughout the 1990s proved to be effective measures of change in income. Testing revealed the power of time series data in tracking income. Esri's postcensal updates emphasize the use of time series data from household surveys to establish a base trend line. Annual updates evaluate current trends in wage inflation and other economic shocks that impact income growth. For the 2010 and 2015 forecasts, a continued evaluation of recessionary income trends that focused on recession duration, as well as recovery periods, was necessary.

After forecasting the state income distributions, household income is estimated for counties and then block groups. Esri's income forecasts are uniquely designed to distinguish local variation, changes in income inequality, and urbanicity as differentiators of income growth. The model correlates the characteristics of households at the block group level with changes in income. This stratification identifies several different patterns of change by household type that are applied to forecast trends in income. The annual change in income is derived from national surveys. Modeling links the current income change to all households with similar socioeconomic characteristics. Separate forecasts of the change in income by strata are aggregated to compose the income distributions.

Once the base 2000 income tabulations are updated, the distributions are extended to provide additional data for the wealthiest households. The Pareto function is employed to extend the upper interval of the income distributions from $200,000 or more to include the intervals $200,000–$249,999, $250,000–$499,999, and $500,000 or more. Finally, the models are calibrated to distinguish the change in average household income, for example, from the change in median income.

Average and median income for 2010 and 2015 are calculated in the same manner that the Census 2000 average and median income are computed. Medians are calculated from the distributions using linear or Pareto interpolation; averages are computed using aggregate household income.[27] Differences arise from the distributions. The 2000 income intervals available to the Census Bureau are different than the intervals reported to the public. Esri's 2010/2015 income base is also different from the Census 2000 reported tables. Medians and averages for 2010 and 2015 represent the extended income distributions to $500,000 or more. It is the extended income distributions that provide the base for updating aggregate income. Using the midpoints of income intervals in the extended distribution, aggregate household income is calculated to be consistent with the distribution of household income and the aggregate incomes that are estimated for the extended distributions of income by age of householder.

Household income reported by age of householder is updated to be consistent with 2010/2015 distributions of household income and age of householder. To update the age distribution of householders, the ratio of householders by age to the population by age in 2000 is updated to 2010, applied to the current age distributions, and adjusted. Once the age of householder targets are set, the 2000 distributions of household income by age of householder by block group are fitted to current distributions of households by income and by age of householder. A similar procedure is followed to update 2010 distributions to 2015.

Disposable Income   Disposable income represents an estimate of a household's purchasing power, or, simply, after-tax income. The proportion of household income left after taxes is estimated from special studies conducted by the Census Bureau to simulate household taxes. With the release of the 2004 Annual Social and Economic (ASEC) Supplement to the Current Population Survey, a new tax model was implemented. The new model performs a statistical match of tax variables not collected in the ASEC Supplement with the 2000 Statistics of Income (SOI) file from the Internal Revenue Service. Post-2005 ASEC

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[27] For further information on calculations used with Census 2000 data, please see Census 2000 Summary File 3 Technical Documentation prepared by the U.S. Bureau of the Census, 2002.

Supplement tax data implements the 2001 SOI file.[28] The tax model in the ASEC Supplement is updated continually to reflect changes in tax code. Additional improvements have focused on improving the match of CPS records with the SOI file. These changes impact the time series of tax variables available and are reflected in this release of disposable income. Esri's 2010 disposable income incorporates data from the 2009 ASEC Supplement. Four types of taxes are deducted: federal individual income taxes, state individual income taxes, FICA (Social Security) and federal retirement payroll taxes, and property taxes for owner-occupied housing.

Sophisticated modeling techniques are employed to improve the handling of top-coded earnings and tax data from the CPS. Internal Revenue Service tax rates are used as guidelines for model testing. Esri then applies the proportions of after-tax earnings to income intervals that are cross-tabulated by age of householder for each state. State-specific proportions account for the variation in taxes by state. The proportions, or multipliers, are then applied to the age by income forecasts for block groups and counties to calculate disposable income.

Net Worth Current income is only one component of a household's financial security. Householders' net worth or accumulated wealth reflects their ability to stay afloat during a financial shock as well as their preparedness for future retirement. In recent years, two major economic factors have impacted household net worth. First, the U.S. housing market, overwhelmed with foreclosures, has seen record declines in home value since 2007. Second, stocks, bonds, and retirement accounts have declined dramatically in value as a result of the major downturn experienced by Wall Street beginning in September 2008. The two largest components of household net worth, equity in real estate and stock holdings, have been subjected to brutal and deep crises. However, Wall Street began to recover during 2009, and current trends reveal that real estate declines are moderating in many markets. The decline in average net worth is evident, with a loss of 11.7 percent in 2009 and a further loss of 6.7 percent in 2010. The median net worth in 2010 is $93,000, a decline of almost 5 percent from the past year.

Net worth is estimated from data on household wealth that is collected from the Surveys of Consumer Finance (SCF) from the Federal Reserve Board from 1992 through 2007. From 2004 to 2007, inflation-adjusted average and median net worth grew annually at 4.1 percent and 5.6 percent, respectively. This growth is significantly more than the growth reported in previous surveys. Most of the measured growth is attributable to the appreciation in residential real estate, a rise in the number of new and second homeowners, and the growth in speculative investment properties.

The size of the triennial surveys used in estimating net worth is approximately 25,000 households. The major strengths of the SCF surveys lie in their enhanced representation of wealthy households and in the comprehensive measurement of net worth components. By definition, net worth equals total household assets less any debts, secured or unsecured. Assets include an individual's own home, rental property, own business, IRAs and Keogh accounts, pension plans, stocks, mutual funds, and motor vehicles. Examples

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[28] Further information on changes to tax variables in the latest Current Population Survey is available at http://www.census.gov/hhes/www/income/publications/cpsasec2005taxmodeldoc.pdf. A detailed review of the tax model is available at http://www.census.gov/hhes/www/income/publications/oharataxmodel.pdf and at http://www.irs.gov/pub/irs-soi/06ohara.pdf.

of secured debt include home mortgages and vehicle loans; unsecured debt includes credit card and other bills or certain bank loans.

The first step in calculating net worth is to measure the relationship of net worth to household income by age of householder. The relationship is further differentiated by tenure, since homeownership represents a major factor in household wealth. The next step is to model the relationship statistically to enhance the reliability of the estimates. Esri's 2010 effort presents a model to incorporate the recent downturn in both the housing and financial markets and their impact on net worth.

The extension of the 2000 household income distribution from an upper interval of $200,000 or more to $500,000 or more also enhances the calculation of net worth for the wealthiest households. The 2010 estimates of net worth reflect current income and homeownership with adjustments for inflation and updates based on economic growth since the 2007 SCF survey.

Use of Projections

Projections are necessarily derived from current events and past trends. The past and the present are known; the future must be extrapolated from this knowledge base. Even though projections represent the unknown, they are not uninformed. Guidelines for the development of projections also inform the use of those projections:

■ The recent past provides a reasonable clue to the course of future events, especially if that information is tempered with a historical perspective.

■ A stable rate of growth is easier to anticipate than rapid growth or decline.

■ The risk inherent in projections is inversely related to the size of an area: the smaller the area, the greater the risk.

■ The risk increases with the length of the projection interval. Any deviation of the projected trends from actual events is amplified over time.

Esri revises its projections annually to draw upon the most recent estimates and projections of local trends. However, this data can be complemented with personal knowledge of an area to provide the qualitative, anecdotal detail that is not captured in a national database. It is incumbent upon the data user and the producers to incorporate as much information as possible when assessing local trends, especially for areas that are subject to "boom-bust" cycles.

ZIP Code Updates

Data for residential ZIP Codes is estimated by Esri. Census 2000 geographic areas are the building blocks for Esri's ZIP Codes. Because ZIP Code™ boundaries change frequently, census geography provides a comparatively stable base for the development of ZIP Code data. ZIP Code data is estimated from block group data. Block groups are assigned to residential ZIP Codes by overlaying the centroids of component blocks onto ZIP Code boundaries. Expressed as latitude and longitude coordinates, centroids approximate the geographic centers of blocks. If the centroid of a block falls within a ZIP Code, it is included in the residential inventory; otherwise, it is classified as nonresidential. Block data is then aggregated, and the ratio of block totals to block group data is used to apportion demographic characteristics to a ZIP Code.

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The 2010/2015 updates include data for 30,114 residential ZIP Codes. This geodemographic method does not provide data for ZIP Codes with no assigned boundary. If a polygon is not defined for a ZIP Code, or no blocks are assigned to a ZIP Code polygon, data cannot be retrieved. In most cases, information about post office box ZIP Codes or single address ZIP Codes is incorporated with the data for the enclosing residential ZIP Code.

Data Source for Boundaries

Tele Atlas creates boundary files for ZIP Codes. The complete ZIP Code inventory includes both point and boundary ZIP Codes. ZIP Code boundaries are current as of October 2009.

Comparisons over Time

ZIP Codes are not amenable to time series analysis, thereby preventing a direct comparison with ZIP Codes from earlier updates. Changes include new residential ZIP Codes (52), dropped ZIP Codes (32), and boundary revisions. The 2010 inventory of residential ZIP Codes includes 10,147 ZIP Codes that have the same code as the 2009 inventory but a different population base as a result of boundary changes or slightly different block allocations. These changes reflect revisions of ZIP Codes by USPS in addition to any changes in the techniques used by Tele Atlas to define ZIP Code boundaries.

Esri's Data Development Team

Led by chief demographer Lynn Wombold, Esri's data development team has a 30-year history of excellence in market intelligence. The combined expertise of the team's economists, statisticians, demographers, geographers, and analysts totals nearly a century of data and segmentation development experience. The team develops datasets, including Updated Demographics, Tapestry™ Segmentation, Consumer Spending, Market Potential, and Retail MarketPlace, that are now industry benchmarks.

For more information about Esri® Data, visit www.esri.com/data/.

About Esri

Since 1969, Esri has been helping organizations map and model our world. Esri's GIS software tools and methodologies enable these organizations to effectively analyze and manage their geographic information and make better decisions. They are supported by our experienced and knowledgeable staff and extensive network of business partners and international distributors.

A full-service GIS company, Esri supports the implementation of GIS technology on desktops, servers, online services, and mobile devices. These GIS solutions are flexible, customizable, and easy to use.

Our Focus

Esri software is used by hundreds of thousands of organizations that apply GIS to solve problems and make our world a better place to live. We pay close attention to our users to ensure they have the best tools possible to accomplish their missions. A comprehensive suite of training options offered worldwide helps our users fully leverage their GIS applications.

Esri is a socially conscious business, actively supporting organizations involved in education, conservation, sustainable development, and humanitarian affairs.

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