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PROMOTING SUSTAINABILITY THROUGH LAND-USE PLANNING AND TECHNOLOGY

Abstract Although the overall rate of population growth has recently decreased in developed countries, population in their cities continues to grow. Urban and suburban sprawl may threaten the environment necessary to sustain livable communities. Farm and forest land and open space are important components of human life. However, they may be lost to residential and commercial development. It has become important to develop land-use regulation mechanisms that accommodate economic growth and preservation of the environment. In the United States, land-use planning systems have been employed for a long period of time. Many US States have enacted laws that protect land from uncontrolled urban sprawl. Geographic Information Systems (GIS) are used to facilitate the process of land-use regulation. The goal of this paper is to discuss how technology-aided sustainable land-use policies are utilized in the USA at a county and city wide scale.

Key words: sustainable development, land-use planning, zoning, UGB, Oregon, Benton County, GIS.

INTRODUCTION

The world population is projected to reach 7 billion early in 2012 and to exceed 9 billion by 2050 [United Nations, 2009]. Globally, the population *growth rate* has been steadily declining from its peak of 2.19% in 1963, but growth remains high in developing countries. Population in more developed

countries may also continue to grow because of the immigration from the developing to developed regions. Industrial and commercial growth resulted in population migration from rural areas to the cities and towns. The UN forecasts that today's urban population of 3.2 billion will rise to nearly 5 billion by 2030, when three out of five people will live in cities [Hunter, 2000].

Urbanization makes it especially important to segregate different land-use practices and protect farm and forest land and open space from commercial development. Residential areas also have to be protected so they continue to sustain housing needs of their residents. These demands are reflected in land-use planning laws that limit specific activities to specific areas. Zoning started in the United States a little after 1910. The first comprehensive zoning law adopted in New York City in 1916 [Toll, 1969] divided the city into different zones according to allowable practices. Other cities soon followed with similar restrictions [Fischler, 1998; Weiss, 1987]. Having started in large cities, zoning quickly spread to small communities and suburban areas [Fischel, 1985; Toll 1969; McKinzie 1933]. By the late 1920s, most of the nation, with a few exceptions, had developed zoning regulations that met the needs of the communities.

Oregon is the ninth largest state in the USA [U.S. Census Bureau, 2008] with a diverse landscape that transitions from *rainforest* in the Coast Range to barren desert in the southeast. Oregon has an abundance of

fertile soils that are the source of a highly successful agricultural sector that is based on production of grain, grass seeds, vegetables, fruit, meat and *dairy* products. Oregon is also one of the major timber producing state in the country.

The Gross Domestic Product (GDP) of Oregon in 2008 was \$161.6 billion; it is the 26th wealthiest state in the USA by GDP [Bureau of Economic Analysis, 2009]. Oregon is a home to high-tech industries and services that have been a major employer since the 1970s (e.g., *Tektronix*, *Intel*, *Hewlett-Packard*, *Nike*, *TriQuint Semiconductor*, etc.) A number of startup high-tech companies have led to the establishment of the so-called “*Silicon Forest*” in the area [Dodds and Wolner, 1990]. Among other factors that attract these high-tech companies (e.g., highly-qualified labor force, strong infrastructure), development-ready land played an important role in such companies’ decision making process. Recently, biotechnology giant *Genentech* has selected Hillsboro (one of the Oregon’s cities) for the construction and development of their facility [Genentech, 2010].

Though population of Oregon is the lowest in the US Pacific North West (4 million people in 2008) [U.S. Census Bureau, 2008] (for example, it is an order of magnitude lower than that of California) it continues to increase (Figure 1). From 1990 to 2008, the population of Oregon grew by 33 percent. The population growth demands new land for development; this puts pressure on planning organs to protect agricultural and timber land and recreational open space while allowing economic growth.

Oregon started designing land conservation and development programs in the mid 1970s. These programs targeted economic growth in coming years and preservation of important natural resources. At the initiative of the Republican Governor Tom McCall and with the support from both parties, in 1973, the Land Conservation and Development Commission (LCDC) and the Oregon Planning Program were created

by Senate Bill 100 [DLCD, 2008a]. The law directed to develop Statewide Planning Goals. Nineteen Statewide Planning Goals were finally adopted¹; many of these goals relate to land-use practices. The goals of the Senate Bill 100 were to address the balance between development and conservation. The goals were also to promote high-quality, livable cities and towns by increasing density, improving public transit options, and encouraging affordable housing close to jobs. Redevelopment of existing urban areas was strongly encouraged. In the same year, the legislature also adopted Senate Bill 101 that substantially strengthened land designation for the exclusive farm use. These bills were challenged by the opponents, but the Oregon voters rejected the initiatives to repeal the growth management laws in 1976, 1978 and 1982.

Critics of Senate Bills 100 and 101 and the concept of Urban Growth Boundary (UGB) included in these bills continued to argue that the system infringes on private property rights and may cause rise in property prices by limiting land available for development. In 2000, the land-use system was challenged by Measure 7 that called for overturning of the existing system. Measure 7 maintained that private property owners were unfairly treated by the state’s planning programs. As a result, Oregon Constitution was amended with the provision that the government should compensate landowners for losses of property values due to land-use laws. This ballot measure was later struck by the Supreme Court. However, in 2004, property rights groups succeeded in passing of Measure 37. Under this Measure, local governments were required to compensate landowners for their property values lost as a result of application of the land planning system. By 2007, almost 7000 claims were

¹ 1. Citizen Involvement; 2. Land Use Planning; 3. Agricultural Lands; 4. Forest Lands; 5. Natural Resources; Scenic and Historic Areas, and Open Spaces; 6. Air, Water and Land Resources Quality; 7. Areas Subject to Natural Hazards; 8. Recreational Needs; 9. Economic Development; 10. Housing; 11. Public Facilities and Services; 12. Transportation; 13. Energy Conservation; 14. Urbanization; 15. Willamette River Greenway; 16. Estuarine Resources; 17. Coastal Shorelands; 18. Beaches and Dunes; and 19. Ocean Resources.

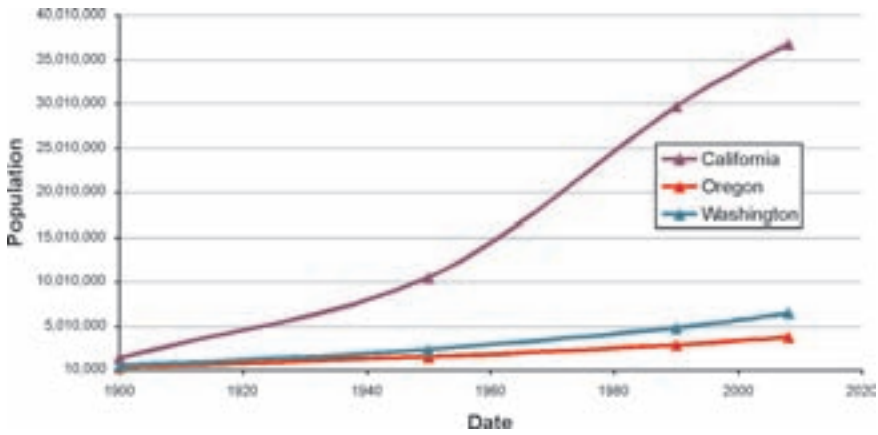


Figure 1. Population Dynamics in the Pacific North West (USA)

filed (for compensations of approximately \$20 million) [DLCD, 2008b]. And finally, Measure 49 adopted in 2007 substantially limited the applicability and extent of Measure 37.

Senate Bill 100 did not mandate the adoption of a state plan. Instead it required every city and every county to prepare or amend its own comprehensive plan which included background inventories and technical information (the plan data base), plan policies (policy choices about future land uses) and implementation of measures (zoning ordinances, subdivision control ordinances). Each plan and regulation was required to satisfy all of the applicable Statewide Planning Goals. LCDC was given the responsibility of reviewing all comprehensive plans to determine whether or not they satisfy the Goals. The law provided opportunities for citizens to participate in all phases of the process of implementing the Goals. The Goals are not mandatory and most of them are accompanied by guidelines, which are suggestions on how these goals may be applied

The concept of UGB is one of the most significant outcomes of the reforms enacted by the Oregon land-use planning law in 1973 [DLCD, 2010]. The UGB concept limits development of farm land, forest land, and open space by defining limits for the future urban growth. The UGB controls urban expansion onto farm and forest lands. Inside

the UGB, land supports urban services, such as transportation, utility systems, parks, schools, fire protection and police, etc., i.e. all necessary infrastructure for a city to function. The UGB promotes effective use of land and transportation network inside the boundary by limiting availability for involving new land and eliminating the need to build new roads and infrastructure. It motivates to develop and redevelop inside the existing urban settings. Nationwide, UGBs are now mandated in Oregon, Washington, and more recently in Tennessee; localized UGBs exist in over 15 California communities, Boulder (Colorado), and Lexington (Kentucky) [Bollier, 1998]. The UGB limits are set for an extended (e.g., 20 years) period of time to promote serious planning and accommodate changes if such become necessary.

Under the land-use system in Oregon, cities have to prepare and submit their proposal regarding UGBs that address applicable goals to the LCDC. Local governments assess the land required for housing, new business, recreation, and other uses, and make a decision on the area where such activities would be allowed. This boundary is actually a line drawn around this area. New development can occur only within this line. It forces cities to apply more sophisticated approaches to planning to prevent urban sprawl. The boundaries are subject to revisions and new land can be included in the UGB is needed.

LAND-USE LAW IMPLEMENTATION

After the enactment of the land-use law in 1973, Oregon has implemented a strong program for land-use planning. Oregon's land-use policy is achieved through local comprehensive planning. State law requires each city and county (or any local jurisdiction that has responsibilities for land-use regulations) to adopt a comprehensive plan and the zoning and land-division ordinances needed to implement these comprehensive plans. Such local plans have to be consistent with the Statewide Planning Goals. The plans are reviewed for such consistency by the state's LCDC. When LCDC officially approves a local government's plan, the plan is said to be "acknowledged" and becomes the controlling document for land use in the area covered by the plan. Oregon's planning laws apply to local governments and to special districts and state agencies. One of the important features of the law is strong coordination between different jurisdictions and agencies to make the plans and programs consistent with each other and with the Goals [DLCD, 2010].

Benton County² is one of the 36 Oregon counties. Value statements of Benton County Comprehensive Plan have specific reference to preservation of farm and forest land. They say, "Agricultural and forest lands provide sustenance for residents of the Willamette Valley. These lands and the larger systems of mountains, valleys, rivers and wetlands of which they are part continue to be highly prized economically, culturally, recreationally, environmentally and aesthetically." They further continue, "The residents of Benton County value the rural character that still exists in much of the county, the distinction that has been maintained between settlement areas and resource land and open spaces and the manageable scale of the cities, towns, and rural centers" [Benton County, 2007]. These statements are reflected in the county's zoning map (printed and digital

formats) that is available for private citizens, businesses, government officials, and all other interested parties.

The seat of the Benton County government, the city of Corvallis³, has a similar comprehensive plan. The city of Corvallis is also required by the Oregon land-use program to provide land-use planning for the area within the UGB [City of Corvallis, 2010]. Corvallis Comprehensive Plan was completed as part of the City's periodic review and implemented by the City Council on December 31, 2006. It states, "The Comprehensive Plan of the City of Corvallis is the primary document that guides and controls land-use within the city limits and the Urban Growth Boundary. The Corvallis Comprehensive Plan is intended to reflect the community's current thoughts on land-use planning and to be responsive to the needs and desires of citizens."

The area between the city's limits and the UGB has to be specifically addressed in the county's and city's land-use ordinances because this land may potentially transition from one jurisdiction to another. Currently, this land is under Benton County's jurisdiction, but may be under the city's regulations if it annexed by the city (entirely or in part). Therefore, the county and the city entered into the "Corvallis Urban Fringe Management Agreement" in 1990 [Benton County 2007] that documents this arrangement. The City of Corvallis Comprehensive Plan states, "The process of land annexation allows for the orderly expansion of the City and adequate provision for public facilities and services." The Corvallis Urban Fringe Management Agreement includes a provision of mandatory public hearings jointly set by the county and the city. The City Charter requires voter approval of an annexation unless the annexation is mandated by State law. For example, health hazard annexations are mandated by State law and do not require

² There were just over 78 thousand people in Benton County in 2004, approximately 30 thousand households and 18 thousand residents in the county; the population density was 45/km² and the average housing was density 18/km².

³ Corvallis is located midway in the Willamette Valley; Corvallis is about 46 miles (74 km) east of Newport and the Oregon Coast. As of the census of 2000 [US Census, 2008], there were 49,322 people, 19,630 households, and 9,972 families residing in the city.



Figure 2. Benton County Open Source GIS Web Application

voter approval. Many times, annexation proposals have been turned down by the voters preventing the proposed annexation lands from being developed to urban densities or perhaps causing them to remain undeveloped⁴.

Participation of the public in land-use management process is a crucial element of land development at all levels. The public's involvement is impossible without easily accessible information on land-use issues. Geographic Information System (GIS) technology may significantly facilitate making such information available; this technology is widely employed in Benton county and the city of Corvallis for the purposes of land-use planning. This transparency and information aids regional sustainable development.

GEOGRAPHIC INFORMATION SYSTEMS AND LAND-USE PLANNING

In Benton County and Corvallis, GIS and GIS-compatible data that relate to all issues of land-use are available to planners, general public, and other interested parties. In Benton County GIS is funded through land transaction filing fees (GIS component of the fees is currently \$20) and is free of charge to

GIS users. An open source GIS application⁵ is available on-line via the county's webpage. A variety of maps and GIS-compatible data may be downloaded and used in land availability assessments. Figure 2 provides a "snap-shot" of this open source GIS application webpage utilized in Benton County.

This application may be used to perform inquiries related to many land characteristics. First, a proper maps application must be chosen. The choices include assessment, election, zoning, survey, aerial photos, topographic, and other maps applications. After the selection is made, a user may perform spatial and tabular data overlays and analyses and print maps, if necessary. In Figure 2, the left part of the GIS application (in this case, the *Aerial Photo and Topographic Maps Application*) is the space where a user may choose what data are displayed and what information can be queried. Data choices in *Aerial Photo and Topographic Maps Application* (shown in the Figure 3) include data on surveying, transportation, boundaries, tax assessment, addresses (e.g., building footprints, house points, driveways), topography, water, and aerial photography.

⁴ Personal Communication: Bob Richardson, Associate Planner, City of Corvallis

⁵ Benton County uses the Easy Land Locator Application Maps (ELLA maps) (<http://www.co.linn.or.us/webmap>). It was created in 2003 to provide Geographic Information System (GIS) and mapping services to the citizens of Linn County.

The “Identify” tool allows a user to identify necessary information using selected layers. After analyses are made, a map may be created and printed at desired scales. This GIS web application is widely used by county employees and the general public. Every day, approximately 20 users employ this application in their work.

Digital GIS-compatible data provided by the county and the city may be used in other open source or commercial GIS programs. Many Oregon jurisdictions have similar applications. Figure 3 demonstrates how such data may be used in the land-use planning process. The study area was the North Western Corvallis, between the city limits and UGB. In this example, using ArcMap

GIS, 9.3^o, data on property parcels, UGB, Corvallis city limits, and zoning were overlaid to estimate the number of property parcels that may be currently used for construction of new houses. The parcels in this area are primarily zoned as *Urban Residential* with the minimum acreage per one dwelling of 5 and 10 acres (one hectare = 2.47 acres) (i.e., *UR-5* and *UR-10*, respectively). New construction of houses can only occur on the land parcels that satisfy minimum land requirements in allowable zoning categories (*UR-5* and *UR-10*). It appears, that out of 2632 parcels in the study area zoned *UR-5* and *UR-10*, only 60 (or 9.5 percent) can be potentially developed; the area of these parcels is slightly over one-half of the parcels zoned *UR-5* and *UR-10* in the study area. Many other restrictions

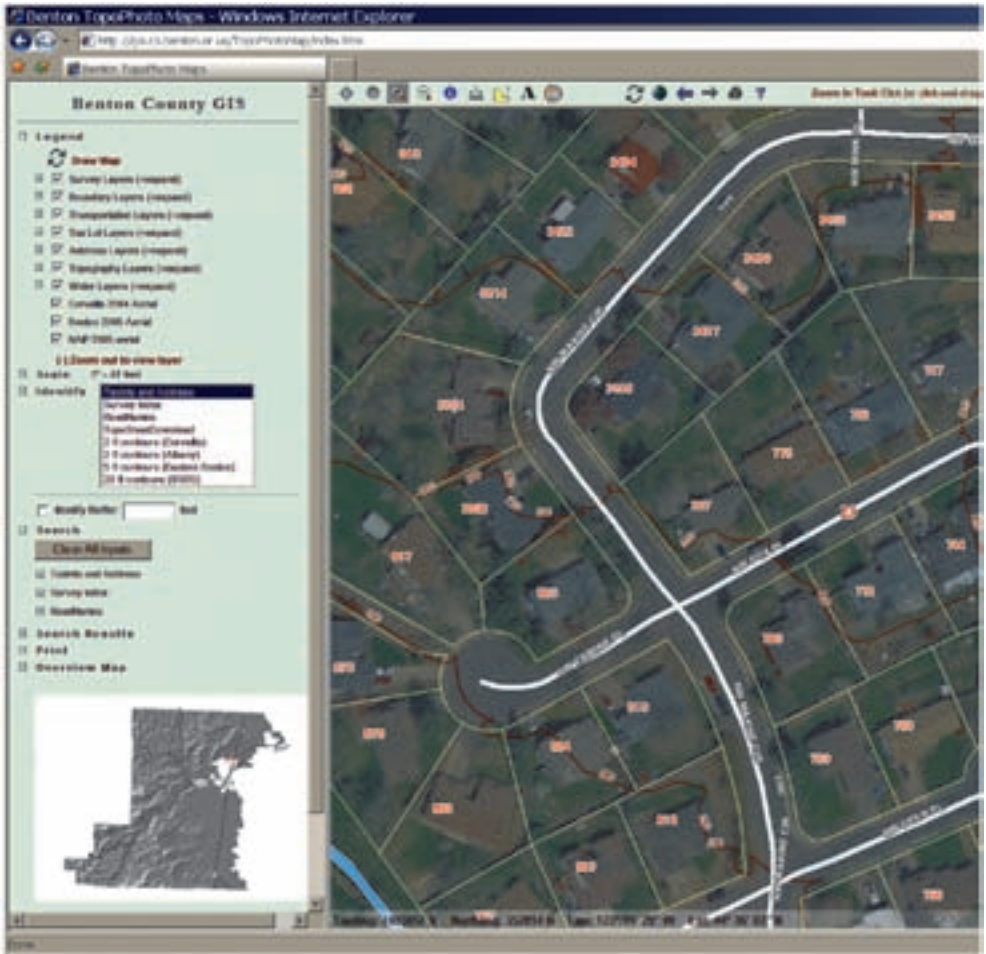


Figure 3. Aerial Photo and Topographic Maps Application

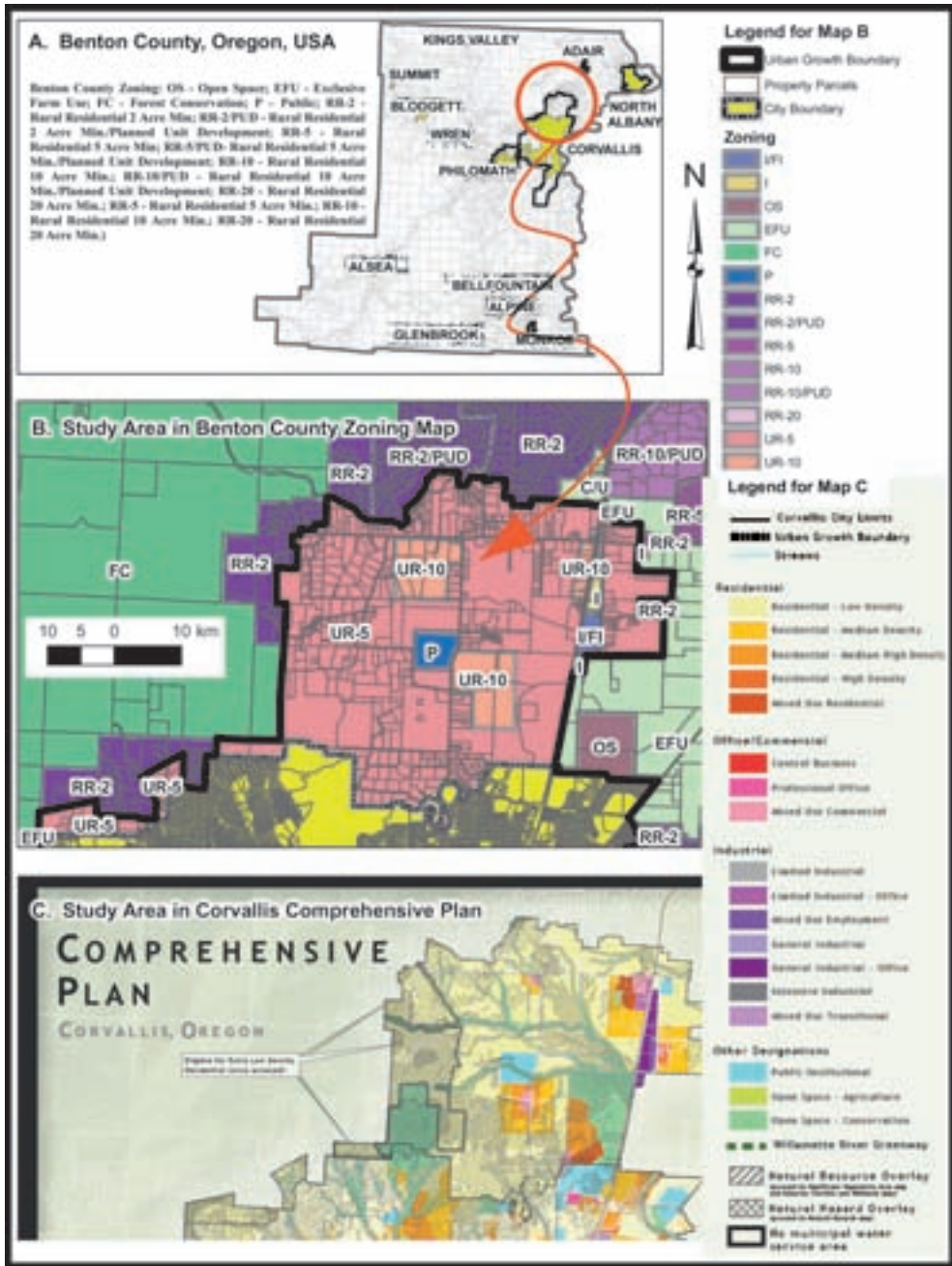


Figure 4. City Limits and Urban Growth Boundary Analysis (Study Area)

may be imposed on the development. Such restrictions include but are not limited to water availability, slope stability, flood or earthquake hazard, etc.

Part C of Figure 3 shows the same area in the City of Corvallis Comprehensive Plan. According to “Corvallis Urban Fringe

Management Agreement” this area is currently under Benton County’s jurisdiction. If land is annexed into the City of Corvallis, such land will fall under the City of Corvallis jurisdiction and may be developed as shown in Part C of Figure 3. For example, if the western part of the study area that is currently zoned as UR-10 (i.e., 10 acres min

limitation per one dwelling) annexed into the city, it will be zoned as *Extra Low Density Residential* area, which allows more dense residential density compared to the current use.

DISCUSSION AND CONCLUDING COMMENTS

The population of Oregon and its cities (along with the entire nation) continues to grow. The relationships between land-use laws, population dynamics, land values, housing affordability, and attractiveness of residential areas are complex and should be considered in land-use analyses. The urban growth boundaries and zoning ordinances create more dense residential development. But “the compact city is not a perfect city” [Abbott, 1997]; “side effects” of more dense urban development that may be more efficient from the standpoint of preservation of rural areas, could include disappearance of existing open local space within city limits. Zoning ordinances may involve shortage of affordable housing and lead to decrease in urban communities’ appeal [Abbott, 1997; Joint Center for Housing Studies, 1996]. Population growth could add to the pressure on urban housing caused by land-use planning restrictions.

Though the price of buildable land can rise dramatically while rural real estate may lose its value, there are studies that indicate that in Oregon, land-use planning system has not caused a generalized reduction in land value across rural Oregon; this is consistent with the design of Oregon’s land-use planning system

[Jaeger and Plantinga, 2007]. Oregon’s land-use planning system is flexible enough and is required by law to accommodate a long term supply of vacant land inside UGBs at all times. Oregon’s land-use law created desirable urban and rural space for economic and residential growth. This became possible by employing GIS technology to facilitate participation of citizens in land-use management decisions. Many governments in Oregon use GIS applications (commercial and open source) and make them and land-use related data available to all their citizens. The transparent process of making decisions on current or future land-use practices promotes sustainable development of communities. Analyses of land availability for agricultural, forest, residential, commercial, industrial, recreational and other activities can be easily performed at all levels of planning. The transparency mitigates possible conflicts between governments and citizens involving zoning/rezoning, UGBs, annexations, and other land-use related issues. Many jurisdictions in Oregon passed measures through citizens’ votes to include GIS fees into their fee-schedules. It created a permanent funding source for GIS implementation and made this technology accessible to anyone who is interested in land-use problems.

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