A Study of Smart Growth Initiatives using GIS: The case of Austin, Texas

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ABSTRACT

This study evaluates the effectiveness of the Smart Growth Initiatives of the city of Austin, Texas using GIS and spatial analysis technologies. The preliminary results show some evidence of the usefulness of the initiatives.

1. INTRODUCTION

Smart growth has recently become a widely accepted concept as well as a nationwide movement that aims to correct problems caused by urban sprawl. Smart growth initiatives are generally designed to encourage infill development, concentrated development, and redevelopment and to promote fiscal equity, environment sustainability, and a better sense of community for a particular city or region.

Popularly known as the "Silicon Hill", Austin, Texas has risen quickly from a quiet college town and state capital to a sunbelt high-tech metropolis. While this star city is enjoying rapid population growth, increasing job opportunities, and rising income levels, it is also suffering from typical symptoms of urban sprawl, such as extensive suburbanization, increasing traffic jams, deteriorating environmental conditions, and weakening of the central city tax base. To combat these problems brought by urban sprawl, the city of Austin launched the Smart Growth Initiative (SGI) in the early 1998 that promotes three major goals: i) to determine where and how to grow; ii) to improve the quality of life; iii) to enhance the tax base.

Geographically, Austin's SGI is designed to promote urban growth within designated areas, enhance existing neighborhoods in the urban core, and preserve environmentally sensitive areas. To achieve these goals, the SGI divides Austin into two primary zones: the desired development zone (DDZ) and the drinking water protection zone (DWPZ). The DDZ, roughly encompassing the eastern two-thirds of Austin, is the area for which substantial future development is encouraged. Historically, eastern Austin is dominated by black and Hispanic population. The high-tech boom of the 1990s greatly increased population in the north, south, and west of the city, while many areas in the east part of the city experienced relatively slower growth compared to the rest of Austin, some even suffered from negative growth. There are concerns about the increasing social inequity and spatial segregation in Austin from both urban planners and social sciences scholars. The DWPZ, largely sitting on top of the Edwards Aquifer, is the area where additional development is discouraged to protected ground water from abuse and pollution. Austin relies mainly on seven incentive-based policies to implement the smart growth initiatives. The two most direct incentive policies are: i) restoring community and vitality to the urban core by government-invested projects in the city center; ii) rewarding developers with reduced fees and flexible application processing for development projects that meet smart growth goals.

Entering the seventh year of the SGI program, both Austin residents and policy-makers are interested in seeing how well the SGI has been working. Following previous work conducted by Sui and his colleagues [2], we made some efforts to improve the methods and to include the most up-to-date datasets to investigate whether growth has been occurring in the DDZ or DWPZ in the past seven years.

2. ANALYSIS METHODS

We selected locations of new building permits as a proxy to monitor the urban growth. Geographic Information Systems (GIS) and spatial analysis technologies have been used to examine the changes of spatial distributions of building permits issued during the period of 1997 to 2003 in the two zones. We used ArcGIS 8.3 to tabulate the number and the types of building permits in the area of Austin. The data (Figure 1) have been collected from the city of Austin's planning division. The GIS operations used in this study were customized using ArcGIS VBA (Visual Basic for Application) scripts. A Matlab script file was created to generate linear regression functions to approximate the change of the distribution of building permits in the two zones (Figures 2-3). Higher order polynomial regression functions are not considered since they show large slopes outside the regression interval. This leads to unrealistic predictions.

3. PRELIMINARY RESULTS

Due to page limits, we confine our discussion on the total (sum of the seven types of building permits in Austin) and

new family house building permits. Out of a total of 108,818 building permits issued between 1997 and 2003, about 27.2% fell within the protection zone DWPZ, and about 69.4% were in the development zone DDZ, as shown in Figure 2. No obvious general trend can be identified, although we notice a slow increase of the number of building permits in the DDZ and a corresponding decrease in the DWPZ in the third quarter of 1998. The number of family house permits in the development zone started to increase, while the permits issued to the protection zone decreased significantly since the first quarter of 2000 (Figure 3). During the period of 1997 to 2003, the development of new family houses in the DDZ seemed to be encouraged and the new development pressure of family houses was alleviated in the DWPZ.

The above preliminary results demonstrated that the Smart Growth Initiatives might be working in the past seven years. The recent economic recession may make the incentive policies of smart growth more attractive for developers. It will be difficult, however, to prove the causal link between the effectiveness of the SGI and the changing distributions of building permits in the two zones. Furthermore, Austin's SGI seemed to have different levels of impacts on different types of constructions as indicated by building permits. We believe new family house permits should be more sensitive to incentive policies than some other types of developments such as public works or commercial buildings. Our preliminary results indicate that Austin SGI was effective to a certain degree, continuous observations and more detailed analysis will be necessary to make more general conclusions.

4. DISCUSSION AND FUTURE WORK

In this short paper, we can mention only a few aspects of the study. However, this project has demonstrated the great potentials to constantly monitor the progress of smart growth using GIS and spatial analysis technologies. First, GIS provides a powerful platform to handle complex and excessive amount of spatial/spatiotemporal [1] and attribute information with efficiency, especially equipped with object-oriented programming tools. Second, web-based GIS technology has made it possible to provide real-time spatial analysis and mapping functions for urban growth; in other words, users will be able to interactively evaluate Austin's SGI through the Internet with the flexibility of selecting both spatial and non-spatial variables, time scales, and formats of final reports such as thematic maps, graphs, tables, traditional text files, or even animations. We believe that a web GIS-based Smart Growth Initiative evaluation system will not only provide stakeholders with a smart tool to judge whether the Smart Growth Initiative is really smart in the long run, but will also help urban planners and managers to find better urban development policies for Austin's sustainable development in the emerging information age.

5. REFERENCES

[1] L. Li and R. Piltner. Voronoi region-based spatiotemporal GIS databases. In *Proc. of the Fifth National Conference on Digital Government Research*, pages 355–356, Seattle, 2004.

[2] D. Z. Sui, W. Tu, and J. Gavinha. *WorldMinds: Geographic perspective on 100 problems*, chapter How smart is smart growth? The case of Austin, Texas. Kluwer Academic Press, The Netherlands, 2003.

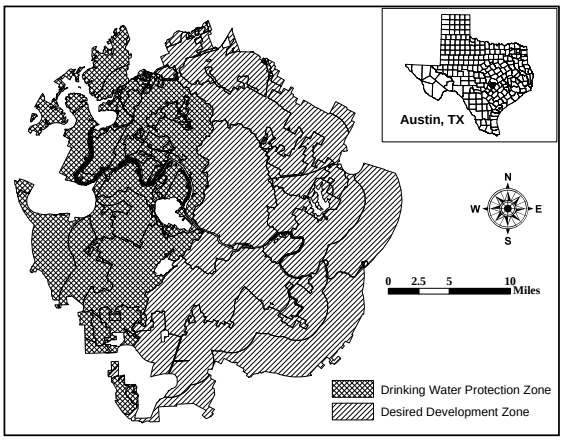

Figure 1: Smart growth zones in Austin, Texas.

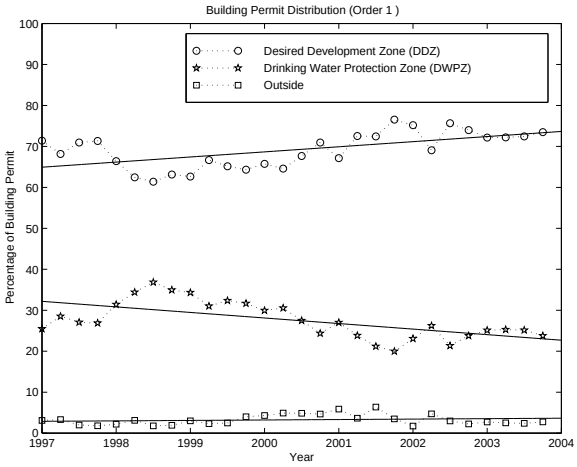

Figure 2: Total building permit distribution.

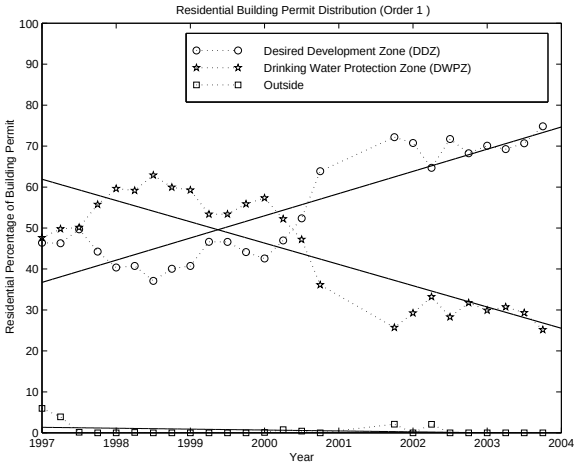

Figure 3: Family building permit distribution.