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Location of manufactured housing and its accessibility to community services: a GIS-assisted spatial analysis

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Abstract

This paper investigates the location and accessibility disadvantages of manufactured housing using Geographical Information Systems. It is found that, on an aggregated basis, manufactured housing has been placed further away from positive public-community facilities and, hence, services than other types of housing. It has also been placed further away from major employment centers. Moreover, a higher percent of such housing has been placed in flood zones. On the other hand, manufactured housing has not been placed closer to large negative facilities, such as landfill sites, heavy industrial or manufacturing plants, or airports. These findings reinforce the claim that manufactured housing faces selected zoning barriers or restrictions.
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1. Introduction

Manufactured homes are constructed in a factory in accordance with Department of Housing and Urban Development (HUD) building code standards (HUD Code). They are eventually transported to a site, placed on foundations, and connected to water, sewer, and electrical lines. Manufactured housing (MH) is a major and less expensive type of factory-built housing, which includes pre-fabricated, panelized, pre-cut, modular, and log homes. In 2000, one out of every six new single-family housing starts was a manufactured home. The average price of a MH in 1999 was $43,600, while the average price of a site-built single-family home was $136,425, excluding land prices. Further, per square foot cost of a new manufactured home is about 50% of a new site-built single-family house [1].

Since 1976, MH has gained more acceptance as an affordable housing alternative to site-built single-family housing. However, it is well known that owners of MH are still treated as "second

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class citizens'' and special land use or zoning ordinances are thus devised [2]. These special zoning regulations seek to protect the safety, health, and welfare of the local citizenry; however, they often lead to restrictions on the location and placement of MH. This is especially so given the fact that about 25% of all new single-family homes sold in the United States in the past decade is manufactured housing. Today, more than 21.4 million, or 7.6%, of the US population live in 8.9 million manufactured homes [1], while approximately 88% of existing manufactured home owners report satisfaction with their housing lifestyle [3].

The dominant form of zoning barriers or restrictions against MH is related to specific subdivision provisions, such as density, lot size, floor area, roof pitch, exterior siding, or architectural style [4–6]. Often, these cases are resolved in court at various levels [4,6–8]. This subdivision-type restriction and its legal implications, however, are not a concern of this research. Rather, the current study focuses on the location and accessibility of MH with respect to public and community services. As zoning is essentially the designation of various uses to land parcels in a community, when a use is assigned to a parcel at a specific location, other possible uses most likely have to be allocated to other parcels at different locations. Therefore, an intrinsic aspect of zoning is location and its corresponding accessibility. For example, when a parcel is zoned for commercial use and a new community shopping center is built on it, the parcel typically cannot be rezoned for another use, while the center would certainly change the level of shopping accessibility for some homes.

Since location and accessibility are related to potential risks, such as closeness to hazardous materials sites, and well-being, such as proximity to schools or jobs, local zoning plays an important role in avoiding the risks and increasing the well-being of all residents [9]. Fair zoning practices should explicitly consider the location aspect of zoning to ensure spatially and functionally balanced land uses. This study thus examines the fairness of local zoning practices through spatial relationships between land use for residential housing and land use for public-and-community facilities (PCF), or, more specifically, the accessibility of housing to facilities.

The study is based on typical classifications of residential homes and public-community facilities. Countywide building and parcel databases from Pitt County, North Carolina, were used. The optimization model developed here is based on the classical assignment model and is implemented for selected housing and facility types within the ArcView GIS environment [9]. The assignments from ArcView were further processed to produce descriptive statistics.

The paper is organized as follows: following the introduction, Section 2 presents the problem statement, as well as the conceptual development of fair zoning in terms of equal accessibility. Section 3 provides the research methodology, which covers such issues as model assumptions, formulations, procedure and data processing, while Section 4 discusses the results and highlights major findings. Conclusions and remarks are included in Section 5.

2. Problem statement

Zoning continues to be a major regulatory barrier to, and discrimination source for, the placement of manufactured housing [4,6–8,10–13]. However, in challenging zoning barriers against MH, much of the effort has been concentrated on statewide legislation and legal actions in individual cases at local levels [1,9,14,15]. The location and accessibility aspects of zoning, which

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