Evaluating predictors for brownfield redevelopment

T.L. Green¹,²,b,*

¹ Department of Business, Legal and Real Estate, University of California, Los Angeles, Extension, 10995 Le Conte Avenue, Los Angeles, CA 90024, United States
² College of Professional Studies, Northeastern University, 360 Huntington Avenue Boston, MA 02115, United States

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A B S T R A C T

This paper quantitatively examines what drives brownfield redevelopment and what factors predict a completed brownfield redevelopment. This research investigated 200 brownfield properties that were listed with the United States Environmental Protection Agency (EPA) and redeveloped between the years 2000 and 2015. Three significant correlations were found in this study: socio-economic factor (income level), green development, and tax incentives significantly correlated with brownfield redevelopment. The combination of six predictor variables was analyzed using multiple regression. Socio-economic (income level) [β = 0.27, t = 3.96, p < 0.001] and sustainable building practice (green development) [β = −0.17, t = −2.56, p = 0.01] significantly predicted brownfield redevelopment. Type of contamination [β = 0.07, t = 0.98, p > 0.05], political climate [β = −0.04, t = −0.52, p > 0.05] and stakeholder involvement [β = 0.04, t = 0.62, p > 0.05] did not significantly predict brownfield redevelopment. Hypothesis two and four assessed predictors of brownfield redevelopment. The findings indicated a significant relationship between brownfield redevelopment and two variables (a) socio-economic factor (income levels) significantly predicted brownfield redevelopment, and (b) green development significantly predicted brownfield redevelopment. The higher value of socio-economic factor, the higher value of brownfield redevelopment. The projects with sustainable development had high brownfield redevelopment value than projects without green development. Recommendations for practice include (a) developers and other stakeholders incorporate sustainable building practices in brownfield redevelopments, (b) government agencies involved in the building process such as building and planning departments provide narratives of best practices in sustainable building to help guide brownfield redevelopments and implement policies to mitigate the displacement of low income residents (c) creation of a centralized database of brownfields that have been redeveloped detailing the project attributes. Recommendations for future research may include (a) quantitative study of demographic factors such as age, gender, race, and education as possible predictors of successful brownfield redevelopment and (b) a study on the types of contamination that have been successfully remediated resulting in a successful brownfield redevelopment.

1. Introduction

Brownfields, properties that are abandoned and underutilized because of either real, or perceived contamination, present social and financial complexities hindering their redevelopment (Thomas, 2003). According to the Small Business Liability Relief and Brownfields Act (Public Law 107–118, H.R. 2869), which amends the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), the term brownfield site, with certain exclusions and additions, means “real property, the expansion, the redevelopment, or reuse of which may be complicated by the presence of a hazardous substance, pollutant, or contaminant” (Davis and Sherman, 2010, p. 4). Brownfields are commonly associated with distressed urban areas, particularly central cities and inner-ring suburbs that were once heavily industrialized (Davis and Sherman, 2010). The United States Environmental Protection Agency (U.S. EPA) estimates that more than 450,000 brownfield sites are present across the United States (United States Environmental Protection Agency, 2011). However, the National Brownfield Association states that more than one million brownfield sites may exist in the United States alone and as much as $2 trillion of real estate may be undervalued due to the presence of contamination (Davis and Sherman, 2010). Additionally, others estimate that more than five million acres of abandon industrial properties exist in urban areas today (Davis and Sherman, 2010). However, brownfields can be found in almost any community. For example, a brownfield can be as large as a manufacturing site that expands over more than 500 acres, or...
as small a gas station on less than a one-acre site.

The land that encompasses brownfields presents both challenges and opportunities. Additionally, the regulations and laws that have formed cleanup and redevelopment efforts have also presented opportunities and problems. Although suburbanization and deindustrialization provide an understanding of why brownfield sites are present in communities, several laws and regulations for contaminated properties disclose why many of these properties exist today. Land is not only a critical component of the earth’s life support system, but is also a precious resource and an important factor of production in economic systems (Hou and Al-Tabbaa, 2014). Therefore, the management of land is also important. The US EPA defines land management as how land is managed and utilized to furnish natural resources, food, open space and habitat, and places for people to live, work, and recreate. (Hazardous Waste Consultant, 2010a,b). Land management options such as brownfield redevelopment and the cleanup and reuse of contaminated and potentially contaminated sites, benefit local communities by creating jobs, increasing property values, increasing tax revenues, and preserving green space. These options are largely under the control of local governments, and can be used to reduce carbon footprints and meet state and local greenhouse gas emission reduction target. However, according to Hou and Al-Tabbaa (2014), industrial operations have resulted in large areas of contaminated, known as brownfields, or brownfield sites, that are slowly being remediated.

Most of the nation’s brownfields are caught in a vicious cycle of decline becoming unwanted legal, regulatory and financial burdens on the community and taxpayers (Davis and Sherman, 2010). Although brownfields can be found almost anywhere, they commonly occur in the urban core areas of major cities (BenDor et al., 2011). According to a survey by the US Conference of Mayors (1998), 33 cities with brownfield sites conservatively estimate their cumulative annual loss of tax revenues at $121 million. This data suggest that more than 20,000 cities and other municipalities nationwide could be losing billions of dollars each year in local tax receipts from their failure to restore brownfields to economic viability. According to BenDor et al. (2011), observations of urban growth patterns across the nation have indicated an exodus of capital and population away from major downtown areas during the last several decades. Downtown areas of major industrial cities such as St. Louis and Detroit have suffered significantly as relocating entities settle in suburban greenfields, which are easily cleared for new development and contain no actual, or perceived contamination (BenDor et al., 2011). For these historically industrial cities, brownfield redevelopment is one of several methods currently sought to revitalize the economic and environmental health and viability of the urban core (Adams et al., 2010). The cooperation among stakeholders is crucial to restoring brownfields to economic viability. The stakeholders involved in brownfield redevelopment include: governments (local, state, and federal), developers, citizens and residents, environmentalist and conservation group, and entrepreneurs and business owners.

Assessing the economic, social, and environmental effects of brownfield redevelopment is important as government budgets tighten and greater attention is given to gauging the impacts of government intervention (De Sousa et al., 2009). Additionally, investigating drivers of brownfield redevelopment may reveal factors that predict completed brownfield redevelopments while assisting stakeholders in their decision-making process and thus increasing the development of brownfields. Therefore, conducting research in this area may lead to the implementation of public policy in areas where brownfield development is limited.

1.1. Background

The redevelopment of brownfields has gained political support in the United States as an essential ingredient of urban revitalization (De Sousa et al., 2009). A survey conducted by the US Conference of Mayors (1998) found that 23,810 brownfield sites averaging in size from five to 15 acres currently exist in 172 of the cities surveyed (De Sousa et al., 2009). As a result of the hazardous conditions of these properties, much of the studies focused on the barriers, benefits and outcomes of brownfield redevelopment. Research on the community impacts of brownfield have focused on their negative implications from an environmental justice perspective, since these sites tend to be more concentrated in non-white neighborhoods (Leigh and Coffin, 2000). Other studies have analyzed brownfield redevelopment and their influence on real estate values (Bond, 2001; Ilhanfeldt and Taylor, 2002) and on other economic issues related to employment, taxes and property investment (Council for Urban Economic Development, 2000). The gap in the literature, according to Lange (2001), is at best weak with regard to empirical studies.

Despite all of the ongoing brownfield-related efforts, the literature still lacks rigorous data analysis of the factors that contribute to a completed brownfield redevelopment (Lange, 2001). While many initiatives have taken place to promote sustainable behavior in the remediation field, little is known on how effectively such sustainable behavior has been adopted, and what may affect its adoption (Hou et al., 2014a,b). For example, Cundy et al. (2013) concluded that the main barriers to widespread gentle remediation options (GROs) application, in Europe and more widely, derive from a general focus of the remediation sector on remediation for critical risks or to rapidly return smaller urban brownfield sites to productive use. Additionally, there’s a limited awareness of and/or confidence in the role of GROs as practical site solutions among stakeholders (Cundy et al., 2016; Onwubuya et al., 2009). The Onwubuya et al. (2009) study also concluded, based on stakeholder feedback, existing tools are too general, contain insufficient detail on the range of gentle remediation options, or alternatively are too complicated, for regular or widespread use by decision makers in selecting and applying gentle (and indeed other) remediation technologies. Zheng et al. (2014) concluded that applying brownfield redevelopment and adaptive re-use to address is an-going challenge in meeting the demand for sufficient land supply. Additionally, the question of how to perfect land use in urban renewal is still waiting for an answer and future research should explore how to realize sustainable housing in urban renewal (Zheng et al., 2014).

De Sousa et al. (2009) work indicates there are several economic issues that still have not received much attention in the brownfield literature, but may have a significant impact on brownfield policy and practice. First, the impact of brownfield redevelopment and the geographic scope of that impact require a more comprehensive study. Second, the literature does not provide enough evidence on whether the property value of brownfield redevelopment is different in more, or less affluent areas. Exploring this issue may assist policy makers in determining whether or not brownfield investments have a positive impact on poorer communities. Finally, according to De Sousa et al. (2009), there is a need for information about whether the amount of brownfield investment (public and private), or the nature of a project in terms of land use and property size, affects brownfield redevelopment.

Lang’s (2001) work indicates the absence of rigorous data on the factors that contribute to a successful brownfield redevelopment. The current literature also lacks the identification of the success factors that contribute to brownfield redevelopment (Lange, 2001). In order to return functionally obsolete or potentially contaminated properties back into productive uses while alleviating society of the burdens of brownfields, this study investigated the factors that predict successful brownfield redevelopments. Additionally, the study quantitatively investigated such factors as the effects of geography, income, politics and stakeholder involvement on brownfield redevelopment.

2. Literature review

Much of the literature that exists focuses on the complexity of brownfield redevelopment with a limited number of quantitative studies that focused on assessing the factors that contribute to a successful
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