CSCanada
Management Science and Engineering
Vol. 8, No. 1, 2014, pp. 1-5
DOI:10.3968/j.mse.1913035X20140801.4266

ISSN 1913-0341 [Print]
ISSN 1913-035X [Online]
www.cscanada.net
www.cscanada.org

The Economic, Social and Environmental Benefits Derived From the Redevelopment of Brownfields

M. Malek[a],*; Chaise V. Matev[b]

[a]Chair of the Construction Management Department, College of Computing, Engineering and Construction, University of North Florida, Jacksonville, US.
[b]University of North Florida, US.
*Corresponding author.

Received 23 November 2013; accepted 16 January 2014

Abstract

Brownfields are defined as former industrial or commercial properties that have been abandoned, idled or are no longer in use. These properties may be compromised with contaminated water and/or toxic materials. This paper demonstrates that Brownfields may however, be salvaged and redeveloped. Redeveloping brownfields has many challenges. Financial barriers and liability concerns are often cited as the main concerns, but this strategy can also have many economic, social and environmental benefits. Some are mentioned as: tax incentives, smart growth and inducement of labor concentrations among many….

Key words: Brownfield; Redevelopment; Sustainable development; Green building

M. Malek, Chaise V. Matev (2014). The Economic, Social and Environmental Benefits Derived From the Redevelopment of Brownfields. *Management Science and Engineering*, *8*(1), 1-5. Available from: http://www.cscanada.net/index.php/mse/article/view/j.mse.1913035X20140801.4266
DOI: http://dx.doi.org/10.3968/j.mse.1913035X20140801.4266

INTRODUCTION

Redevelopment of brownfields is a fairly new theme in sustainable development. Beginning in 1995, the US Environmental Protection Agency developed a Brownfields Program that has grown into a proven, results-oriented program dealing with recycling brownfields. This program was designed to empower communities with brownfields to work together to assess, safely clean up, and sustainably reuse brownfields.

Brownfields have been found to have negative social and economic influences on surrounding communities (Bullen, 2007). Contaminated brownfields can be linked to increased health risks resulting from exposure to dangerous toxins and unsafe environmental conditions. Brownfields also have a negative social impact on the community since they can often become sites for illegal drug activity and other crimes. “Brownfields in close proximity to residential property have been found to lower the value of the neighboring properties” (Cloutier; Kaufman, 2006). Redevelopment of brownfields can revitalize neighborhoods socially and economically and may also increase property values significantly.

Although there are many benefits to brownfields redevelopment, it is a very challenging process and involves many liability concerns and financial barriers. However, brownfields need to be addressed for their negative environmental, social, and economic influence on local communities.

1. BACKGROUND INFORMATION

The US Environmental Protection Agency (US EPA) defines a brownfield as a “real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant” (US EPA Website). An example of such property is a former industrial or commercial site that is underused and possibly contaminated. There are between 500,000 and 1,000,000 brownfields in the US and the magnitude of benefits from redevelopment can be significant. In 1997, the US EPA selected Jacksonville, Florida for its Brownfields Pilot program to clean up “more than 100 downtown sites with known or suspected soil and groundwater contamination” (US EPA Website). The pilot program created a local brownfields database and a remedial action plan to clean up the brownfields. The majority brownfields are usually

located in former industrial or commercial areas that have been abandoned or are underutilized but are in close proximity to poor, residential neighborhoods (Greenberg et al., 1998).

Although not all brownfields are contaminated with dangerous toxins, they still have a significant negative impact on the local communities and local economy. Brownfields not only lower nearby property values, they can also become centers for illegal drug related activities, dumping grounds for hazardous products, and other crime (Greenberg et al., 1998). Properties closer to brownfields have a significantly lower values compared with those further away (Figure 1). Brownfields can become so distressing that the neighboring residents leave the area resulting in the formation of more brownfields. Cleaning up and reinvesting in these properties increases local tax bases, facilitates job growth and takes the development pressures off of undeveloped land, both improving and protecting the natural environment (Greenberg et al., 1998).

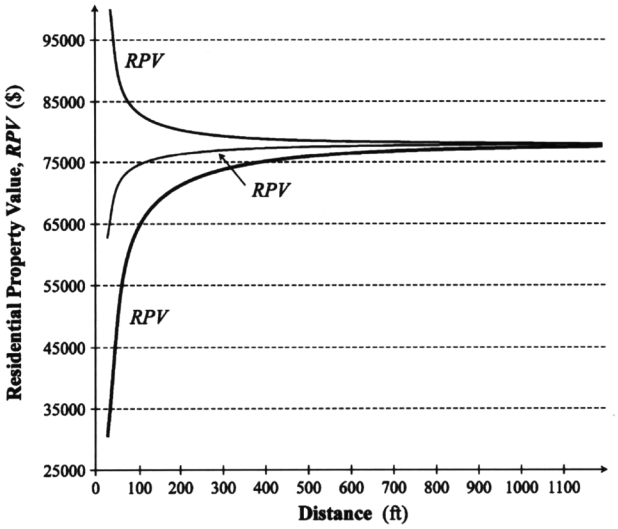

Figure 1
Property Value (RPV) **Increases With Increasing Distance Away From A Brownfield in the Lincoln Neighborhood of Kenosha, Wisconsin**

When contaminants are present on a brownfield, they can be located in the soil, buildings, containers and groundwater. Case studies by EPA have studied sites that included petroleum hydrocarbons, lead, construction debris such as lead paint or asbestos, industrial chemicals and other US EPA Website.

2. REDEVELOPMENT OF BROWNFIELDS

Sustainable development is development that meets the needs of the present without compromising the ability of future generation to meet their own needs. Environmental clean-up and redevelopment of brownfields is one of the best ways to improve and protect the environment. The ultimate goal in sustainable development is to address the environment, health concerns, livability issues, financial objectives and social and economic needs of the local community US EPA Website.

2.1 Challenges of Redevelopment

One of the greatest challenges in brownfield redevelopment is liability concerns and financial barriers. Because of the high cost involved in clean up and liability concerns, lenders and investors are discouraged from working with possibly contaminated sites. In some cases, clean-up costs can be more than the property's value. For example, in 1995 the City of Emeryville in California began to redevelop its numerous brownfields. The average cost for testing and cleanup was $8 per square foot and exceed $50 in some instances, exclusive of litigation and other legal costs. In comparison, the land value at the time was only $12 to $25 per square foot (City of Emeryville, CA Website).

The ultimate goal for brownfield redevelopment is to return the land or property back to productive use. The kind of use should account for community's needs, the safety of the site, and economic feasibility. Brownfields need to undergo environmental assessments to determine the level of contamination, if livability is possible and determine costs that will be involved. Environmental assessments are costly and require commitment from all stakeholders (Crawford-Brown, Wedding, 2007). Redevelopment of brownfields is best when both public and private sectors are involved along with architects, land planners, engineers (civil, plumbing, mechanical and electrical), real estate and investment professionals, environmental scientists, interior designers, and construction management firms.

2.2 Process of Redevelopment

The US Environmental Protection Agency suggests four major steps in the redevelopment process: pre-development, securing the deal, clean up and development, and property management. The success of a brownfield redevelopment project depends greatly on the commitments of all parties involved.

The goal of the pre-development phase is to identify and refine the redevelopment idea—the project has to make sense from a financial and environmental standpoint. Environmental assessments need to be conducted to identify the presence, type, and extent of contamination to develop a remedial action plan. Identifying the presence and extent of contamination is essential to evaluating risk, liability and appropriate reuse.

Securing the deal involves negotiating the terms of the contract, the purchase price, and securing the funding. Contract negotiations should include the sellers and buyers term sheet that describes all environmental concerns and who will be responsible for them. One of the most important components of the contract is

to determine who will manage the liability once the redevelopment is completed.

Clean up and development follows once all the planning is done and the sale or transfer of property is completed. Once all the planning and construction documents are approved, clean up can began according to the action plan. Clean up activities can include soil, surface or ground water remediation. Brownfield cleanup is followed by inspection and approval of local, state or federal regulatory agencies. Clean up and development is followed by construction.

Property management of a brownfield includes a long-term operations and maintenance program. Management ensures the long-term sustainable reuse of the property.

3. IMPORTANT ADVANTAGES OF BROWNFIELDS REDEVELOPMENT:

3.1 Existing Infrastructure

When reusing an existing building, all building's infrastructure is already in place. You don't have to pay to connect water, electricity or phone lines. Moreover, these sites already have access to the transportation infrastructure, so no new roads, rail lines or bus routes need to be created to support your project.

3.2 Tax Incentives

Many sites in need of redevelopment are located inside Enterprise Zones. Companies relocating in these zones are eligible for significant tax savings, potentially up to $15,000 per employee per year. Furthermore, qualified remediation costs can be written off. Finally, highly progressive legislation has just been passed in Rhode Island which gives developers a 30% tax credit for the rehabilitation of eligible historic buildings which, when coupled with similar federal tax credits, can mean a total credit of up to 50%.

3.3 Labor Concentration

Because these sites exist in the heart of urban areas, there is an accessible labor pool easily available.

3.4 Progressive Legislation

The Industrial Remediation and Reuse Act protect property owners from being sued should any contaminants be discovered on site after redevelopment.

3.5 Smart Growth

A recent study estimates that every brownfield acre redeveloped would have required a minimum of 4.5 acres had the same project been located in a green-field area. Every building that is reused means one less new building is required to be built. That means rural areas can be more effectively preserved, providing better air, water, open space, and quality of life for everyone.

3.6 Architectural Beauty

Many buildings in need of redevelopment were built in an age when astonishing craftsmanship and attention to detail was affordable. The intricate masonry, hardwood floors, and expansive courtyards characteristic of these sites would be very expensive if not impossible to duplicate today in a new development.

4. DATA COLLECTION

In the last decade, sustainable development and sustainability have become important topics in the construction industry. According to a recent survey in the UK, 59 percent of developers in both commercial and residential sectors would redevelop on contaminated sites (Dixon, 2006). A survey conducted by the U.S. Conference of Mayors asked cities to identify the most important benefits of redeveloped brownfields. Based on 244 participants who responded to the survey, it was determined that the most important benefits of redeveloped brownfields, highest priority first, is tax base growth, then neighborhood revitalization, followed by job creation, environmental protection, infrastructure utilization and lastly, open space preservation (Figure 2).

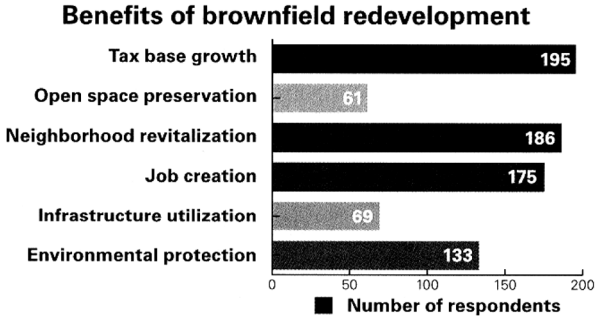

Figure 2
The US Conference of Mayors Conducted a Survey to Identify the Most Important Benefits of Redeveloped Brownfields
Note: Eighty percent of the 244 survey respondents cited an increase in the tax base as one of the major benefits.

4.1 Emeryville Brownfields Pilot Project

The City of Emeryville, located between Oakland and Berkeley, California, experienced enormous benefits from brownfields redevelopment in the late 1990's and continues to work on redeveloping brownfields today. The city saw most of its supporting industries abandon the area during the 1970's, leaving more than 230 acres of abandoned or underused land. Ninety percent of this idle land was known to have soil and water contamination. The US Environmental Protection Agency awarded Emeryville a $200,000 Brownfields Assessment grant for the Emeryville Brownfields Pilot Project to develop a brownfields database for the area and to learn about environmental assessment results and other essential facts necessary to determine reuse potential. Based on these findings, Emeryville was able to develop the brownfields

program followed by a marketing strategy that attracted private investors to purchase property and redevelop contaminated brownfields (US EPA Website).

Part of the initial remedial action plan was to study the history of brownfields and determine the sources of contamination and levels of contamination. It was determined that more than 85 percent of the vacant land had prior industrial and commercial use. Cross contamination made it difficult to pin point sources of contamination. Environmental assessments were conducted by taking groundwater and soil samples to study the geologic conditions. For example, a former 3 acre vacant industrial area called "Site B" was found to have 16 different metals and 30 other volatile and non-volatile organic compounds in the groundwater and soil samples (Table 1). The remedial action plan for cleanup is specific and unique for each site. Teams of experts determine the best options for cleanup on each individual project.

Table 1
Identified Chemicals of Concern on Site B

Identified chemicals of concern	Soil	Groundwater
Metals		
Antimony	X	X
Arsenic	X	X
Barium	X	X
Cadmiun	X	X
Chromium (total)		X
Chromium (VI)	X	
Cobalt		X
Copper	X	X
Lead	X	X
Mercury	X	
Molybdenum	X	X
Nickel		X
Selenium	X	X
Silver	X	
Vanadium	X	X
Zinc	X	X
Volatile Organic Compounds		
Acetone	X	
Benzene	X	X
n-Butylbenzene	X	
sec-Butylbenzene	X	
Chlorobenzene	X	X
1,1-Dichloroethane		X
1,1-Dichloroethene		X
cis-1,2-Dichloroethene	X	X

To be continued

Continued

Identified chemicals of concern	Soil	Groundwater
Ethylbenzene	X	X
Isopropyltoluene	X	
4-Isopropyltoluene	X	X
Methyl tertiary-butyl ether		X
Naphthalene		X
n-Propylbenzene	X	
Tertiary-butyl alcohol		X
Tetrachloroethene	X	X
Toluene		X
Trichloroethene	X	X
1,2,4-Trimethylbenzene		X
1,3,5-Trimethylbenzen		X
Vinyl Chloride		X
o-Xylene	X	
m,p-Xylene	X	X
Semi-Volatile Organic Compounds		
Bis(2-ethylhexyl)phthalate	X	
Fluorene	X	
1-Methylnaphthalene	X	
2-Methylnaphthalene	X	
Total Petroleum Hydrocarbons		
TPH-g, gasoline range	X	X
TPH-d, diesel range	X	X
High boiling point hydrocarbons	X	X

Table 2
Numbers That Represent the Success of Brownfield Redevelopments in Emeryville, California Since 1995

The numbers behind success: since 1995	
Housing Units	534 Completed
	311 Under Construction
Low and Moderate Income Units	214 Completed
	62 Under Construction
Sq.ft.of Office (New Or Redeveloped)	3.6 Million
Sq.ft.of Retail	830,000
Hotel Rooms	488
Estimated Additional Jobs	8,400
Total Value of Development	$513 Million
Estimated Tax Increment	$5.4 Million

Since 1995, the City of Emeryville has leveraged more than $500 million in clean up and redevelopment funding from the private sector, an estimated $5.4 million tax increment, and more than 8,000 new jobs were created (Table 2).

5. DATA ANALYSIS

The City of Emeryville has benefited enormously from incorporating brownfields and redevelopment strategies. With a strong leading role on behalf of the City and a greater understanding of the risks of brownfield redevelopment, numerous sites have been developed or are currently planned for development, creating housing units, businesses, shopping, services, and jobs. This proves that there is a strong correlation between economic, social, and environmental benefit and the regeneration of brownfields into usable and productive properties.

CONCLUSION

There is a lot of interest on behalf of communities and local governments to redevelop brownfields and revitalize their neighborhoods. The question today is how to integrate green building as an important aspect of successful brownfield redevelopments. There is strong evidence that brownfield redevelopment has both economic and social benefits, but more research needs to be done to measure the site-level success of brownfield redevelopments. Currently, there is no framework or tool known to exist that could be used to interpret data and determine the site-level success.

REFERENCES

Charles, J. K. (2008). Sustainable Construction Green Building Design and Delivery. John Wiley & Sons, Inc..

Christopher, W., & Douglas, C. B. (2007). Measuring site-level success in brownfield redevelopments: A focus on sustainability and green building. *Journal of Environmental Management, 85*, 483-495.

Dennsi, A. K., & Norman, R. C. (2006). The impact of small brownfields and greenspaces on residential property values. *J Real Estate Financial Economy, 33*, 19-30.

Greegberg, M., Lee, C., & Powers, C. (1998). Public health and brownfields: Reviving the past to protect the future. *American Journal of Public Health, 88*(12), 1759-1760.

Michael, G. (2002). Should housing be built on former brownfield sites?. *American Journal of Public Health, 92*(5), 703-705.

Michael, R. G., & Justin, H. (2006). The environmental protection agency's brownfields pilot program. *American Journal of Public Health, 96*(2), 277-281.

Peter, A. B. (2007). Adaptive reuse and sustainability of commercial buildings. *Facilities, 25*(1/2), 0-31.

Tim, D. (2006). An analysis of UK development industry's role in brownfield regeneration. *Journal of Property Investment and Finance, 24*(6), 521-541.