CREATING PUBLIC ASSETS FROM BROWNFIELDS: A COMPARISON OF PRACTICES IN THE UNITED STATES AND GERMANY

By

Cassi Marie Meitl

A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

Urban and Regional Planning - Master of Urban and Regional Planning

2015

ABSTRACT

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Contaminated, vacant, or derelict lands, commonly known as brownfields, offer opportunities for economic growth, community revitalization, and increasing resident's quality of life. Due to numerous social, economic, and political forces, brownfields are becoming increasingly concentrated in previously industrial cities and urban areas in the United States and Europe. Literature is readily available on brownfield definitions, policies that guide brownfield management, barriers and challenges to remediation, and economic and environmental benefits of redevelopment. Research is limited on public sector brownfield redevelopment strategies. Many of the previous planning efforts and much of the existing literature is centered on private investment in brownfield sites and vacant land where the site remains commercial or industrial and the process excludes community involvement.

This study focuses on public investment in the adaptive reuse of brownfields by assessing applicable policies and programs, exploring funding practices, and addressing misconceptions about public investment in brownfield redevelopment in the US and Germany. General and location specific information is gathered from scholarly journals and articles, and existing public documents and records, and details on current processes and experiences are revealed through case studies of redevelopment projects in Michigan and the Ruhr region.

ACKNOWLEDGEMENTS

I express my sincere gratitude to my advisor Dr. Zenia Kotval for her continuous support of my Masters study and research. This thesis would not have been possible without her guidance, patience, and encouragement. I would also like to thank the interviewees who participated in this research for their time and valuable contributions.

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KEY TO ABBREVIATIONS

APA	American Planning Association
BEA	Baseline Environmental Assessments
BEDI	Brownfields Economic Development Initiative
BMBF	German Federal Ministry of Education and Research
BMU	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
BMVBS	Federal Ministry of Transport, Building and Urban Affairs
BRA	Brownfield Redevelopment Authority
CABERNET	Concerted Action on Brownfield and Economic Regeneration Network
CBO	Community Benefit Organization
CDBG	Community Development Block Grant
CDC	Community Development Corporation
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CNTS	Covenant not to sue
CRP	Cleanup and Redevelopment Program
DNR	Michigan Department of Natural Resources
EDA	Economic Development Administration
EEA	European Environment Agency
EFRD	European Fund for Regional Development
EPA	Environmental Protection Agency, Unites States
ESIF	European Structural and Investment Funds
EU	European Union

FONA	Research for Sustainability
GCBRA	Genesee County Brownfield Redevelopment Authority
HUD	US Department of Housing and Urban Development
INTERREG III	Joint Initiative for Trans European Cooperation
LEDC	Lansing Economic Development Corporation
LVF	Land Value Finance
MDEQ	Michigan Department of Environmental Quality
MEDC	Michigan Economic Development Corporation
MSHDA	Michigan State Housing Development Authority
NABU	Nature and Biodiversity Conservation Union
NPL	National Priorities List
NREPA	Natural Resources and Environmental Protection Act
OPRA	Obsolete Property Rehabilitation Act
RCRA	Resource Conservation and Recovery Act
REFINA	Research for the Reduction of Land Consumption and Sustainable Land Management
RESCUE	Regeneration of European Sites in Cities and Urban Environments
RRC	Community Assistance Team
SARA	Superfund Amendments and Reauthorization Act
TED	Department of Talent and Economic Development
TIA	Talent Investment Agency
TIF	Tax Increment Financing
TIMBRE	Tailored Improvement of Brownfield Regeneration
URBAN II	Joint Initiative for Urban Sites

US	United States
VCP	Voluntary Cleanup Program

CHAPTER 1: Introduction

1.0 Introduction

Contaminated, vacant, or derelict lands offer opportunities for economic growth, community revitalization, and increasing resident's quality of life. This abandoned, underused, or real property is generally considered a brownfield, or site that was previously used for industrial or commercial purposes, is usually located in an urban area, and may or may not be contaminated (American Planning Association, 2010; Bacot & O'Dell, 2006; Levy, 2013). Coined in the United States, the common term *brownfield* is globally used today in public policy and the development industry (Vanhuesden, 2009). Due to the challenges that accompany the redevelopment of brownfields, the term can have a negative connotation. Recent studies, on the other hand, encourage an optimistic view of brownfields with potential to become community assets through public investment. This study assesses applicable policies and programs, explores funding practices, and addresses misconceptions about public investment in brownfield redevelopment in the United States (US) and Germany.

1.1 The Importance of Studying Brownfield Strategies

The sheer number of brownfields that exist in the US and Europe alone highlights their significance. There are about 425,000 brownfield sites in the US that cover five million acres of vacant land, and account for $2 trillion of undervalued real estate according to an estimate by the Government Accountability Office (National Brownfield Association, 2014). In the 33 European Environment Agency (EAA) member countries per a 2011 estimate there are 2.5 million potentially contaminated sites, 45% of which have been identified (EAA, n.d.).

The stock of brownfields will never disappear since they are part of a constant and complex land use process that affects all cities. As uses of land become redundant, new sites are

made available while others are redeveloped in a land use cycle (Adams, De Sousa, Tiesdell, 2009). Today, brownfields are not equally dispersed, but rather increasingly concentrated in post-industrial cities. Studying the redevelopment of brownfields is necessary to identify solutions, strategies, policies and incentives for the adaptive reuse of the large amount of idle land in urban areas.

1.2 Where Brownfields are Concentrated

Commonly referred to as legacy cities, post-industrial cities, or cities in transition, during the 19th and early 20th centuries these places were booming industrial metropolises of manufacturing, retail, and services. In the decades of structural changes in the world's economy that followed, the success of these cities became history. City factories and mills closed, businesses and residents relocated, and services dwindled as a result of social, economic, and political forces. The shift in economy affected urban form and many industrialized countries and regions are now challenged with the remains of cities with manufacturing-based economic roots.

Post-industrial cities and regions face numerous challenges. Odd-shaped or small plots of land resulting from irrational plot lines, aging infrastructure, and a mixture of incompatible land uses plague the aging cities (Lyons & Hamlin, 2001). The areas struggle with supporting growth and establishing a new economy that will provide opportunities for the existing population that may be poorly educated and untrained. The ability to balance the socioeconomic characteristics of the existing population and encourage social organization challenge leaders with limited capacities to bring about change in local governments (Mallach & Brachman, 2013). With weak market demand, the city's houses, and commercial, office, and industrial buildings become increasingly vacant, abandoned, or demolished and the revenue base declines as businesses and residents vacate the city. The result of these forces is a concentration of brownfields.

1.3 Problem Statement and Research Questions

The redevelopment of vacant and contaminated land has been the focus of planning agencies and professionals worldwide. Scientific literature on the redevelopment of brownfields in the United States (US) and the European Union (EU) has increased in the last two decades. In most recent years, research has expanded the literature from national policy strategies and the identification of redevelopment barriers towards evaluating program outcomes and assessing the effectiveness of initiatives (Hula & Bromley-Trujillo, 2010; Ploegmakers & Beckers, 2014; De Sousa, Wu, & Westphal, 2009). Literature is readily available on brownfield definitions, policies that guide brownfield management, barriers and challenges to remediation, and economic and environmental benefits of redevelopment.

Research that explores adaptive reuse strategies and public funding mechanisms for redevelopment projects is lacking in the US. Many of the previous planning efforts and much of the existing literature is centered on private investment in brownfield sites and vacant land where the site remains commercial or industrial and the process excludes community involvement. Research has not fully explored the broader benefits to the public of brownfield redevelopment for uses other than industrial or commercial. Other potential uses for vacant land include: recreation, residential, education, temporary, agriculture, and entertainment. Numerous states in the US have incentive programs and options to encourage the adaptive reuse of brownfields to transform them from liabilities to community assets, but research is lacking on the process to do so (Adelaja, Shaw, Beyea, &McKeown, 2010). In Germany brownfield redevelopment is advanced, the public sector is increasingly involved in the process, and innovation in adaptive reuse strategies is a priority. This research will provide a comparison of redevelopment practices to convert brownfields to public assets in the United States and Germany.

Research was guided by the following research questions:

1. How do policies and programs address brownfields?
2. What is the public sector's current role in funding brownfield redevelopment projects?
3. Which misconceptions potentially limit public investment in brownfield redevelopment?

1.4 Methods

For this thesis research, general and location specific information is gathered from scholarly journals and articles, and existing public documents and records. Details on current processes and experiences are revealed through case studies of redevelopment projects in Michigan and the Ruhr region. The analysis of one redevelopment project in each location includes a qualitative interview to provide a practical application of current strategies. Attention is paid to applicable policies and programs, public funding mechanisms, and barriers and opportunities.

A case study is an appropriate form of research because the research questions are explanatory in nature, contemporary events are the focus of examination, and the researcher does not intend to manipulate relevant behavior (Yin, 2009). It is expected that an analytic generalization of the case study results combined with information from existing public documents and records will lead to the development of theoretical strategies with application to brownfield redevelopment (Yin, 2009). Furthermore, the international comparison of current practices will reveal opportunities to promote public sector investment in the adaptive reuse of brownfield sites in the US.

1.5 Michigan and the Ruhr Region (Ruhrgebiet)

This research focuses on two specific locations: Michigan, Unites States and the Ruhr region in North Rhine-Westphalia, Germany to provide an international perspective. Numerous similarities allow for a comparison between the two places. Both regions had previously concentrated industrial activity and have experienced significant population and economic decline.

Michigan is located in the northeast part of the Midwestern US. The state is surrounded by the Great Lakes and includes two land masses: an upper and lower peninsula. There are more than 1,500 cities, villages, townships, and unincorporated areas in Michigan's 83 counties. The state's vast resources and optimum location provided opportunities for success in the agriculture, mining, and logging industries. By the 1800's, these industries that relied on the network of lakes to transport goods were booming. Urbanization of the state and its cities then followed the general trend of urbanization in the United States. Cities grew in geographic and population size with industrialization during the late 19th century partially because they were easily accessible by water and by land, near production centers and close to sources of coal, iron, and copper (Sugrue, 2007). Detroit, the largest city in Michigan was originally a leading center for the manufacturing of cigars and kitchen ranges and the production of shoes, bicycles, paint, beer, and pharmaceutical products (Craig, 2006). By the early 20th century, the city became the center of the automobile industry. As the auto capital, economic growth in Michigan was dramatically impacted by the success of the industry (Michigan Legislature, 2001).

Michigan experienced significant economic growth and prosperity during the 1940's. By this time, Detroit was home to nearly two million people and was the fifth largest city in the United States (Levy, 2013). During the following decade, the city began experiencing

decentralization as a result of numerous forces, including: the automobile, the growth and prosperity of the middle class, federal funding for highway system improvements, new technology that removed the need for face-to-face business contact, affordable housing options in the suburbs, a lack of appropriate economic development tools, and racial tension (Levy, 2013; Thomas 1990). The deterioration of Detroit is reflective of the state's experience. After losing over 300,000 manufacturing jobs in the 1970's, Michigan experienced population loss, and economic decline (Michigan Legislature, 2001).

Despite Germany's longer history, the Ruhr region as it is known today is about the same age as Detroit; considering substantial growth and urbanization occurred around the same time. The Ruhrgebiet includes 53 cities and villages located in North Rhine-Westphalia in western Germany in the center of Europe. The region's location at the southern end of the Dortmund-Ems Canal stimulated rapid growth since it offered opportunities for transportation through the Ruhr River to the North Sea. Following industrialization in the late 1800's, the area became a center for coal, steel, iron, and beer production. By the early 1900's, the regional cities Bochum, Dortmund, Duisburg, and Essen were leading Germany in the mining of coal, iron and steel production, the brewing of beer, and machinery and motor vehicle production (Stadt Dortmund, 2015). Between 1850 and 1925, the population in the region grew from about 400,000 to 3.8 million, as people came from all over Germany and neighboring countries (Hospers, 2004). The major industrial region became the center for military weapons and machinery during the World Wars; resulting in the destruction of 75% of the area during World War II (Encyclopedia Britannica, 2014). After reaching its peak in 1956, the mining industry crumbled as a result of the mining and steel crisis, industrial dismantling, modernization, and controlled rebuilding (Encyclopedia Britannica, 2014; Hospers, 2004). The collapse of industry contributed to

population and economic decline beginning in the 1970s as the region lost tens of thousands of jobs (Grieshaber, 2014).

The influential forces on economic decline and the cultural context differ between the two locations, yet the extent of job loss relative to the previous population and significant land vacancy makes their present situations similar. Michigan is currently home to 9.8 million people, only 7% of which live in the largest city, Detroit. The city filed for bankruptcy in 2013 to address its estimated long term $19 billion of debt. It has 78,000 abandoned structures, a weak market for downtown office space and retail shopping, an unemployment rate that is more than double the national average, and is plagued by crime and violence (Reeves, 2013; Eisinger, 2003). Detroit is not alone in its struggles. Since 2012, a total of thirteen units of government, including a county, in Michigan have been appointed an emergency manager to assist with financial instability. In the Ruhr metropolitan region, where there are 5.3 million residents and an unappealing urban fabric, the unemployment rate is nearly double the national average, and the regional cities face budget shortfalls and have significant debts (Greishaber, 2014; Thimm, 2010). The air, water, and soil are polluted and the landscape is littered with deteriorating roads, waterways, railways, and gas or sewage pipes (Kunzmann, 2004).

Today both places are encouraging the development of arts, entertainment, sports, culture, and services to support the tourism industry. Michigan advertises its western Lake Michigan beaches and northern forests and campgrounds to every outdoor recreation enthusiast and family across the state and Midwest region. The development of attractions is encouraged in all cities and townships to entertain, feed, and house the yearly influx of visitors. In regards to entertainment, Detroit for instance has three casino complexes, three major sports arenas, one of the largest theater districts in the country, a university, numerous museums, an art institute, and

hosts a large jazz festival and the auto show each year (Detroit Metro Convention & Visitors Bureau, 2015). The Ruhr region is home to numerous monuments, museums, galleries, theaters, and shopping districts, an annual music and arts festival, universities and research institutes (Thimm, 2010). Sports venues and green space are also attracting visitors (Dortmund Tourismus, 2014). The region was named the European Capital of Culture in 2010 by the European Union; the first entire German region to receive this honor (Internet Commercial Informations Services, 2015).

Once thriving industrial areas, Michigan and the Ruhr region have since suffered from economic depression. The regions are deep in debt, have unemployment rates that are considerably higher than their respective national average, and struggle with an increased prevalence of drugs, crime, and violence. The former manufacturing state in the Midwest and previous industrial heart of Germany are trying to reinvent themselves with a new economy, but the industrial jobs lost during the late 1900's have not yet been replaced (Grieshaber, 2014). Both places are currently in the process of planning and making efforts for redevelopment. Furthermore, both have an abundance of brownfields and are challenged with the problems that accompany them.

1.6 Case Study Projects

As identified in the methodology, this research includes a case study on one brownfield redevelopment project in both Michigan and the Ruhr region. Information on each project is gathered from existing documents and records, and through a qualitative interview with a local and knowledgeable professional. Questions about the contamination and environmental remediation, funding mechanism, redevelopment plans, and economic impact are used to guide the interviews.

Both brownfield redevelopment projects identified below were financed with public funds; incorporated community input in the planning stages; are located in economically depressed areas, but where there is a demand for housing and entertainment; and exemplify the conversion of contaminated, vacant, or derelict land to a new use that is not industrial in nature. The publicly funded projects promote environmental, social, and economic goals and the new recreational, residential, and public space uses offer improvements to local residents' quality of life.

The Utica Community Complex is located in southeast Michigan. Although it is outside the boundaries of the City of Detroit, like many places in Michigan, Utica was affected by similar social, economic, and political forces that contributed to deindustrialization. It is worth noting that the project is located on the fringe of an outer suburb rather than in an urban area and is currently under construction, to be finished in 2016. The Phoenix-See project is located in Dortmund, one of the four largest cities in the Ruhr region. The social, economic, and political situations in the city are reflective of those in the Ruhr region.

1.7 Utica Community Complex: Utica, Michigan

Details on the Utica Community Complex are revealed in an interview with Michelle Bakun, Brownfield Redevelopment Coordinator with Michigan Department of Environmental Quality (MDEQ) Remediation and Redevelopment Division and in Macomb County's Brownfield Redevelopment Grant and Loan Application (personal communication, October 21, 2015; 2015). The Utica Community Complex is a redevelopment project in Utica, Michigan on a brownfield site. The City of Utica is located in western central Macomb County, 12 miles north of Detroit. The "historic, traditional, walkable downtown community" is small, only 1.8 square

miles with under 5,000 residents (Macomb County, 2015, p. 7). As shown in Figure 1, it is located on the Clinton River and off a major Michigan highway.

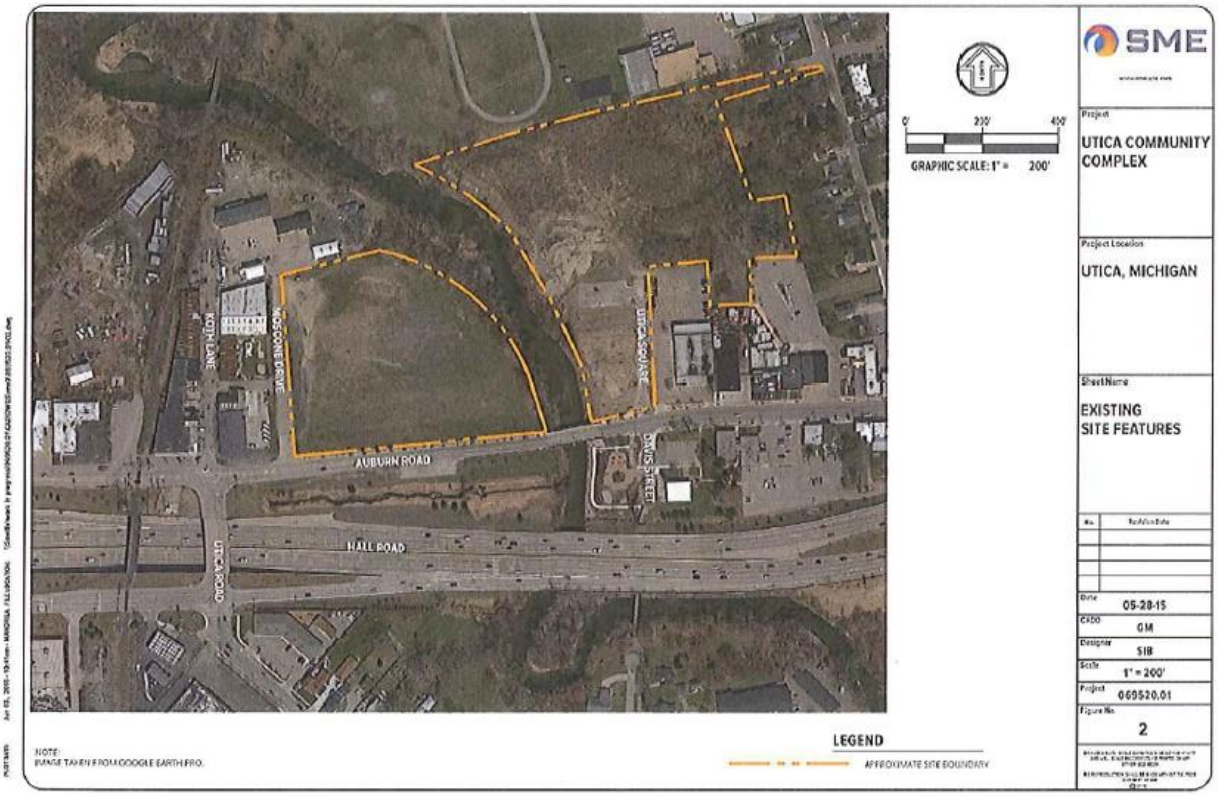

Figure 1. Utica Community Complex Aerial View
Source: Macomb County, Brownfield Redevelopment Grant and Loan Application

The property for the Utica Community Complex was originally a sand mine which was then used an unlicensed dump from the 1940's to the 1960's and then it remained vacant. The 15 acres of property located near the main downtown commercial area of Utica are divided into east and west parcels by the Clinton River. The city acquired the west parcel in 2009 as a result of tax reversion and used the land periodically for community events. A residential building was constructed on the east parcel in the early 2000's but it was never finished or occupied. The Downtown Development Authority and the city acquired this parcel in 2009 by voluntary acquisition and demolished the building remnants. Both parcels are contaminated by waste

material with volatile organic compounds, polycyclic aromatic hydrocarbons, metals, and methane gas.

The $12 million community activity complex currently under construction will include a 2,000 seat ballpark and entertainment venue, picnic areas, and parking. The stadium, pictured in Figure 2 below, will house a three team minor baseball league, be used by school and college level softball and baseball teams, and is designed to accommodate community uses including but not limited to: a walking program for seniors, concerts, an outdoor ice rink, graduation ceremonies, and movie nights. In addition, plans are in place to build a pedestrian bridge over the river, and connect the recreation and picnic areas to numerous other walking, hiking, and biking trails. The place-making project is a public-private partnership between the City of Utica, Macomb County, and General Sports and Entertainment (a sales, marketing, and customer service company).

Figure 2. Future Utica Ballpark and Community Complex
Source: Macomb County

1.8 Phoenix-See: Dortmund, Germany

Information on the Phoenix-See project is gathered from an interview with Jens Woelki, Aktionsraumbeauftragter of Hörde within the Aktionsplan Soziale Stadt in Dortmund. His position is a project manager for the urban revitalization of Dortmund-Hörde within a program to develop the less developed third of the city's neighborhoods and improve the social situation for residents (personal communication, October 26, 2015). Phoenix-See is one part of a two-part redevelopment project that includes Phoenix-See and Phoenix West in Dortmund, Germany. Both properties are located just southwest of Dortmund city proper on the east and west side, respectively, of the Hörde borough or district, which is bordered by major highways. The historic downtown of the Hörde, where there is rail connection to Dortmund city center, is between the properties.

Prior to 2001, both sites totaling 200 hectares were owned by ThyssenKrupp, a diversified industrial group. A blast furnace was on the site of Phoenix West and Phoenix-See was home to a steel-plant. When the company shut down operations at the sites in 1998, over 10,000 jobs were lost and the city was left with vacant industrial buildings and contaminated soil. The sites then became one of the largest urban development projects in Germany, funded by the city of Dortmund, the Land, the federal Bundestag, and the European Union. The city purchased both properties in 2001 and gave them to a subsidiary of the Dortmunder Stadtwerke AG, the public developer Phoenix See Entwicklungsgesellschaft mbH. The steel mill equipment was removed and sold to a company in China, plans were made for both sites, and the environmental contamination on the Phoenix-See site was remediated. Since individual properties were then sold to private developers and businesses, the project can be considered a public-private partnership.

Today Phoenix West is a technology park to encourage the development of new industry in the region. About 30% of the area is sold and 20% is reserved by companies and businesses that employ about 750 people. The city's goal is for 3,000 people to work in Phoenix West in the next five to ten years. As of 2011, the Phoenix-See side of the project, pictured is Figure 3, is a €200 million (over $221 million) mixed-use residential, commercial, and recreational development with a lake with a water surface area of 24 acres. The man-made lake attracts wildlife and can be used for sailing small boats, the property is surrounded by pedestrian and bicycle paths, and other features include a marina, floating stage, and promenade with restaurants (Stadt Dortmund, 2015).

Figure 3. Phoenix-See Aerial View
Source:www.commons.wikimedia.org

1.9 Overview

The following paper is divided into three chapters that individually address each research question: Policies and Programs, Public Sector Funding, and Misconceptions About Brownfield Redevelopment. Each chapter opens with findings, proceeds with a discussion that compares both locations, and closes highlighting opportunities for the application of German practices in the United States and Michigan. Details from the case study projects are used to support arguments throughout the discussion in each chapter. The paper concludes with a discussion of overall recommendations and implications for planning in the US.

CHAPTER 2: Policies and Programs

2.0 Introduction

Brownfield redevelopment practices are directed by government policies. This chapter assesses how policies and programs apply to vacant, contaminated, and derelict land. Background information is provided to explain the definition of the brownfield term, and the complicated history and evolution of policies. The presentation of findings begins with the legislation, programs, and agencies involved in the US and Michigan, and are then provided from the EU and Germany. Comparisons are made in the discussion between the highest levels of government, which include the federal US and federal Germany, and the lowest local municipal levels. The role of the European Union is so too considered. The levels of government in the middle include the state and county in the US, and the state and region in Germany.

2.1 Brownfield Definition

The brownfield definition challenges the accurate evaluation and comparison of laws and legislation. The definition of brownfield sites is not universal within jurisdictions in the United States, among EU member states, or worldwide (Bacot & O'Dell, 2006; Alexandrescu, Martinat, Klusacek, & Bartke, 2014). According to the US Environmental Protection Agency (EPA) and US Small Business and Liability Relief and Brownfield Revitalization Act, a brownfield site is "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" (USEPA, 2002; Public Law 107-118, H.R. 2869, p. 6). Examples of brownfields in the US, according to the National Brownfield Association (2014) include: abandoned gas stations and dry cleaners, strip malls, railroad properties, and closed military bases.

Even though the federal EPA definition is recognized in the US, state governments are authorized to determine the local definition of brownfields. Since 2000, brownfields are defined in Michigan as "functionally obsolete" or blighted facilities previously used for commercial, industrial, public or residential purposes (Hula & Bromley-Trujillo, 2010). Michigan's definition does not consider whether or not the land is contaminated or may be contaminated. Michigan's cleanup programs consider property contaminated with more hazardous substances than the state cleanup standard for residential property to be considered to be a *facility* (MDEQ, 2013a). A Michigan brownfield is not necessarily a facility.

The European Union does not have a generally accepted definition since descriptions are determined at the national level, and member states do not consistently use the English term *brownfield* or a term that directly translates to brownfield when referring to the land use problem (Vanhuesden, 2009). When considering only polluted soil, examples of sites in Europe include former and current industrial sites, dumps, wrecked car heaps, river basins, petrol stations, and sites of illegal dumping (Vanhuesden, 2009). In France, brownfields are spaces that are temporarily or definitely abandoned and can be partially occupied, derelict, or contaminated (City of Stuttgart – Department for Environmental Protection, 2012). Since there is not a commonly recognized definition in the Netherlands, sites are not necessarily vacant or contaminated (Ploegmakers & Beckers, 2014; City of Stuttgart – Department for Environmental Protection, 2012).

The German definition of the equivalent of a brownfield separates the land challenge into parts. The term *Altlasten* is used to describe "disused waste disposal and other sites with extensive soil contamination identified by hazard assessment as a concrete threat to human health or the environment" (Academy for Spatial Research and Planning, 2008, p. 175). The

broad German term *Brachfläche* is translated as derelict and vacant land and omits the question of pollution or contamination (Academy for Spatial Research and Planning, 2008). The terms frequently used to describe these "urban revitalization areas" include *Innerstädtische Brachflächen* (innercity building areas not currently used) and *Innerstädtrische Entwicklungs und Sanierungsgebiete* (innercity areas for redevelopment and refurbishment) (CABERNET, 2003). As identified by the German Federal Environmental Agency guidebook (2005), the definition is always describing "land that was previously used" (p. 5).

2.2 United States

Many policies trickle down from the highest level of government leadership in a country or organization of countries to set the tone and focus. The highest level of leadership in the US, a federal constitutional republic is the federal government. The Legislative branch (US Congress) passes laws that apply to all fifty states. The laws are interpreted by the Judiciary branch and implemented through regulations enforced by Executive branch departments and agencies. Executive bodies that are involved in the remediation and redevelopment of contaminated, vacant, and derelict land include the US Department of Housing and Urban Development (HUD), and interior agencies such as the US Environmental Protection Agency (EPA) and Economic Development Administration (EDA).

Federal policies on brownfield management in the US began with the Resource Conservation and Recovery Act (RCRA, Pub. L 94-580) of 1976 and the Comprehensive Environmental Response Compensation, and Liability Act (CERCLA) of 1980. Under RCRA, individuals were allowed to file a citizen-suit to hold previous owners responsible for contamination on properties (American Planning Association, 2010). Commonly known as *Superfund*, CERCLA requires owners of contaminated sites or those responsible for

contamination (including retroactive liability for contamination caused before such contamination became illegal) to bring the land up to EPA standards (Jones & Welsh, 2010).

Per the United States Environmental Protection Agency website (2012), CERCLA:

- Created a tax on the chemical and petroleum industries
- Provided broad Federal authority to respond directly to releases or threatened releases of hazardous substances
- Established prohibitions and requirements concerning closed and abandoned hazardous waste sites
- Provided for liability of persons responsible for releases of hazardous waste at these sites
- Established a trust fund to provide for cleanup when no responsible party could be identified
- Authorized a response action for short-term removal to address releases or threatened releases requiring prompt response
- Authorized long-term remedial response actions that permanently and significantly reduce the dangers associated with the releases or threats of releases of hazardous substances that are serious, but not immediately life threatening

Since CERCLA focused exclusively on remediation, there were unfortunate consequences. Some companies and individuals abandoned properties or declared bankruptcy to evade responsibility for the costly cleanup (Brachman, 2004). In addition, CERCLA made potential buyers hesitant to purchase the liability of and/or invest in previously industrial sites that may be contaminated (De Sousa et al., 2009). Finally, since banks were hesitant to foreclose on properties and cleanup standards required sites to be restored to pre-development levels of contamination, the act contributed to a market that favored greenfield sites, or undeveloped land in suburban and rural areas, for industrial and commercial development over urban brownfields (Levy, 2013; Brachman, 2004).

In 1986, CERCLA was amended by the Superfund Amendments and Reauthorization Act (SARA). Per the EPA website (2012), SARA:

- Stressed the importance of permanent remedies and innovative treatment technologies in cleaning up hazardous waste sites;
- Required Superfund actions to consider the standards and requirements found in other State and Federal environmental laws and regulations
- Provided new enforcement authorities and settlement tools

- Increased State involvement in every phase of the Superfund program
- Increased the focus on human health problems posed by hazardous waste sites
- Encouraged greater citizen participation in making decisions on how sites should be cleaned up
- Increased the size of the trust fund

CERCLA and SARA establish federal priority in the area of environmental cleanup. The policies were originally directed towards the most hazardous waste sites and did not encourage site redevelopment or post clean-up use (Jones & Welsh, 2010). To mitigate some of the negative effects of these acts, allocate funding for redeveloping sites, and provide clarity on the federal government's role in managing brownfields, the Brownfields National Partnership Action Agenda was launched in 1995 (De Sousa et al., 2009). The goal of the agenda was to develop a coordinated national agenda for addressing environmental protection, economic development, and community revitalization related to brownfields (Garczynski, 1997).

In the years that followed, state governments took the lead in redevelopment with an alternative to the CERCLA model (Jones & Welsh, 2010). By implementing voluntary cleanup programs (VCPs), state environmental remediation capacity increased significantly. The programs simplified the cleanup process and capped future liability to encourage owners to remediate brownfield sites and attract redevelopment. In response to the increasing resistance and disapproval of the federal approach, the Small Business Liability Relief and Brownfields Revitalization Act (Pub. L. 107-118,115 stat.2356) commonly known as *The Brownfield Law*, was passed by the federal government in 2002 to again amend CERCLA (De Sousa et al., 2009; Bacot & O'Dell, 2006; EPA, 2012). The Brownfield Law:

- Exempts persons from Superfund response cost liability at National Priorities List (NPL) sites as generators and transporters if the person can demonstrate that they contributed less than 110 gallons of liquid materials or 200 pounds of solid materials containing hazardous substances and that all or part of the disposal, treatment, or transport occurred before April 1, 2001

- Exempts persons from Superfund response cost liability as generators for the disposal of municipal solid waste if the person is an owner, operator, or lessee of residential property, or a business of nonprofit with not more than 100 employees
- Expedits settlements based on limited ability to pay
- Authorized a new budget for brownfields assessment and cleanup
- Expands the definition of brownfields to include mine scarred lands and lands contaminated with petroleum or controlled substances (American Planning Association, 2010)
- Exempts persons that own contaminated land and bona fide prospective purchasers (and their tenants) from owner or operator liability if the land was contaminated by someone else
- Offers protection for innocent landowners
- Authorizes grants to assist States and tribes in the development of State response programs

The amended CERCLA and Brownfield Law currently apply to contaminated sites according to different classifications. Brownfields are typically less contaminated that CERCLA or Superfund sites, of which the most contaminated are listed on the National Priorities List (NPL). The NPL classification, which designates the sites that need a more elaborate management process, helps to prioritize remedial response action funding (American Planning Association, 2010). The EPA, a federal US agency, oversees Superfund and NPL sites while state and local jurisdictions oversee most brownfield cleanup and redevelopment projects.

These acts have had both positive and negative impacts on public and private development. Although the Brownfield Law provides some liability relief, CERCLA is still a strict liability statute. This may deter developers that are not best prepared to protect themselves as the potentially responsible party (Goodstein, Trinward, & Lynch, 2011). Public agencies, on the other hand, are protected. To support public investment and protect local and state governments, when property is acquired by a government entity by escheat, through a voluntary transfer, or eminent domain, the entity is not held to CERCLA liability in the US (Goodstein et al., 2011).

2.3 Michigan

Understanding state authority is key to understanding the state's role in brownfield management in the US. The federal government shares sovereignty with all fifty state governments. Per the US Constitution, state governments are awarded all powers not granted to the federal government. Since state governments are modeled after the federal government, the state law making process is similar; the state legislature passes laws that are implemented through regulations enforced by executive branch departments and agencies. Brownfield applicable executive departments in the state of Michigan include: MDEQ, Michigan Department of Natural Resources (MDNR), and the Department of Talent and Economic Development (TED), which includes the Michigan Economic Development Corporation (MEDC), the Michigan State Housing Development Authority (MSHDA), the Michigan Strategic Fund and the newly created Talent Investment Agency (TIA).

Forces at the state and local level have driven brownfield redevelopment beginning in the 1990's to promote economic development with tax-base growth, job creation, and neighborhood revitalization (Adams et al., 2009). Many state laws originally followed federal legislation with a strict liability framework and held the owners of contaminated property liable for cleanup regardless if they had or had not caused the contamination. The *Polluters Pay Law* (Public Act 233 of 2990) in Michigan held private parties responsible for pollution so that public funds would not be used to pay for cleanup (Swartz, 1994). As a result of this strict legislation, investors began to avoid polluted or potentially polluted brownfield locations. The financial industry denied resources for reinvestment in brownfields fearing that environmental liabilities would be imposed on lending banks (Swartz, 1994). When frustration with this approach grew,

as mentioned earlier, states took the lead in brownfield redevelopment with innovative legislation that released liability and created voluntary cleanup programs (VCPs).

VCPs release liability or ensure that the state will not enforce later action on the remediated site if the development party implements a state approved remediation plan (Goodstein et al., 2011). Recent research in Chicago highlights the success of state VCPs; although it should be considered that Illinois is at the forefront of remediation programs in the US. Winston-Geideman, Simons, and Pendergrass' (2004) research found that properties redeveloped in the program that received closure letters during the early 21st century were prepared for market re-entry, as they demonstrated high building and property values. Nationwide the number of these state programs have increased; adapting over time to meet the needs of those involved in brownfield redevelopment (Goodstein et al., 2011). Regardless, participation in the cleanup program does not guarantee that the site will be redeveloped since it only releases the owner from liability.

To release liability in Michigan, the state initially passed the Natural Resources and Environmental Protection Act (Act 451 of 1994, NREPA) to enable the state to enter into a covenant not to sue (CNTS) with a landowner innocent of contamination for past liability. The EPA was involved in the agreement to protect a future purchaser from federal pursuit of liability as long as the new use did not release pollutants. Under the Act, parties responsible for contamination on property they own are required to pay for remediation and can be fined up to $10,000 per day for not diligently pursuing containment and cleanup (Jones & Welsh, 2010). The act regulates the discharge of substances and use of resources, and sets standards for pollution control. The pollution controls specify waste management, pollution prevention,

funding, remediation, and underground storage tanks (Natural Resources and Environmental Protection Act of 1994, 2009).

This act highlights the shift of focus from environmental cleanup to economic development. The CNTS punishes those responsible for contamination and requires cleanup. However, it does not require cleanup from owners not responsible, and releases both current and future owners from liability. This act was the first of its kind with the goal of promoting the redevelopment of contaminated sites with industrial and economic potential (Swartz, 1994).

Over the years, the state's policies and practices have improved. Michigan has designed a Site Reclamation Program to provide funding through grants and loans for the cleanup and reuse of properties with economic potential (Swartz, 1994). Furthermore, to avoid full liability in Michigan, new owners of potentially contaminated property are required to conduct and submit a Baseline Environmental Assessment (BEA) to MDEQ within 45 days of purchasing a property (MDEQ, 2013a). This analysis is a more efficient process to evaluate liability claims against previous and current landowners and operators than the CNTS process discussed above (Jones & Welsh, 2010). Under the BEA, new owners and operators of contaminated sites are required to protect the public and avoid worsening existing contamination by meeting "due-care" requirements. Replacing the practice of receiving a No Further Action Letter, as requested, MDEQ still issues a Certificate of Completion. The certificate releases the party from liability upon completion of a MDNR approved remedial action plan. It is worth noting that a BEA does not provide liability relief from state and federal laws.

In sum, state policy innovations in Michigan that differ from the federal approach include:

- Increased flexibility in cleanup standards with criteria based on land use
- Limited owner liability for innocent land owners

- Increased reliance on private or voluntary action with a baseline environmental assessment
- Increased public funding and tax incentives
- Explicit recognition of economic development as a policy goal
- Expanding the definition of brownfield to include vacant and underutilized properties in blighted areas (Hula & Bromley-Trujillo, 2010; Jones & Welsh, 2010).

The state agency that oversees contaminated property or *facilities* is the Michigan Department of Environmental Quality (MDEQ). When the federal approach required strict remediation, MDEQ created a unique framework that does not require contaminated properties to be brought to a "greenfield standard." Instead Michigan originally had three tiers of standards, in descending order of stringency for: residential, commercial, and industrial properties. The standards differ by the type of contamination present and provide local governments the option to institute controls on land use through zoning or restrictive deed covenants as an alternative to site cleanup. Today there are five categories of land use-based cleanup standards: unrestricted residential, unrestricted site-specific, restricted residential, restricted non-residential, and restricted site-specific (MDEQ, 2013a). They provide flexible options to clean property to a level appropriate for the future use and release liability concerns.

Numerous other organizations in Michigan are involved with brownfields in some capacity. Organizations include: Community Assistance Team (RRC), Brownfield and Redevelopment Programs, and the United States Environmental Protection Agency (EPA) Region 5 Brownfield Program. The organizations provide local units of government with various support programs, technical information, and resources.

2.4 Local

States in the US are subdivided into counties and then municipalities (cities, townships, and villages). Many states, including Michigan, follow a Home Rule Act which allows for local self-governance. The act grants counties and municipalities the right to exercise state powers of

governance at a local level without state intervention, given that they establish a city charter. The municipalities use ordinances and zoning regulations as land use tools for governance and make decisions locally, guided by community master plans.

Since development is overseen at a local level, city governments play an central role in the reduction of vacant land (Pagano & Bowman, 2004). The local government is responsible for providing the long-range vision for the community through the master plan (Kotval & Mullin, 2009). Brownfield redevelopment is impacted by these plans, ordinances, and zoning regulations. For example, community master plans that prioritize brownfield redevelopment can inform developers about incentives, assistance, or resources, and proactively changing zoning regulations can indicate that the community is ready for revitalization (Kotval & Mullin, 2009). In addition, city governments can encourage private sector development and public-private partnerships with use and reuse policies. Finally, local units of government can further impact development with a Brownfield Development Plan, a written requirement to receive state funding for projects.

In regards to policies and programs that address brownfields directly, two Michigan acts apply at the local level. Firstly, under Michigan Public Act 381, any local unit of government can establish a brownfield redevelopment authority (BRA) and adopt brownfield plans. Secondly, the Obsolete Property Rehabilitation Act (OPRA), Public Act 146 of 2000 encourages the redevelopment of contaminated, blighted, or functionally obsolete buildings through tax incentives. Brownfield redevelopment authorities, as advised by community advisory committees, provide tax increment financing (TIF) reimbursement for environmental and non-environmental activities on eligible properties according to definitions and procedures set by the state Brownfield Redevelopment Financing Act (MCL 125.2651-2660). The Genesee County

Brownfield Redevelopment Authority (GCBRA) for instance works with the Genesee County Land Bank in Genesee County in central eastern Michigan and the City of East Lansing established a BRA to operate within its boundaries in central Michigan to provide TIF reimbursement for blight elimination and the improvement of brownfields.

Aside from local government, city nonprofit organizations are indeed involved in brownfield redevelopment. In Detroit, Midtown Detroit, Inc. collaborates with other city entities and provides resources and services to guide interested parties through brownfield redevelopment. The organization's website offers information on federal, state, and local funding opportunities (Midtown Detroit, Inc., 2015). The Lansing Economic Development Corporation (LEDC) in Lansing encourages brownfield redevelopment by attracting, expanding, and retaining business and industry in the city. The benefits of such organizations is that they aid developers through the complicated process of redevelopment from the most local level up to the federal level.

2.5 European Union

Since there is unifying leadership among European countries through a twenty-eight country partnership, the highest level of leadership is European Union (EU) legislation in the form of regulations, directives, and decisions. The European Parliament and Council approve legislation, which is drafted and implemented by the Commission. It is worth noting that EU legal acts may not be binding and may not apply to all member countries.

Brownfield regeneration in Europe is not associated with a specific set of regulations from the EU to be adopted at national levels (Alexandrescu et al., 2014). Since member states do not consistently use the term brownfield, European law addresses soil remediation (Vanhuesden, 2009). From this environmental perspective, brownfields are overseen by the Environment

Directorate General of the European Commission under the European Commission (European Commission, 2015). The initial step in an integrated EU policy that addressed the remediation of contaminated sites and pollution was the Soil Thematic Strategy (COM(2006) 231) adopted by the European Commission in 2006 (European Commission, 2015). The EU legal framework communicated a need for soil protection to other European Institutions, proposed a framework for the adoption of soil protection by member states (Soil Framework Directive), and included an assessment of economic, social, and environmental impacts. In 2014, the Soil Framework Directive was withdrawn. Since the directive called for action at the European level besides action by member states, the member states felt that it did not respect the principle of subsidiarity. EU member states feel strongly that soil issues should be handled at national, regional, or local levels (Vanhuesden, 2009). To commit contaminated soil remediation as an EU principle, the Seventh Environment Action Programme, a non-legally binding document, has since been adopted (European Commission, 2015).

Other applicable directives include the Environmental Liability Directive, and Environmental Crime Directive (Vanhuesden, 2009). The Environmental Liability Directive provides a framework for holding operators that caused environmental or land damage fiscally responsible for the costs of preventative and remedial actions (Vanhuesden, 2009). To ensure the provision of penalties, member states are required to comply with the Environmental Crime Directive. According to the directive, the contamination of a brownfield may be considered a criminal offense (Vanhuesden, 2009).

In the EU, unexcavated purposefully or accidentally contaminated soil is considered waste. Waste is overseen by the Waste Framework Directive, which previously did not recognize the possibility of a risk assessment and limited remediation techniques. To ease the burden on

developers, the new Waste Framework Directive excludes what would be considered brownfield soil (Vanhuesden, 2009). The management of contaminated or brownfield soil is held to national standards given that they comply with the applicable directives discussed above.

European law is limited in terms of binding policies and directives related to brownfields, but the EU commits to numerous research programs. For instance, the Regeneration of European Sites in Cities and Urban Environments (RESCUE) program that began in 2002 is tasked with identifying previous mistakes and exploring solutions to land use. CityChlor, another EU program that encourages environmental protection and sustainable urban development, focuses specifically on small inner-urban polluted sites (City of Stuttgart – Department for Environmental Protection, 2012). These programs, among others, are designed to explore and guide policy and practices in member states.

2.6 Germany

As in many EU member states, federal brownfield-related legislation in Germany was strongly influenced by the American federal approach, including the Superfund legislation (Thornton, Franz, Edwards, Pahlen & Nathanail, 2007). Germany is a democratic, federal, parliamentary representative republic with sixteen federal states known collectively as Länder. The Bundestag and Bundesrat comprise federal legislative power to pass legislation; which is frequently executed by state or local agencies. Permanent committees in Parliament work on specific areas of policy. Committees that apply to contaminated, vacant, or derelict land include Economic Cooperation and Development and Environment, and Nature Conservation, Building and Nuclear Safety. The initial focus of legislation was from an environmental standpoint with strict liability statutes. Much like in the US, German law holds the polluter responsible for

remediating damage from contamination. When the polluter cannot be determined, the owner of the property is liable (Federal Environmental Agency, 2005).

Consistent with the European approach, German policy addresses contaminated soil. Prior to the withdrawn EU Soil Framework Directive, Germany passed the Federal Soil Protection Act (BBodSchG, 1998) to regulate the remediation of contaminated sites. The Act sets limits for allowable contaminant concentrations and requires that contaminated land classified as waste be decontaminated, disposed, or remediated (Thornton et al., 2007). Under the Federal Soil Protection and Contaminated Sites Ordinance (BBodSchV), the federal states are responsible for acquiring brownfields. Both pieces of legislation establish standards for evaluation and regulate the decision-making process (City of Stuttgart – Department for Environmental Protection, 2012). To orchestrate the redevelopment process, the later ordinance established a public-private decontamination contract. Related key policies that apply to the management of contaminated soil include the Closed Cycle Management Act, the Sewage Sludge Ordinance, the Federal Nature Conservation Act (BNatSchG), and the Ordinance on Biowaste to provide guidelines for the recycling and disposal of waste.

Combined with the policies above that directly apply to contaminated soil, German policies that limit sprawl and focus on contaminated land management and *Flächenrecycling* (land recycling) address the redevelopment of brownfields (CABERNET, 2003). The German federal agenda includes measures to protect greenfields and limit what is referred to as land sealing (Federal Environmental Agency, 2005). The Land Protection Concept from 1985 and the succeeding measures set the tone for environmental policy with a focus on land protection. In 1998 the Federal Building Code was amended with a land protection clause and the Federal Land Protection Law was adopted. The law, combined with the Federal Land Protection and Residual

Contamination Ordinance from 1999, improved cost-efficiency and ecological effectiveness of the clean-up of contamination and reduced liability (Federal Environmental Agency). Similarly, objectives such as the 1998 Draft Environmental Programme published by the Federal Ministry for the Environment detail goals including: industrial site rehabilitation and hazard elimination; and land consumption reduction (CABERNET, 2003). Land consumption reduction was further emphasized in the National Sustainability Strategy from 2002 (Federal Environmental Agency, 2005).

To guide and advance policies that address land use and redevelopment issues, research is a priority to the German federal government. Key agencies involved in research include the Federal Office of the Environment and the Federal Office of Construction and Regional Planning. Both organizations actively research creative strategies and provide manuals and guidelines for reuse and financing possibilities (Federal Environmental Agency, 2005). The Research for the Reduction of Land Consumption and for Sustainable Land Management (REFINA) was created by the German Federal Ministry of Education and Research (BMBF) under the Research for Sustainability (FONA) program. The program involves numerous other organizations including the Federal Ministry of Transport, Building and Urban Affairs (BMVBS) and Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU).

Significant funding for all programs is provided to develop innovative concepts for reducing land consumption and encouraging sustainable land management while working with universities, local authorities, companies, associations, and private consultants. Over 100 projects, many of which can be considered brownfield projects and 25% of which have been completed in the Ruhr region, have revitalized individual sites and rehabilitated inner-city neighborhoods (Federal Ministry of Education and Research, n.d.). Organizations such as the

Nature and Biodiversity Conservation Union (NABU), an environment association committed to nature conservation, have been engaged in the redevelopment of brownfields at the national level.

2.7 Ruhr Region and Local

Whereas individual federal states in Germany implement and oversee their own education system, internal security, and organization of local self-government; the central government is the primary legislation-determining body. Policies and programs related to the regulation of brownfields, contaminated soil, and land use planning typically originate from the federal government, as addressed above. This legislation is usually executed by state and local agencies, or smaller government regions. As encouraged by federal objectives, states can issue guidelines that impact development. The 1998 Draft Environmental Programme and the National Sustainability Strategy recommend that states issue precise guidelines to protect open space and limit sprawl by making urban development and redevelopment more attractive.

Aside from state leadership, the level of government that significantly impacts brownfield redevelopment in Germany is the regional level. The scale at which urban planning is directed with policies, programs, and incentives in Germany is considered to be regional (Vanhuesden, 2007). The Federal Regional Planning Act (Raumordnungsgesetz) guides overall area planning and the use of land and soil. Under this law, states are subdivided into planning regions which are of concern to state governments, local authorities or counties. Consider the state of North Rhine-Westphalia, where the Ruhr region is located, which is divided into five government regions and numerous districts. Each region has plans, which may consist of ordinances, local statutes or by-laws, that are independent of comprehensive, state, and local planning. By having this additional tier of legal oversight, cities and villages have less authority in planning decisions

and initiatives. To proceed with development projects, regional development authorities and other regional institutions usually work with local governments, representatives and experts. The local decisions and initiatives function within a regional, state, and national framework (Schmidt & Buehler, 2007).

Research programs, funding mechanisms, and development initiatives are provided by the federal government to address brownfields through regional cooperation. The REFINA program explores regional land management practices and develops regional model concepts and planning tools to encourage land recycling (Federal Ministry of Education and Research, n.d.). Furthermore, states receive regional incentives such as a land or property fund. The activities of the property fund include: establishing business parks, accumulating experience with brownfield redevelopment, encouraging urban construction over economic considerations, preserving industrial architecture, and protecting monuments. Funds such as the Grundstückfonds Ruhr and Grundstückfonds North Rhine-Westphalia are used to purchase old industrial sites for redevelopment (Thornton et al., 2007). Commercial sites throughout numerous communities in the region are then bundled and packaged with investment incentives to spur regional economic development (Federal Environmental Agency, 2005).

Finally, development initiatives with a focus on brownfield revitalization and contaminated land exemplify the federally supported regional approach. The IBA Emscher Park Initiative was a 10-year initiative established in 1989 in the Ruhr Area to encourage the redevelopment of over 5,000 acres of brownfields (Internationale Bausausstellung Emscher Park; Kunzmann, 2004). A regional agency independent of the regional government was charged with steering and managing the project, and was allowed to bypass the traditional regional policy networks to maximize efficiency (Kunzmann, 2004). The goals of the project were to transform

the derelict landscape, restore environmental health to the river and land, construct affordable housing, promote cultural industries and the arts, and create new jobs. The winning projects from international competitions among architects, urban designers and landscape architects were held to strict environmental, social, and cultural principles by the regional agency. Overall, the initiative achieved significant success. Two of the flagship projects: Landschaftpark in Duisburg and Zeche Zollverein in Essen are recognized worldwide. Even though the project has not been repeated in Germany since 1999, elements of the IBA Emscher Park model have been applied to development initiatives in other regions.

The German regional model seems to be successful because it provides guidance rather than dictates general development locally. In the IBA Emscher Initiative, the role of the regional authority contributed to the project's success. The organization set specific environmental, social, and cultural goals and principles with a focus on regional modernization but did not make a blueprint or write a master plan for the project. The regional authority designed flagship projects to apply the guidelines and serve as models for private and other public sector development. By limiting the requirements, the local governments and private sector were encouraged to be innovative and creative in their project design (Kunzmann, 2004). The organization selected and approved projects, given that they aligned with the principles. This approach resulted in a holistic top down strategy that changed the market; whereas the project designs and reuse ideas originated from the bottom up. In summary, this approach describes the German model for brownfield redevelopment.

2.8 Discussion

To begin a discussion and comparison of how policies and programs address brownfields, governmental approaches to the definition of brownfields must be recognized. Definitions are

helpful in guiding policy, but they are not fixed and only based on the current understanding of problems (Adams et al., 2009). Today in post-industrial nations, brownfields are widely understood to be sites that were previously developed, are no longer in use, and need to be redeveloped to restore use. They are contaminated, vacant, or derelict land. This definition has evolved but still differs among states, nations, and larger organizations. Without consistency, limitations or over-extensions of policy applications could negatively affect practices.

In the US, the brownfield definition is complicated. To summarize: contaminated property is a brownfield, but not all brownfields are contaminated. The term *brownfield* was adopted over *contaminated property* to reduce any negative connotations, liability implications, and restrictions (Adams et al., 2009). Yet, the nationally recognized definition acknowledges the presence or possible presence of toxic pollutants on brownfields using the word *contaminant*. The definition implies that the property is contaminated and there is currently no differentiation between contaminated land and a brownfield. At the state level, the Michigan definition omits the requirement of existing or potential polluted or contaminated soil from the description of a brownfield. Since policy is applied, funding is allocated, and the involvement of organizations at the national, state, and local levels are made according to this definition, confusion about what qualifies can have a negative effect on practices. Based on the existing definitions, a piece of property could be considered a brownfield by the state of Michigan, but not necessarily a brownfield by the federal government. There is even inconsistency within the state. MDEQ oversees what are commonly called brownfields, but the organization is only involved in redevelopment if the soil is contaminated and deemed a *facility*.

The US is not alone in the struggle with using a consistent definition. Among EU member states, a partnership comprised of numerous countries that speak different languages,

there is a lack of uniformity in the definition of the equivalent of a brownfield. In Germany, a different word is exclusively used to describe contaminated soil. The terminology differentiates between the two situations: brownfields and contaminated property and specific policies are applied for brownfields (which are not contaminated) and contaminated soil.

Another key difference between the US and German definitions is the direction of focus: past versus future. In Michigan, attention is paid to recognizing that the target site was previously used; thus acknowledging the main difference between a greenfield and brownfield. This choice of words suggests a focus on the past; that the land was developed and is no longer of use. The USEPA definition has more of a forward focus by highlighting reuse or redevelopment potential. In Germany, the translated definition accomplishes both an acknowledgement of the past by describing a site previously used and of the future by highlighting opportunities for renewal and refurbishment. The direction of focus could play a role in implications for redevelopment. Ideally the definition would define land that was previously used that has the potential to be reused.

Aside from affecting policy application, the lack of a standard definition impacts the tracking and inventorying of brownfield sites. In the US, this inventory is maintained at state and local levels, but determining what qualifies and should be included is a problem. There is a question of which definition to follow and what is considered to be a brownfield. Provided with the opportunity, cities, governments, and land owners tend to avoid the classification of land as a brownfield because they fear the stigma of a brownfield label, to prevent the loss of land value, or because they lack the capacity to maintain such an inventory (American Planning Association, 2010; Adams et al., 2009). This limits the creation of detailed and extensive inventories of re-developable land. At the state level, Michigan maintains a contaminated property database, but

only for properties for which a BEA has been filed. A BEA is required to release liability on properties where contamination is suspected. One way to indirectly identify vacant sites with potential contamination is through state lists of sites with known underground storage tanks (American Planning Association, 2010).

European Environment Agency member countries maintain inventories at differing levels. A majority of countries maintain a comprehensive data inventory at the national level, while Germany and a few other countries manage inventories at a regional or local level (EAA, n.d.). Many cities, including Dortmund, have environmental liabilities registers or Altlastenkataster with information on land type, size, soil contaminants, former uses, and any special characteristics to manage and market the sites (Federal Environmental Agency, 2005). Information gathered for this research reveals that cities maintain these registers for all land in the city, not just for known brownfields (J. Woelki, personal communication, October 26, 2015). As property owners change and assessments are conducted, the information is updated. The register can be referenced by home owners and potential purchasers, and is always referenced by the city prior to approving development activities. This strategy of maintaining an inventory for all land at the city level encourages a detailed and extensive inventory of soil contaminants and prior uses. This registry includes an inventory of what would be considered a brownfield.

In the US, the system of only classifying brownfield sites may not be working due to differing definitions and a lack of accountability from higher levels of government. A state, regional, or national inventory of contaminated property could prevent the avoidance of classifying land as brownfields and encourage the development of detailed inventories. It seems appropriate to manage inventories at local levels since local governments would be most knowledgeable of actual sites. A local inventory of all land within the city's boundaries, like the

German register, could also benefit brownfield redevelopment in the US. The inclusive inventory or database could be a resource for developers, businesses, and other organizations to find the location opportunities for which they are looking, without singling-out or excluding contaminated property.

An exploration of the history of policies reveals that both federal and state legislation in the US and Europe originally focused on the issue of contamination. When governments and the public recognized the problems of pollution from human health, natural environment, and land value perspectives, and the costliness of cleanup, private parties were held responsible for environmental remediation. Both countries established a necessity for liability platforms to protect the public from paying financially for contamination caused by the private sector. Unfortunately, in the US many polluters still evaded obligation and the strict liability requirements dissuaded new private investment for fear of financial and legal burdens. Regardless of the effort in the US to avoid the use of the term *contaminated property*, it could be argued that the word *brownfield* acquired a negative connotation and liability implications as a consequence of the application of legislation. The legislation's focus on liability and cleanup caused developers with risk concerns to shift their attention to undeveloped land. Furthermore, since the US lacks guidelines and goals to preserve inner-city areas and limit suburban sprawl, urban boundaries were expanded and urban brownfields were abandoned. Greenfield development was further encouraged by incentives that supported suburbanization through tax incentives for commuters and subsidies for new home construction (Thornton et al., 2007).

Recent research captures these observations and suggests that the abundance of vacant land in post-industrial urban areas cannot be explained solely by the issue of environmental contamination (Schoenbaum, 2002). In addition, research suggests that focusing solutions on

brownfields as an environment issue creates numerous problems. It discourages community participation and reduces the value of proposed projects (Hula & Bromley-Trujillo, 2010). In the US there is still limited demand for brownfield redevelopment projects due to low density zoning on suburban edges, a complicated and time consuming process to clear land titles in urban areas, and government spending that encourages greenfield development over redevelopment (Welsh & Jones, 2010).

In Germany, the environmental contamination problem was combined with federal goals and objectives to encourage urban development over sprawl. The German government is committed to protecting open space, reducing land consumption, and limiting sprawl with specific goals that include reducing land consumption by a certain amount per year. Additionally, there are strict requirements for building permissions on greenfield sites (CABERNET, 2003). This leadership helps retain development in urban areas regardless that it may be more expensive for developers to redevelop contaminated property. As sites are cleaned up and redeveloped, environmental improvement goals are consequently accomplished.

European legislation has recently focused on soil contamination and waste reduction from an environmental perspective, while adjustments in the general definition at the US, Michigan, and German levels of government in the last few decades have shifted the policy focus towards economic development goals such as tax-based growth and job creation. Unfortunately, this economic focus, supported with the intention of creating jobs and increasing land value, can limit redevelopment because it directs policy towards redevelopment on contaminated properties for the private market. Providing jobs and increasing the tax base is particularly important in struggling post-industrial areas like Michigan and the Ruhr region where residents struggle due

to unemployment and absent city services. However, an incomplete policy focus produces inadequate results.

Political leadership in the form of policies, objectives, and programs from higher levels of government in the US in regards to development, land use, and planning is limited overall compared to in Germany. Many states in the US, including Michigan, have home rule which provides for essentially autonomous local decision making. Municipalities are also enabled to provide local planning and zoning through the Standard Acts which limit state authority. Regional planning organizations exist to coordinate regional activities and provide technical, outreach, or marketing support. Many have economic development goals, but they do not have authority in planning decisions or policies. Therefore, local governments have control over development, and are not required to follow county, regional, or state planning efforts. Because decisions are made by independent local units of government who are essentially in competition with each other, there is very little coordination between municipalities. This model for planning differs from the German model which encourages regional collaboration to meet goals, increases the ability to attract developers by bundling properties, expands funding capacity, and promotes resource sharing among a region of municipalities. The US lacks this political framework or model for regional cooperation; which as demonstrated by the German approach, is beneficial to public efforts to redevelop brownfields.

2.9 Conclusion

Brownfield cleanup and redevelopment is a complex issue, complicated by complex definitions, policies, and programs; many of which overlap. An international comparison of policy and program approaches reveals implications for the US to encourage brownfield redevelopment. To increase the success of public projects that encourage adaptive reuse,

national, state, and local governments could consider a few lessons from Germany. Firstly, simplifying the regulatory framework with consistent definitions and standardized, strong, and consistent policy goals could encourage remediation. Policies should indeed protect the public sector by easing liability requirements and offer incentives for developers other than private companies. A simple and consistent definition among the federal government and state governments in the US could clarify discussions, streamline processes, and appropriate policies and funding. There should be independent regulations and funding for contaminated soil and previously developed land in urban areas. Secondly, regional planning efforts have significant potential to transform contaminated, vacant, and derelict land to community assets. The successful brownfield redevelopment policies and programs in Germany reflect the country's more regional planning approach. Despite the benefits of a local bottom-up approach, as in the US; without national, state, and regional guidelines and priorities there is less consistency in outcomes. Thirdly, shifting greenfield development to urban development should be made a priority, a national priority.

Brownfields are not solely an environmental problem, nor only an economic issue. While the contamination is an environmental problem, the concentrated vacant and derelict land in urban areas are economic and social issues. The contamination further complicates the redevelopment of such land, but this kind of policy focus has limited redevelopment potential. Directing policy towards the economic issues of brownfields will not solve the problem alone. Ideally policy would also encourage community revitalization. Policies should guide development to remedy environmental, economic, and social problems. The American Planning Association (APA, 2010) highlights the increased success of reuse projects when economic and community development issues are addressed with environmental concerns. This broader focus

of legislation could increase the involvement of agencies and entities and restructure the allocation of public funding.

CHAPTER 3: Public Sector Funding

3.0 Introduction

Brownfield redevelopment faces significant financial challenges. The costs associated with site cleanup and environmental remediation increase project costs compared to greenfield development. In addition, access to loans is limited due to the increased risk of liability concerns associated with owning a contaminated or potentially contaminated property. Therefore, brownfield sites are not economically competitive with greenfield sites without public intervention (Thornton, 2007). In many places, the increasingly concentrated contaminated, vacant, and derelict land in areas with constrained available public funds further complicates these financial challenges.

In the US and Germany, various public funding tools are available to make brownfield redevelopment projects financially feasible. The practices of private or public sector involvement differ from an international perspective. The following discussion will explore funding practices in the US and Germany. In Germany, there is a long tradition of public sector involvement while the US is predominately driven by private sector funding. A comparison will help identify long standing practices in Germany and how they might be adapted to the US context. In a manner similar to the previous chapter on policies and programs, findings in this chapter are discussed at federal US, state of Michigan and local municipal levels, and European Union, Germany, and local level funding.

3.1 Historical Context

During the second quarter of the 20th century, largely in response to the Great Depression, the federal government in the US played an active role in the development of urban areas. The involvement may have been a response to unequal patterns of growth and decline

among the country's states (Schmidt & Buehler, 2007). Federal urban programs dating back to the 1930's provided funds for blight removal, improvements to the built environment and public infrastructure, and job creation. With the 1980's came budget cuts to these urban programs; leaving cities responsible for urban revitalization (Lyons & Hamilin, 2001). Without federal programs, when tax bases declined with the evacuation of businesses and residents from central cities, city governments sought increased private sector involvement and funding for redevelopment projects. Since then, a dependence on private investment and the evolving public-private partnership have become accepted practices to provide urban revival activities, including the redevelopment of contaminated, vacant, or derelict land.

Along the same lines, in Germany, the federal government has a history of playing an active role in economic renewal and public works projects. The role was changed by World War II since activities destroyed cities and left the country divided. The rebuilding of the nation's infrastructure and industry was supported in part by international aid through the Marshall Plan, or European Recovery Program. This American initiative to aid Western Europe in reconstruction implemented credit institutes in Germany to fund redevelopment projects. As the country recovered, national policies were implemented to support redistribution efforts. The practice of wealth redistribution between richer and poorer states through the federal government compensation fund has since been implemented (Schmidt & Buehler, 2007). With reunification in 1990, the country has increasingly experienced spatial disparities of income and economic growth. As the public sector faces modern economic challenges and city budgets become increasingly tight, the reliance on public-private partnerships for urban development is increasing (OECD, 1999; Stadt Dortmund, 2004).

3.2 Differences between Traditional Development and Brownfield Funding

In traditional funding for development projects, sources of capital include debt and equity; the debt being of low risk and low return, and the equity being of high risk and high return based on the project's performance. In regards to brownfield projects, lenders in the US are typically unlikely to provide loans for projects on contaminated property due to complications associated with liability (Goodstein et al., 2011). Without access to debt, brownfield projects are limited to funds from the sponsor and equity. The remaining capital can be sought from the public sector, private sector, or through a combination of funds. Contaminated soil or brownfield projects in Germany do not necessarily experience similar funding challenges. The funding model in Germany for redevelopment projects does not differ significantly if the soil is contaminated (J. Woelki, personal communication, October 26, 2015).

In the US, numerous factors determine the initiator and source of funding for the remediation of contaminated property. The economic conditions, existing private demand based on location, level of contamination, and the foreseen new land use are all influencers (Howland, 2003). The location, and its related value and demand, largely impacts the interest level of developers and can determine the redevelopment initiator. The private sector is more likely to be the initiator when there is high economic demand, strong market conditions, low levels of contamination, and the new use remains industrial (which requires less and cheaper cleanup) according to Howland's (2003) research on three case studies in Baltimore. When there is weak market demand, the property is highly contaminated, and the future land use is residential, the research suggests that extensive public subsidy is required (Howland, 2003). Unfortunately, there is an abundance of brownfields in areas where market demand is weak and the appropriate future land use is not industrial or commercial; thus creating a demand for public aid.

3.3 United States

In the US, the common financing tools available to supplement traditional funding include insurance policies, CERCLA cost-recovery actions, citizen-suit actions, grants, loans, loan guarantees and tax incentives. Firstly, contractual provisions on past or future sales and insurance policies can be used to protect buyers and lenders from cleanup liability. Insurance assets can be used for early stages of a project if the environmental contamination occurred when it was covered by historic insurance policies (Goodstein et al., 2011). The historical insurance assets can provide funds for the remedial investigation, cleanup, or a citizen suit; or capital can be effectively recovered from the responsible polluters through CERCLA cost-recovery actions. In addition, the Resource Conservation and Recovery Act (RCRA) allows an individual to file a citizen-suit to address contaminated properties.

Grants, trust funds, tax incentives, loan guarantees, and low or no-interest loans through revolving funds are available from government agencies, and grants and loans are also available from philanthropic foundations and banks (American Planning Association, 2010). The grants and loans from foundations and banks are considered private funding. Public funding options exist in the forms of grants, loans, loan guarantees, and tax incentives from federal, state, and local programs for activities to aid in development. Activities eligible for public funding include: conducting site assessments, developing a remediation plan, cleaning up the contamination to state standards, and making physical improvements (American Planning Association, 2010). To restore a brownfield property to public use, Goodstein at al., (2011) recommends combining a variety of funding options if possible.

The source and availability of these funds depends on the proposed type of redevelopment and the owner of the site. At the federal level, the USEPA's Office of

Brownfields and Land Revitalization provides the majority of funding and resources to brownfields through local units of government that can only be used for brownfield assessment and cleanup. The EPA is authorized to award Brownfield Assessment Grants, Brownfield Cleanup Grants, and the Brownfield Revolving Loan Fund to states, communities, Indian tribes, and nonprofit organizations through the Brownfield Law for assessment and cleanup. In the Utica Community Complex project, Macomb County received grant/loan funds from the USEPA Revolving Loan Fund. The County allocated $700,000 to the project to conduct environmental response actions (Macomb County, 2015).

Furthermore, the USEPA can indirectly fund brownfield projects through other funds awarded to states. For instance, the remediation of contaminated properties that contribute to the contamination of surface or drinking water can be funded through the Clean Water State Revolving Fund and Drinking Water State Revolving Fund. Given that the project meets federal guidelines, the state allocates the funds they receive from the USEPA to projects that apply (American Planning Association, 2010). Area Wide Planning Grants are awarded to conduct research and provide technical assistance for neighborhood, downtown, or commercial corridor revitalization. The funds may be used to collect information, evaluate environmental conditions and market potential, and develop strategies for site cleanup and reuse. While these funds cannot be used to actually clean up the site, the grant seems to be the first funding mechanism that addresses brownfield cleanup preparation and plan-making from a holistic neighborhood revitalization perspective.

Brownfield redevelopment projects can receive funding through local governments from numerous other federal agencies if the project qualities. Assistance for economic development, housing rehabilitation, public facilities, and large-scale physical development projects is

provided by the Department of Housing and Urban Development (HUD). The applicable programs include the Brownfields Economic Development Initiative (BEDI) and the Community Development Block Grant (CDBG) Section 108 Loan Guarantee Program. The CDBG program is a revenue sharing program where funds are allocated to states, cities, and projects on an as-needed basis considering that they meet federal priorities. Assistance for public works and economic development facilities is available from the Department of Commerce's Economic Development Administration, and assessment, cleanup, and community revitalization in rural areas is supported by Rural Development funds from the US Department of Agriculture. Other programs that provide financial assistance include the Department of Transportation's Livable Communities program and the Department of the Interior's National Park Service programs.

Finally, tax related funding mechanisms include tax incentives, tax increment financing (TIF), brownfield federal tax credits, and state tax credits for remediation that may be extended or doubled (Goodstein at al., 2011). With these mechanisms, taxes paid on property income or sale are commonly reduced or deferred. In general, tax incentives are a function of the state and local governments and will be further discussed in the succeeding section.

3.4 Michigan and Local

Financial aid and incentives for brownfield redevelopment are provided by state governments, mostly through voluntary cleanup programs. The Michigan Department of Environmental Quality (MDEQ) initiates and oversees state-funded cleanup through the Cleanup and Redevelopment Program (CRP) where the financially viable liable person cannot be identified. However, the program was originally geared towards sites where immediate action was needed and the contamination posed the most significant risks to human health and the environment. The Leaking Underground Storage Tank Program accompanies CRP to match

federally funded cleanup at Superfund sites. While funding from these programs is beneficial, it was is applicable to many brownfield sites in Michigan. Many do not participate in the Superfund program and may not be considered a *facility* since brownfields may or may not be contaminated according to the definition in Michigan.

To level the playing field between brownfield and greenfield sites, MDEQ reinvented the program to offer grants and loans explicitly to Michigan local units of government, brownfield redevelopment authorities, or other public bodies created pursuant to state law, including state-funded schools and universities to offset costs for remediation and redevelopment (Midtown Detroit, Inc., 2015). The funding originates directly from specific revenue streams targeted to brownfield redevelopment efforts rather than from state general funds (Jones & Welsh, 2010). The properties eligible are sites or facilities with known contamination or properties with redevelopment potential and suspected contamination. Numerous activities that include evaluations and assessments, plan preparation, remedial actions, and demolition are eligible for funding (MDEQ, 2013b).

Local units of government must apply for the funding with an eligible project. The Brownfield Redevelopment Grant and Loan Application reveals evaluation criteria that include: the potential economic benefit to the community, the environmental benefit, and local support. The application asks about how many jobs are created, the amount of committed private investment, how the proposed development fits into the community's development plans, the conditions of the surrounding neighborhood, and if the project demonstrates recognized planning and design principles.

Additional information on MDEQ funding and the evaluation process was revealed through the interview conducted to gather insight on the Utica Community Complex. The

interviewee shared the following information. MDEQ significantly evaluates the financial aspects of the project, considers the appropriateness of the use for the land, and ensures that the project has a committed developer with local government support and will definitely be developed. In order to qualify for a grant, the project must have a committed developer and the total expected economic benefit for the community (job creation, private investment, and/or property tax increase) must be greater than the amount of the grant. Without a committed developer, the project could receive a loan rather than a grant if the site has economic redevelopment potential. There is more flexibility in evaluating the creation of jobs and other community benefits with loans. Nevertheless, communities are increasingly hesitant to take them.

In general, MDEQ funding programs emphasize the public focus on involving the private sector in economic development. They reward the private developer's involvement in a public-private partnership by lessening the burden of investment in projects that create jobs and increase tax revenue. The Utica Community Complex project reveals the recognition of community outcomes in the evaluation of funding. Although the project's Brownfield Redevelopment Grant and Loan application demonstrates a private investment of $12 million, local government support, and the creation of 110 jobs (20 full-time and 90 part-time), it was approved in part because it demonstrated significant place-making benefits.

Moreover, the project highlights some funding restrictions. MDEQ is prohibited from providing grants for professional baseball stadiums. While the Utica Community Complex includes community space and a stadium for a minor league baseball team, the project is still restricted to only loan funding. Besides, it is important to note that MDEQ can only provide grants and loans to local units of government. Therefore, a local unit of government must be

willing to take on the risk of the loan. MDEQ is finding that many are hesitant to do so regardless of what and where the development will be because if the developer defaults, the unit of government is still responsible for paying it back to the state of Michigan. The loans are not forgivable and according to the law, MDEQ can withhold revenue sharing. In the case of the Utica Community Complex, since the city of Utica was not willing, Macomb County took the $1 million loan with development agreements or reimbursement agreements with the developer in place. The loan was used for waste removal, methane mitigation and monitoring systems, a perimeter monitoring system, contact barriers, utility engineering controls, storm water management, and installing a deep foundation system.

The options to leverage funding are somewhat limited. Through some programs, local units of government can receive numerous state grants and loans. For instance, a project can receive both a Brownfield Redevelopment Grant and a Brownfield Redevelopment Loan in the same year (MDEQ, 2015). However, the local unit of government may only receive one grant and one loan from MDEQ up to $1 million each, per year. This challenges local units of government to determine which one project they want to pursue with these extra public funds each year. For many other programs, the funds cannot be combined. A property is not eligible for a Site Reclamation Grant if it is receiving other state cleanup funds.

State cleanup funds provide free site assessments for approximately seven sites depending on the assessment cost and availability of funds through the Brownfield Redevelopment Assessment Program. It has become common practice to conduct Level One Assessments on all property prior to purchase or redevelopment to determine the possibility of contamination. These assessments are relatively low cost, but if the likelihood of contamination is found to be high, a very costly Level Two Assessment must be conducted. MDEQ has

received funding for the program that eliminates these costs through a federal grant. Local units of government, governmental agencies, and non-for-profit community development agencies can apply potential sites for the program. The purpose of the assessment is to enhance cleanup and redevelop programs by identifying contaminated properties that may need to be remediated prior to development, and provide a preliminary basis for further evaluation. During completion of the assessment, information and environmental samples are collected to determinate contamination levels, and recommendations for cleanup and redevelopment are determined (MDEQ, 2011). Properties are more likely to receive the free assessment if a proposed or active redevelopment project is in place (MDEQ, 2011). Properties proposed for public use are accepted, but private redevelopment projects are a higher priority.

Like with federal funding, brownfield projects can receive state funding from other public agencies not directly associated with brownfields. Considering Michigan's NDRE programs, which fund remediation activities but not actually redevelopment efforts, some of these funds have specific restrictions. Michigan Economic Development Corporation (MEDC) initiatives and programs are geared towards strengthening Michigan's city centers and rural communities. MEDC efforts have increased private investment, created jobs, and encouraged cleanup and improvements of brownfield conditions at sites throughout the state (Midtown Detroit, Inc., 2015). The projects that are selected for MEDC funding programs are expected to have positive local and regional impacts, promote a traditional downtown (dense, walkable, mixed-use, and sustainable), and demonstrate financial need (MEDC, 2015a). Under the Core Communities program (Core Communities Fund) from 2000, incentives were put in place to target urban aging communities in Michigan, enabling brownfield tools to be used on blighted and functionally obsolete sites as well as on contaminated properties (MEDC, 2015a). An

economic and financial consideration for prioritizing candidate projects is that the project demonstrates a "high ratio of private dollars compared to the total amount of public contribution (state and federal funding) to a project" (MEDC, 2015a). This criterion indeed prioritizes projects that have received private funding through a public-private partnership.

In regards to tax incentives, Michigan Public Act 381 and OPRA previously mentioned are directed towards brownfields. They provide tax incentives that freeze local property taxes for up to 12 years, exempt all real property improvements from local property tax, and exempt one-half of the school millage for up to six years (Midtown Detroit, Inc., 2015). To qualify for the exemption before redevelopment can begin, the developer's application must be approved by the state. This program has limited availability and certificates are only being issued until December 31, 2016. There are other tax incentives not geared towards brownfield redevelopment explicitly, but for which a brownfield project could qualify. Consider Personal Property Tax Relief in Distressed Communities (PA 328 of 1998). Businesses can have personal property taxes abated on new investment for projects such as: manufacturing, mining, research and development. Funding is also available for projects in rural and urban low-income communities through the New Markets Tax Credit Program through the Community Development Financial Institutions Fund (Goodstein et al., 2011). Nonetheless, tax incentives are directed towards private investment since only private entities pay property taxes.

The tool tax increment financing (TIF) is increasingly used by local governments to fund infrastructure improvements. TIF is a function of local government where future property tax revenue is used to finance the redevelopment project. Local BRA's offer TIF incentives to reimburse developers for activities that prepare sites for redevelopment. Activities that prepare sites for redevelopment include but are not limited to: baseline environmental assessments, due

care activities, additional response activities, lead or asbestos abatement, demolition, site preparation, and public infrastructure improvements (Detroit Economic Growth Corporation, 2008). Eligible properties for incentives are located within the BRA's boundaries, and have "eligible activities identified under a Brownfield plan, are formerly or currently used as commercial, industrial, public, or residential properties and are one of the following: contaminated, blighted, or functionally obsolete" (Detroit Economic Growth Corporation, 2008).

3.5 European Union

In Europe, funding for brownfield redevelopment is available from the EU. Brownfield redevelopment projects in Europe are eligible for European Structural and Investment Funds (ESIF). The funds originate at the EU level and are distributed and managed by national and regional authorities who choose projects that meet certain priorities (Thornton et al., 2007). The thematic objectives that support growth for 2014-2020 focus on technology, environmental protection and climate change, transportation, employment, social welfare, education, and public administration (European Commission, 2015). The funds include: European Fund for Regional Development (EFRD), Joint Initiative for Urban Sites (URBAN II), and Joint Initiative for Trans-European Cooperation (INTERREG III) (Federal Environmental Agency, 2005). Specific projects such as the TIMBRE project (Tailored Improvement of Brownfield Regeneration in Europe), are EU-funded (Alexandrescu et al., 2014). The TIMBRE project explores innovative solutions for overcoming barriers that prevent the reuse of large and complex contaminated sites.

The Phoenix-See project in Dortmund received EFRD funds to supplement local, state, and federal investment in the project because it fit within the EU scope of thematic objectives promoting regional development. EU funds, which may reimburse for between 50% and 80% of the investment, are only distributed after the project is finished (J. Woelki, personal

communication, October 26, 2015). This model supports projects with alternative investment from local, state, and federal units of government that are funding the redevelopment.

Liability standards impact the availability of European funds since the EU holds member states responsible for identifying the person liable for contamination. According to EU standards, aid cannot be granted when a person or party is identified (Thornton, 2007). If the person or party responsible cannot be identified, the cost of remediation less the increase in land value can be 100% financed by state aid (Vanhuesden, 2009). Considering EU directives and decisions are not necessarily binding, standards are not in place for member states to direct the distribution of a country's own public funding for redevelopment projects. This is determined at the national level and varies by EU member state. The Netherlands, for example, has limitations on publicly funded projects based on use. Brownfield improvement initiatives through public funds are not geared towards the reuse of land for residential or other uses (Ploegmakers & Beckers, 2014). Examples of regeneration initiatives funded by municipalities include improvements to infrastructure, public investments, relocating activities, and demolishing vacant buildings to promote redevelopment (Ploegmakers & Beckers, 2014). These approved funded activities are similar to those in the US. Germany on the other hand, does not have these restrictions.

Besides providing funds, the role of the EU is to offer funding recommendations. In a recent Science for Environment Policy report (2013), the European Commission encourages local governments to evaluate innovative funding mechanisms for urban brownfield regeneration. The mechanisms include public-private partnerships, Land Value Finance (LVF), Urban Development Funds, and Impact Investment Funds. LVF refers to a program similar to tax increment financing, tax relief or specific property tax. An example of what is called Urban Development Funds is revolving funds; a fiscal mechanism similarly used in the US. Impact

investment funds are described as “socially responsible investments […] that tend to take the form of a balanced investment portfolio over a range of projects” (European Commission, 2013, p. 9). Although the EU does not offer these funds, they are approaches that could be applied in any member state.

3.6 Germany

In Germany, funds are provided by the federal government and federal states through support programs for brownfields, which are often combined. It is worth noting that land purchases and building renovations on brownfields receive aid comparable to those received by new construction projects on greenfields (Federal Environmental Agency, 2005). The measures for which this aid is available for brownfields is complicated by the need for both below soil and above soil funding (City of Stuttgart, 2012). As explained in the previous chapter, since policy programs separate contaminated soil from brownfields, contaminated soil has specific funding options.

The main programs that apply to brownfields originate from the Office of Urban Planning and Renewal and the Office of Environmental Protection (City of Stuttgart, 2012). Approved activities include: marketing and redevelopment concepts, urban planning, detection of contamination and cleanup, demolition of buildings and facilities, development, building renovation, assurance and project management, and real estate purchases and the management of property (Federal Environmental Agency, 2005). By improving the competitiveness of brownfields, the federal and community support programs encourage urban development. Additionally, funding is available through Urban Conversion East or Urban Conversion West programs which finance economic development. Other support programs include: state contamination cleanup and urban development programs; support for special purposes such as

the write-off of monuments or promotion of culture; and research, development, and demonstration projects (Federal Environmental Agency, 2005). Lastly, funds are allocated by state governments through property funds such as the North Rhine-Westphalia fund described earlier.

3.7 Ruhr Region and Local

In general, brownfield redevelopment in Germany has a history of not being limited by a lack of financial resources at the local level. Beginning in the 1980's, local governments were offered access to a large rotating superfund for brownfield redevelopment from the federal government (Kunzmann, 2004). Brownfield redevelopment fits within city action plans that are funded to promote urban redevelopment. For example, in Dortmund, the Aktionsplan Soziale Stadt is funded to develop the less developed third of the city's neighborhoods. This program also funds infrastructure improvements, supports job growth, develops missing community assets, offsets costs for home improvement, and takes steps to correct social inequalities. To encourage public or private development agencies or companies to redevelop contaminated sites and quicken the pace of cleanup, it is common for local public brownfield authorities or the local unit of government in Germany to cover some or all of the investigation and cleanup costs (Federal Environmental Agency, 2005). This is done even though liability is primarily assigned to the polluter or property owner to fund the remediation of the contaminated property.

In the Phoenix-See project, the city of Dortmund purchased the land for a public subsidiary group who acted as the project's developer. The developer received additional public funds from the city of Dortmund, the Land, the federal Bundestag, and the EU to remediate the soil contamination, construct the lake, commercial buildings, roads, walking paths, and public space. Then the lands and building spaces were sold to private entities. When the project was

finished, the city obtained ownership and oversight of the lake, roads, walking paths, and public space, some of which can be seen in Figure 4 below. The proceeds from the property sales to private entities, combined with the proceeds from the sale of the old steel mill equipment went to the public developer to offset development costs (J. Woelki, personal communication, October 26, 2015).

Figure 4. Lake and Public Space at Phoenix-See

The Phoenix-See project is an example of a primarily local public redevelopment project with significant private investment in the new use. In general, the public sector typically finances the strategic planning and management of brownfield projects, and the characterization and remediation, possibly with supplementary city, region, or state funding assistance. The costs of revitalization and reintegration are traditionally covered by the private sector, although they may also be supplemented with additional funding mechanisms (City of Stuttgart, 2012). This public-private partnership model is discussed below.

3.8 Discussion

In both the US and Germany, the public sector is involved in brownfield redevelopment to increase the competitiveness of previously developed land compared to greenfields. Federal and state governments and agencies in both countries offer grants and loans for which brownfield redevelopment projects may qualify. Some are intentionally directed towards the remediation of contaminated property and redevelopment of vacant and derelict land, and others have a broader application. Grants and loans with economic development, environmental, or urban redevelopment objectives may not necessarily exclude brownfield projects; given that they meet the qualification criteria.

The level of involvement of the public sector in the market is reflective of overall political values. Since the US is more focused on private property, private capital, and the private market; intervention in the private market is not justified (Schmidt & Buehler, 2007). Therefore, development is currently dependent on market based adaptive reuse strategies that require private or not-for-profit investors, developers, and stewards (Ryan and Camp, 2012). When public sector intervention is justified, it is to correct market failure and promote economic development. This possibly explains the history of brownfield redevelopment approaches which focus on economic development goals over social, environmental, and public issue goals.

Since German policy has been long focused on urban redevelopment and reuse, public funding has been a priority. It is generally accepted that the role of the government is to intervene in the private market to achieve specific holistic goals. When there are market imperfections, the government steps in to correct the situation by cleaning land and creating demand. When the market does not exist, the public sector creates public reuse projects including temporary use, event space, and museums. The budget for brownfield redevelopment projects

traditionally originates mainly from public-sector budgets with some private investment in the final product.

In the US, funding priority is given to projects with private investment. Regardless that federal and state funds are provided to local governments, they are intended for projects with private partners. Financing through public-private partnerships seems to be the common practice. In general, a public-private partnership describes cooperation between the private sector and the public sector to accomplish a shared goal. The relationship may take the form of a leader-follower, buyer-seller relationship or a joint venture partnership, and the financing structure differs depending on the project. Since the availability of public financial resources is very limited, this financing is actually a necessity for redevelopment based on the current system in the US. In Germany on the other hand, funding programs typically do not require private investment and may even finance redevelopment projects in entirety.

Despite this historical commitment to public funding, research suggests that public-private partnerships are gaining in popularity in Germany (Federal Environmental Agency, 2005). Public-private partnerships in the country occur in the form of: public investment to encourage private investment and create legal and planning conditions that favor private investment, or the municipality develops projects in collaboration with private partners through subsidiary companies (Stadt Dortmund, 2004). For example, the Zeche Gneisenau coal mine in Dortmund-Derne was a public-private partnership to create urban housing with childcare, recreation areas, and employment opportunities in a craft and services sector. Funding for the urban redevelopment project was divided at 51% from the city of Dortmund and 49% from the mining company (Stadt Dortmund, 2004). In addition, the NRW URBAN is an institution financed by public and private money. It is a state-owned company for city and neighborhood

development that provides support in planning, marketing, remediation, and construction to local governments for brownfield redevelopment or land recycling projects.

Based on an analysis, it is evident that a goal of public funding practices in both countries is to encourage and leverage private funds. Encouraging and leveraging private funds is accomplished by streamlining the local redevelopment process, through public-private partnerships, and by using public funds to invest in infrastructure improvements to stimulate private investment. A significant part of this is attracting private development. In Michigan the Redevelopment Ready Communities program is a certification program that support's Michigan's communities in taking steps to attract developers. With MEDC aid, communities are encouraged to write clear redevelopment master plans, conduct community assessments, make the local redevelopment review process easy for developers, and market brownfield sites. However, participation in the program does not necessarily decrease costs to clean the land and soil if it is contaminated or guarantee that the local government will cover the costs. As previously mentioned, it is more common for local governments in Germany to clean the soil and land first to attract developers. Clean, greenfield equivalent land removes liability concerns and the risk of potential contamination. Since it is known that providers of equity become more interested as the property gains value from steps towards redevelopment such as cleanup, removing the contaminants eases their liability fears.

In Michigan, MDEQ has cleaned property for developers and local units of government, but only after the project submitted a Brownfield Redevelopment Grant and Loan Application that demonstrated commitment from a developer. In the Utica Community Complex, MDEQ completed over $700,000 of waste removal on both the east and west parcels. The Surface Water Quality Initiative Funds were used to remove environmental contaminants that threatened the

Clinton River (M. Bakun, personal communication, October 21, 2015). The work was completed within the scope of the public-private partnership.

Figure 5. West Parcel of Utica Community Complex Site

A challenge of a private-sector market focus for brownfield redevelopment is that the private sector actors sought for investment are mostly businesses or developers that would be "new" to the site. Many industrial sites are abandoned because previous resident companies relocated, abandoned the site, may have gone bankrupt, or no longer exist. It is less common for brownfield redevelopment initiatives to involve the previous site owner or tenant in the US; although it has been done before. The redevelopment of a large steel plan in Bethlehem, Pennsylvania was successful in part due to the financial investment of the company prior to its filing for bankruptcy (Rastorfer, 2015). After the Bethlehem Steel Corporation closed its 1,800-acre plant in 1997 the corporation, with headquarters still operating from an office in Bethlehem, hired a team of professional planners, engineers, and attorneys to develop a master plan for the site. The company then invested $40 million remediating the environmental contamination and

preparing the site for redevelopment. Combined with the development of a 20-year tax increment financing district to finance the site's infrastructure improvements, liability relief from state and federal agencies, and the city's rezoning of the site; this public-private partnership created an environment favorable for redevelopment after Bethlehem Steel filed for Chapter 11 bankruptcy and its assets were liquidated (Rastorfer, 2015).

Many public-private partnerships are centered around public investment in infrastructure improvements. This is commonly accomplished with the creation of a TIF district. In the Bethlehem Steel redevelopment project, the city used future revenues of the industrial park district and future casino-generated revenues to construct streets, create parking, install utility lines and related municipal infrastructure, and develop public space to merge areas of the site, including a greenway. The site is now home to a casino resort, the Bethlehem Works entertainment and commercial campus, a visitor center, and Bethlehem Commerce Center (Rastorfer, 2015).

Whereas the above project created many jobs, the use of TIF financing tool, which uses future tax revenue that otherwise would not have been created, highlights the public sector focus on economic stimulus. A focus exclusively on economic development can result in numerous challenges in regards to securing funding. Since fund allocation is determined by economic development potential, numbers determine funding priority. There is significant evaluation in the number of jobs created and local tax benefits, and intensive (and costly) feasibility studies are completed to demonstrate that the project is profitable. Therefore, architectural, development, or business consulting firms (the private sector) are commonly drivers of development. They invest money and expect a short to medium investment buyback period (Kunzmann, 2004). In Germany, projects are led and implemented by the public sector local government (working with

a local or regional public developer), interest groups, or occasionally competitions or concepts, and the investment buyback period is medium to long (Kunzmann, 2004). There is also less evaluation of feasibility and less pressure to demonstrate significant financial gains. For instance, the successful IBA Emscher Park Initiative did not include feasibility studies (Kunzmann, 2004). The rotating property fund discussed earlier enabled the state's development corporation to purchase the industrial land and structures. A public-private foundation was then established to maintain the structures and fund the development projects. It is worth highlighting that the state government of North Rhine-Westphalia has invested a significant amount of money over the life of the IBA Emscher Park Initiative project (over US $2 billion) (Kunzmann, 2004). Since the city of Dortmund invested heavily in Phoenix-See, the project was evaluated in regards to fiscal and economic decisions, as well as social, ecological, and sanitary goals among others (J. Woelki, personal communication, October 26, 2015).

The other challenges to securing funding revolve around the limited grant programs that cover specific activities, and the complicated application process. The information gathered for this research does not reveal the complexity of the application process in Germany. In the US, Federal and state funding through grants is limited and subject to change since many programs have deadlines or maximum award amounts. For example, funding for the Site Assessment Fund Grant of 1989 ($10 million) was exhausted by 2010. Even when funds are available, securing brownfield funding from available grants in the US is not an easy task. The procedure to apply is complicated by strict timelines and many find the practice of determining funding source, approved activities, and overall process to be confusing and frustrating (American Planning Association, 2010). The MDEQ, on the other hand, does not think that the process is limiting redevelopment (M. Bakun, personal communication, October 21, 2015). Since each grant or loan

can only cover specific activities, funding could come from many different places. It is time consuming to even find the public funding for which a brownfield project may qualify. Specific funds are available to cover environmental assessment, plan preparation, demolition, and site or building improvements. In Germany the funds cover additional activities such as research, marketing and developing concepts, and purchasing or managing real estate. The availability of these funds suggest that they incentivize groups to be innovative in redevelopment and provide capital to get projects off the ground.

In the US, finding the funding, going through the application procedure, and being notified about being awarded the funds does not guarantee that funding is available at the right time. Depending on the source, grant money may not be received at the beginning of the project. The Michigan Community Revitalization Program issues numerous means of economic assistance, but funds are not distributed until the project is verified as complete (MEDC, 2015b). Since this would not help organizations lacking fiscal capacity with starting projects, it does not encourage them to undertake redevelopment projects.

In general, US federal or state funding directly applicable to brownfields is directed towards the most contaminated sites that pose the highest threat to human health and the environment. This funding for environmental remediation trickles down from the top; from federal agencies, to state agencies, to local governments. The USEPA only funds the worst sites and does not regulate cleanup outside the Superfund program. State agencies directly fund cleanup at the most contaminated sites; although they regulate cleanup of local brownfields and may receive some funding from federal programs. Nevertheless, the funding does not fit within a greater top-down framework as it is geared towards environmental remediation or economic development goals. Also, much of the funding, in the form of grants and loans, is retroactive.

Project ideas originate from the private sector who apply for funding through a local unit of government. The local units of government receive funding from larger levels of government if the project demonstrates a committed private developer and significant economic benefits.

Project ideas have begun to originate from the community as residents and local agencies becomes increasingly involved in redevelopment to meet local goals. Brownfield redevelopment projects are being increasingly initiated by community-based organizations (CBOs) or community development corporations (CDCs). Due to the structure today, these groups must seek funds from public and private entities (American Planning Association, 2010). The organizations are challenged with finding funding since it is not aligned within a greater framework of similar national or state goals, and priority is given to private projects. In Germany, the funding and goal framework align from the top down to encourage development that originates from local units of government and agencies.

Finally, in a market where funding for brownfield redevelopment is driven by the private sector, practices lack government oversight. Only with the allocation of public funds in public participation is citizen involvement a priority. In the US, the level of public participation depends on the local government, private developer, and type of project. To qualify for Michigan state and federal level programs and grants, the local municipality must be involved. The lengthy process includes public hearings, MEDC approval, the completion of numerous applications, and intense evaluation. In Germany there is a formal process that follows established planning regulation procedures to ensure citizen involvement. In general, for redevelopment projects the local unit of government is required to present the plans to the public, invite residents by letter to provide public comment within two to four weeks, and adjust the plans accordingly (J. Woelki, personal communication, October 26, 2015). The other key part of public participation is the

involvement of numerous institutions and public groups with different focuses and goals to provide comment and evaluate renewal projects.

It could be argued that recent successful projects in the US involve levels of public involvement higher than the norm. The projects' success highlights that public involvement is positive regardless that it provides local opposition with an opportunity to prevent brownfield redevelopment. In recent years, citizens have begun taking an active role in projects, forming community groups, and directing the local government's attention to brownfield sites. Even when the community is highly involved though, when private investment is driving redevelopment, the public may be forced to compromise in terms of the resulting land use. Community residents in Bethlehem decided that they would rather the Bethlehem works site be developed than left abandoned, even though they opposed the development of a casino over a national museum of industrial history (Rastorfer, 2015). The private developer was able to develop according to a use that they found to have potential to be profitable, regardless of other community goals.

3.9 Conclusion

In the US, the public sector's current role in brownfield redevelopment is to incentivize private investment by offering grants and loans. The financial awards that favor projects that demonstrate economic development are given to local units of government for redevelopment projects with a committed developer. The limitations in available funding that covers very specific redevelopment activities, and the complicated process to receive funding that does not fit within a broad framework of goals and priorities, may not be encouraging redevelopment to its highest potential. Navigating the path to find funding requires a skill set beyond that of the

average community planner, nonprofit organization, local developer, or community group; from whom many community asset project ideas originate.

The most significant difference between the US and Germany in terms of funding revolves around political motives and business decisions. The market in the US is driven by the profit margin in the consideration of both private and public spending. This is evident by the evaluation process to receive public brownfield funding and the lack of public and private investment in reuse efforts in urban areas where demand is low. In Germany, the accomplishment of community goals and objectives takes priority over the financial gains. The goal of public spending for public sector projects is more or less to break even rather than make a profit.

Redevelopment in the US could benefit from the allocation of public general funds from the federal government for the adaptive reuse of brownfields to encourage equitable redevelopment in urban areas. If so, there would need to be a change in political outlook to provide funding even though the investment may not provide significant financial gains in profit. Federal and state programs could also be implemented and funded to research strategies and models for the successful conversion of contaminated, vacant, and derelict land to community assets. If the grant and loan funding mechanisms are going to remain in place, local government agencies would benefit from an education program to learn about the opportunities available and help navigate the public funding process. Further, state and local governments should strategically use public funds to influence market dynamics and create a model for fully funded brownfield projects. Funding for cleanup and infrastructure improvements should be proactively allocated so that local municipalities can take an active role in improving the competitiveness of brownfields within their borders and creating community assets.

CHAPTER 4: Misconceptions About Brownfield Redevelopment

4.0 Introduction

This final chapter discusses the common misconceptions that can potentially limit public investment in brownfield redevelopment in Michigan. Each myth is identified and then addressed through a discussion of approaches in the United States and Germany. The misconceptions may only be applicable in Michigan, as the statements made here that correct them only reflect a small sample of a complex picture. Examples from the Utica Community Project and Phoenix-See case studies are used to support the arguments made. The chapter concludes with recommendations for how the public sector can trade these myths for truths.

4.1 Myth: The costs of brownfield redevelopment outweigh the benefits.

Although the costs associated with brownfield redevelopment vary by project, in general it is very expensive to convert contaminated, vacant, or derelict land to a community asset. Despite the costs, the benefits of doing so are great. Public investment projects can have noteworthy environmental, economic, and social benefits. The creation of community assets on remediated brownfield property improves the environment, enhances communities, and increases quality of life for residents (Bacot & O'Dell, 2006).

From an environmental perspective, brownfield redevelopment reduces pollution in urban areas to promote public health and wellness. Lead (paints) and other heavy metals, arsenic, gasoline, diesel fuels, solvents, acids, polychlorinated bi-phenols (PCBs), pesticides, asbestos, and hydrocarbons from fuel leaks are among the contaminants found on brownfield sites (Adelaja et al., 2010; American Planning Association, 2010). This contamination threatens the health of residents living within a close proximity. The toxic pollution has been found to cause serious health complications, specifically among children and the elderly after exposure to or by

ingestion of contaminants in air and water (Bacot & O'Dell, 2006). There is a high concentration of contaminated brownfields in urban areas and a high concentration of socioeconomically disadvantaged groups in inner-city areas. Therefore, socioeconomically disadvantaged groups are disproportionately exposed to pollutants (Bacot & O'Dell, 2006). Remediating a contaminated property removes toxins from the environment that threaten the health of community residents.

The USEPA emphasizes that brownfield redevelopment can result in greenfield development pressure relief, air quality improvements, and a reduction of natural habitat destruction (Goodstein et al., 2011). Aside from redeveloping brownfields to spare greenfields, brownfields can be redeveloped to green or open space. Green space is considered a public asset in Germany. Although the Phoenix-See project did not necessarily create green space, it did significantly change the landscape of the previously industrial area in Dortmund. The removal of the steel mill equipment and the heaps of contaminated soil created a valley with trees and a lake to support wildlife. Without the massive equipment blocking the view out the window of homes, residents can enjoy scenic open space. Studies advocate the health and well-being benefits of open or green space to include: increasing property value and quality of life if near residential areas, providing a natural environment for children to play and learn, and presenting an opportunity for creative temporary uses (Hoffmann, Gruehn, & Ziegler-Hennings, 2010). Green space redevelopment projects in Toronto, Canada demonstrated improved soil quality, the creation of habitats for plants and wildlife, the enhancement of recreation opportunities, and neighborhood economic revitalization (De Sousa, 2003).

In the US, converting brownfields to green space has not been a recent practice. However, vacant land has a history of being repurposed as green space. Following the Great

Depression, county governments in Michigan, Minnesota, and Wisconsin became the owners of thousands of acres of land after the land owners faced tax delinquency, foreclosure, and abandonment. The land was bought by the state and federal governments and has become the six national forests and numerous state forests to benefit the local residents and visiting guests (Skidmore, 2013).

The most recent area of research explores brownfield redevelopment from a community benefit approach to convert the site to a community asset. De Sousa highlights that the community benefits could include "environmental renewal, economic stimulation, improvements of neighborhood aesthetics, enhancement of the sense of community and place, and preservation of historically-significant buildings and/or landscapes, […] stakeholder collaboration and involvement, providing more recreational spaces, […and increasing] social networks" (2003, p. 194). This alternate approach is supported by APA and is an increasingly popular topic of discussion among planning professionals. Resulting from a US Environmental Protection Agency grant, in 2010 APA released *REUSE: Creating Community-Based Brownfield Redevelopment Strategies* to guide brownfield redevelopment efforts in the US.

In addition, brownfield redevelopment offers psychological benefits for community residents that live in urban areas of concentrated vacant sites and buildings. These abandoned and damaged buildings are considered blight or urban decay. Psychological research has found that residents become distressed by blight and crime, as both lead to a feeling of loss of control (Greenberg & Lewis, 2000). The redevelopment of contaminated, vacant, and derelict land has been found to reduce blight, improve the quality of the neighborhood, protect public health and safety, and ease resident's stress (Greenberg & Lewis, 2000; Adelaja et al., 2010). The reduction of stress through blight removal for residents is particularly imperative in communities with high

unemployment rates such as Michigan and the Ruhr region, where the challenges of meeting their needs may already be severely stressful.

Specific benefits that result from brownfield redevelopment may vary by community considering individual community needs; as revealed in case study research. A redevelopment project to build renewable energy production could have economic and environmental benefits in a community (Adelaja et al., 2010). A brownfield-to-greenhouse project highlights how brownfield redevelopment can help achieve holistic community development goals such as a more just and sustainable food system (Seamon, 2014). The Utica Community Complex is providing community space for recreation and picnic activities on the site, and is part of a larger project to improve neighborhood connectivity through pathways and trails for walking, hiking, and biking (M. Bakun, personal communication, October 21, 2015). Construction of the stadium can be seen in Figure 6 below, across the street from a pathway along the Clinton River.

Figure 6. Pathway Along Clinton River in Utica, MI

Furthermore, brownfields can provide opportunities for cities to redevelop history through industrial heritage tourism. By returning brownfield sites to historic conditions and adding educational and experiential elements, a city could draw visitors, stimulate the tourism industry, and celebrate their previous success. Overall, this research does not identify the specific costs of remediation and redevelopment or assign values to the benefits identified. Instead, it highlights the significant benefits of investment in a community via brownfield redevelopment – benefits that contribute to neighborhood revitalization and quality of life improvements for community residents.

4.2 Myth: Greenfield development is more economical than brownfield redevelopment.

Many developers consider greenfield development to be more economical than brownfield redevelopment. With conventional development, previously undeveloped land, typically farmland or open space on the urban periphery is built up. Developers do not have to remediate contaminated land, tear-down buildings, remove aging infrastructure, or inherit the risks associated with contamination liability. In the US, subsidies and the readily available financing for projects without risks and liabilities further encourage suburban development. As the city develops outward at a decreasing density, public services and infrastructure are extended, utility lines are lengthened, and longer and wider roads are constructed at the expense of the municipality. The public perceives cost savings from access to less expensive real estate, lower property taxes, and lower public service costs that result from less demand (Burchell & Mukherji, 2003). Therefore, developers, private investors, and landowners perceive greenfield development or sprawl to be more profitable than brownfield redevelopment (De Sousa, 2000).

To consider the economic benefits of brownfield redevelopment, the costs associated with sprawl that typically fall on local units of government and the public must be considered.

The costs of sprawl include: expenses related to the expansion of water, sewer, and local road infrastructure; increased public service costs; and transportation-related expenses associated with decreased densities. As residents and businesses develop, municipalities must build new infrastructure to serve the public, however, at decreasing densities, these costs are proportionately higher. When daily activities including work, school, and home are geographically farther apart, especially in American suburbs that lack public transportation, it is more expensive and time consuming for the public to travel between them. Since transportation at greater distances is more expensive for companies to transport goods, the prices that consumers must pay for products increases as well. Decentralized development in general has been found to incur public costs related to a negative effect on environmental and human health. Increased emissions of pollutants from automobile travel have been found to exacerbate global climate change and human health conditions and illnesses. According to literature, a risk factor for a variety of negative public health outcomes is neighborhood-scale air quality affected by motor vehicle emissions (Mansfield, Rodriguez, Huegy, & Gibson, 2015). There are significant public costs associated with air pollution, one of the ten leading causes of premature death and preventable disease in the world (Gillings School of Global Public Health, Department of Environmental Sciences and Engineering, 2015).

In a comparison of social costs and benefits between greenfield development and brownfield redevelopment, researchers have found that development in greenfield locations leaves unpaid costs and forgone benefits (Persky & Wiewel, 1996). The redevelopment of brownfields, which are traditionally located in urban areas reduces sprawl and the exceeding costs of sprawl. Many cost saving opportunities from the redevelopment of a previously developed site are recognized in Germany. The Federal Environmental Agency's 2005

brownfield guidebook highlights the following advantages of brownfield sites over greenfield sites: better location efficiency, increasing property value, less risk of vacancy, decreased construction costs due to available infrastructure, savings on ecological compensation measures, financial incentives and support programs, the marketing advantage of historic structures with "special flair", and the possibility of promotional temporary use. In the US these advantages are not as readily recognized.

Brownfield redevelopment reduces the exceeding costs of sprawl and can increase profitability for the developer given that they develop on an urban brownfield rather than a greenfield. Brownfield redevelopment reduces municipal costs in regards to infrastructure and the provision of public services. Brownfields offer existing infrastructure (waterway, railway, roads, electricity, drainage, etc.) (Vanhuesden, 2007). The utility pipes have already been laid, and the roads and pathways have already been built. Although in the US, many brownfields are generally located near existing, albeit aging infrastructure in urban areas. If the redevelopment of brownfields became regular practice, then infrastructure would not be left to decay for the extended length of time as it has been in the past. Regardless, in many cases, the reuse of existing infrastructure can offer a cost-effective and sustainable alternative to the construction of new infrastructure. Consideration of economies of scale at increased densities suggests a decrease in local public service costs compared to that at decreased densities (Burchell & Mukherji, 2003). Increased density and infill redevelopment relieves road congestion and the costs in time and money that fall directly on automobile commuters for gasoline, car maintenance and traffic collisions, and the related costs of increased travel (Persky & Wiewel, 1996). Partially for this reason, the development of residential property specifically on a brownfield has been found to be more cost-effective than greenfield development (De Sousa,

2000). In addition, reducing automobile and semi-trailer travel time reduces pollution. The increased location efficiency of urban sites and greater density of development means that vehicles are traveling less miles, thus emitting less pollutants. Brownfield redevelopment in urban areas over greenfield redevelopment reduces pollution emissions including greenhouse gases and the human health and environmental costs associated (EPA, 2014). Overall, since it is known that density in urban areas is cheaper for the public than sprawl, in the long run, redeveloping contaminated, vacant, and derelict land which are located in urban areas is more economical than developing greenfields.

4.3 Myth: Brownfield redevelopment is not an effective use of public funds.

By definition, something that is effective is successful at producing the desired result. Brownfield sites in the US are commonly redeveloped exclusively for industrial or commercial purposes through private or public-private funds with the intention of spurring economic growth. As discussed in the earlier chapter on funding, in the US, the focus on the private market does not justify public intervention unless it is correcting market failure and promoting economic development. Therefore, the public sector currently encourages private development for economic benefits with a focus on job creation and capitalizes on the private sector's motivation to redevelop to maximize profit, divest liability risks and costs, and take advantage of the devalued property costs (De Sousa, 2000). It is not uncommon for private developers to conduct a market assessment which suggests a land use and proceed with redevelopment. To help accomplish economic development goals, grants are awarded by the public sector to the projects that create the most jobs and reveal the greatest financial improvements. While brownfield redevelopment with public funds can result in economic development, the public funding approach in the US may not be having the most effective results.

The question of redevelopment brings to light the opportunity for cities with a legacy of previous manufacturing success to reconstruct their former selves by encouraging the development of manufacturing jobs. Research highlights the benefits of economic development efforts based on stimulating the manufacturing industry to aid in the return of manufacturing to central cities (Lester, Kaza, & Kirk, 2013). To understand the brownfield problem and consider redevelopment, it is important to recognize the social and economic forces that ended the former use (Adams et al., 2009). The history of many of these cities is complicated and contested, as benefits and opportunities were not equally distributed. These cities are challenged with moving forward post-industrialization and developing a "new" identity; therefore, there is amplified effort in developing something new and converting derelict land to other uses. This research suggests that public funding that encourages the creation of manufacturing jobs may not be producing the expected economic development effects.

The current public funding model may not be effectively encouraging private development for economic benefits. The challenge is that brownfields typically come into ownership by a local government when a landowner abandons a property and defaults on property taxes. The local government then must remediate the contamination or motivate a private developer to do so with the provision of direct incentives (Meyer & Lyons, 2000). These site-specific strategies to promote development have not been as successful as intended since many private developers find it difficult to work with municipally owned brownfield sites due to the competitive bidding process, public involvement, negative perceptions of sites located in neglected urban areas, and restrictions of use (Meyer & Lyons, 2000).

On the other hand, public funding to convert contaminated, vacant, and derelict land to community assets could be effective at producing environmental and social goals, which are

linked to economic development. The significance of these goals is evident by citizen involvement in projects, which has been found to steer redevelopment initiatives in a direction that benefits the public. The land use they prefer may be a different land use than suggested by the private developer's market assessment (Howland, 2003). Studies have found that when asked, people prefer public community assets over commercial and industrial uses (Greenberg & Lewis, 2000). Literature suggests that residents desire recreation and other community service facilities that meet educational and health care needs (Greenberg & Lewis, 2000). Research found that residents in a largely Hispanic census tract neighborhood prefer play areas and parks, community cultural facilities, and health care facilities over warehouses, factories, and stores (Greenberg & Lewis, 2000). Community assets include, but are not limited to: green space and parks, renewable energy space, community gardens, and housing.

The Utica Community Complex exemplifies the enhancement of a community asset from a brownfield. Since the city of Utica owned the land for the Utica Community Complex, community events such as festivals, activities, and carnivals were previously hosted on the contaminated and vacant land. By financially supporting the brownfield redevelopment through a public-private partnership, the public funds are cleaning and improving the community space. There are agreements in place to ensure that the city is able to use the stadium and parking space for about 250 days a year when it is not being used by the baseball league. The public funds are helping the city achieve clean, pleasant community space for an ice skating rink, firework displays, graduation celebrations, recreation opportunities. The project is a significant benefit to the community and the public funding or market intervention to support the project was considered an effective use of funds to accomplish place-making goals.

The concept to explain the German commitment to market intervention with public funding is *Kommunale Daseinsfürsorge* or municipal general interest. Public funding decisions in Germany are made according to a doctrine that the municipality must provide everything that a resident would need (J. Woelki, personal communication, October 26, 2015). This seems to extend past simply providing public services and infrastructure to a commitment to develop space equitably. Both the EU's commitment to providing funds to ensure that each country and their inhabitants have equal chances for opportunities for development, and Germany's pledge to narrow the gap between rich and poor communities emphasize how equity goals are shaping redevelopment.

The Phoenix-See project fits within the Aktionsplan Soziale Stadt, which is a funded program to develop the less developed third of the city's neighborhoods. After the coal mine and steel-plant closed in the Hörde district, many residents in the area were left in the dark shadow of industrial equipment that littered the landscape but was no longer able to provide financial security. The area struggled from a lack of investment and the social issues associated. The Phoenix-West and Phoenix-See redevelopment project transformed the vacant and contaminated land into clean places to live, work, and play. With public funding, the residents that were previously lacking services were provided with new parcels for homes, opportunities for employment, public space, and recreation activities.

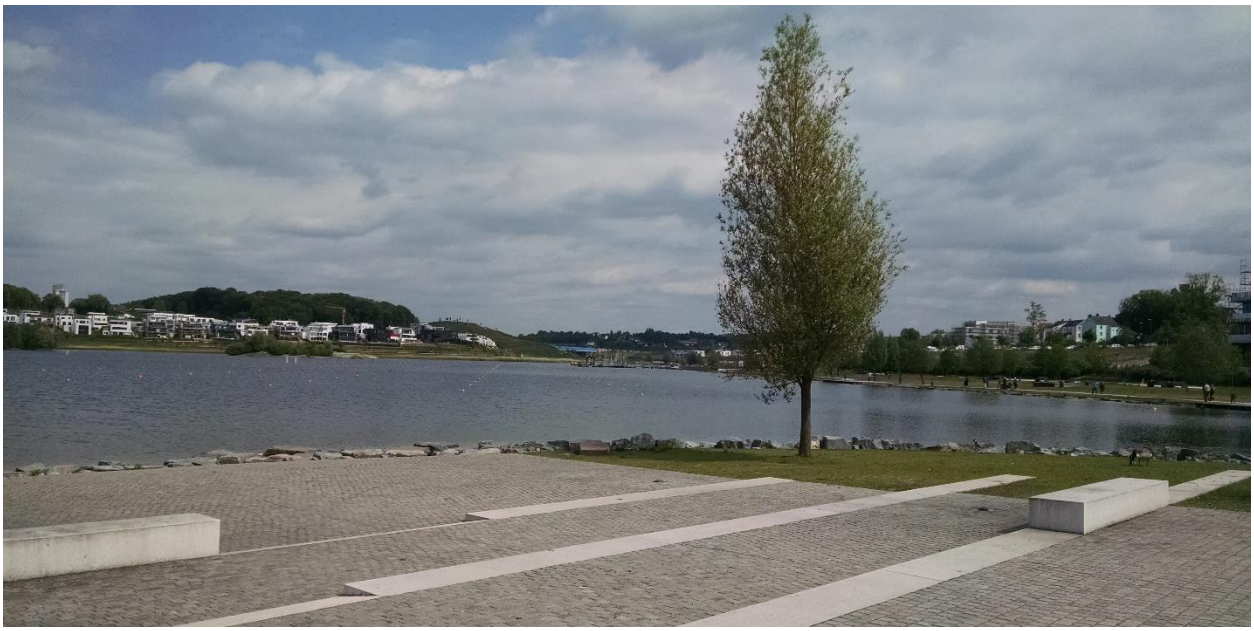

Figure 7. Western View of Phoenix-See

Research has found that there is a strong correlation between the productive reuse of brownfields and social, environmental, and economic benefits (Malek & Matev, 2014). As demonstrated by both the Utica Community Complex and Phoenix-See projects, publicly funded brownfield redevelopment can successfully help communities achieve holistic community development goals. Brownfield redevelopment cleans or contains contaminants in the soil and land, changes neighborhoods, achieves placemaking goals, and develops the poorest parts of cities. Therefore, this research supports that brownfield redevelopment is an effective use of public funds because it produces social and environmental benefits, and indirect economic development benefits.

4.4 Myth: Public projects do not generate tax revenue.

In the US, individuals and businesses pay property tax for real property, including land and improvements to the land to finance local services. The tax may be levied at state, county, municipal, township, and school district levels; but a majority is collected at the local levels. The

property tax, which is based on a percentage of the assessed value of the property, finances services such as: the operation of local governments, public education, special infrastructure projects, and police and fire protection. To keep a property in one's possession, private individuals and businesses must pay the property tax. When a public entity owns land, the land is considered a nontaxable entity and exempt from local property taxes (Jones & Welsh, 2010). For this reason, local governments prefer traditional private development to receive the property tax benefits of increased property value from redevelopment.

Although brownfield redevelopment on publicly owned projects may not directly contribute property tax revenue, research suggests that public projects still lead to an increase of tax revenue in the community. Recent studies support a real and perceived increase in property values surrounding a brownfield site as a result of redevelopment (De Sousa et al., 2009; Ploegmakers & Beckers, 2014). Contaminated, vacant, or derelict land usually becomes city owned through the property tax foreclosure process. Rather than only finding a private purchaser of the land or when a private purchaser cannot be found, given that improvements to the land could increase property values of surrounding properties, it is beneficial for the public sector to retain ownership of brownfields and convert them to public assets. Since property tax is based on the assessed value of the property, as the value increases, additional property tax revenue is generated and the local tax base increases. By increasing the property value of surrounding properties, public projects generate supplementary tax revenue.

In general, neighboring property values increase with the removal of vacant and blighted structures, the remediation of environmental contamination, and the provision of parks, pathways, and green space. In a study on surrounding residential values in two similar cities, researchers found a significant increase in values after the completion of brownfield projects and

that a majority of stakeholder interviewees believe that redevelopment positively impacts the value of surrounding residential property (De Sousa et al., 2009). According to a recent Environmental Protection Program study, after a brownfield site was assessed or cleaned up, there was a 5.1 to 12.8% increase in nearby residential property values (2014). Overall, the EPA study found that property values within a one-mile radius of a cleaned up brownfield site can increase by $0.5 to $1.5 million (EPA, 2014).

However, the degree of increase is highly dependent on the site's location and other characteristics, and the new use, as recently studied by De Sousa, Wu, and Westphal (2009). The properties proximity to roads, water, and employment are considered main factors that influence a project's impact on surrounding property values (De Sousa et al., 2009). Redevelopment projects might not be economically successful in terms of increased value possibly due to their location in generally depressed inner-city areas. The type of redevelopment project indeed impacts value. Stakeholder interviewees that participated in their study perceive the greatest impacts on the value of surrounding residential property to be made by residential and park projects; compared to a moderate impact by retail and office projects and a negative effect by heavy industry (De Sousa et al., 2009). According to the respondents, if a project involves neighborhood residents, is compatible with the community, and meets community goals in relation to jobs, recreation, or housing, it can be more effective at increasing property values (De Sousa at al., 2009).

The financing method and use of a public-private partnership dynamic for the redevelopment project supports an increase in tax revenue. Consider public-private partnerships, which can be used to increase expenditures in infrastructure in exchange for private investment in the redevelopment project. Public-private partnerships can also take the form of TIF incentives

where future property tax revenue that would result from development is used to finance the redevelopment project. The developer pays for development activities and the TIF incentives provide reimbursement from property tax revenue that would otherwise not be generated.

In Utica, since the land for the Utica Community Complex is owned by the city and rented for $1 per year by General Sports and Entertainment, the city will not see an increase in property tax from the development or collect TIF. According to the application, the city is hoping to see ancillary development in the community as a result of this project. The project is proposed as a place-making project that will be a catalyst for entertainment venues. With an increase in visitors to the commercial center, the existing restaurants and shops will benefit from additional patronage. The development of a public community complex will lead to an increase in sales tax revenue and increase in property tax revenue as neighboring properties increase in value (M. Bakun, personal communication, October 21, 2015).

Similar to the US, German residents and companies pay property tax and income tax. The publicly funded Phoenix-See project has and will continue to generate increased tax revenue. The residential properties that were developed were sold to private landowners who are now paying property tax on the properties. To prevent gentrification and forcing financially constrained residents out of the region, the city is capturing taxes on the original land value rather than the increased land value. The upscale residential properties are being used to attract wealthy residents. Ideally these residents will be attracted to the high quality of life offered by the mixed use community on the lake and will bring their businesses and innovative ideas to the region (J. Woelki, personal communication, October 26, 2015). In the long run, this will lead to an increase in property tax and income tax revenue. Therefore, as evidenced by practical

application in this project and the Utica project, public investment in brownfield redevelopment projects can increase tax revenue in the community.

Figure 8. Phoenix-See: New Commercial and Residential Space, and a Reminder of the Old Land Use

4.5 Myth: The challenges and barriers to brownfield redevelopment are too complicated to be handled by public agencies.

Brownfield redevelopment projects face numerous challenges and barriers. All outcomes are affected by market, environmental, regulatory, administrative, and political conditions and risks (Howland, 2003). There is much uncertainty related to the risk assessment, financing problems, and high costs of insurance due to issues related to contamination. Time is a challenge. The slowness of the regulatory review process alone has been mentioned to be a significant obstacle (De Sousa, 2000). The redevelopment process may take years, and it may be numerous years before the full benefits are realized (Jones & Welsh, 2010). Projects require the consideration of funding, collaboration across institutional differences, accountability, and balancing human development and economic goals (Seamon, 2014). The fear of the unknown regarding the presence of contaminants is real and there is a need for innovation in determining

an appropriate reuse for the site. For the project to be successful, community and political involvement and consensus-building are potential barriers to address (Adelaja et al., 2010). Lange and McNeil's (2004) research found that the two variables with the greatest impact on the success of redevelopment projects are community support and consistency with the master plan. Even though community residents, organizations, and business owners are often the main supporters for brownfield redevelopment, they do not always participate in the process or take ownership of the project. Considering their support is a potential barrier to the success of the project, on top of all the other barriers, their lack of participation intensifies the challenge.

These challenges and barriers are significant, but the German model of public agency involvement in brownfield redevelopment demonstrates they are not insurmountable. Local units of government including cities and agencies work independently within the local authority, partner with private companies, and form subsidiary groups to oversee small and large-scale brownfield redevelopment projects in Germany. The Phoenix-See project is an example of such public agency involvement in a project. The city of Dortmund purchased the brownfield properties and gave them to a subsidiary of the Dortmunder Stadtwerke AG, the public developer Phoenix See Entwicklungsgesellschaft mbH. The city was involved in the formation of the agency, plan-making for the redevelopment project, cleanup, and redevelopment.

Additionally, in Germany contamination assessments are standard practice and city land registers provide information to minimize the fear of the unknown, and ensure that information is readily available to both public and private developers. Site passports or certificates are granted to provide detailed information and make brownfield sites more transparent to developers (Federal Environmental Agency, 2005). The document contains essential property data, evaluation and financing, economical type of location, general construction conditions and

restrictions, contamination and ground characteristics. To aid in determining reuse, redevelopment activities are experimental and non-traditional. Numerous research programs are funded by all levels of government and dedicated to exploring models of public investment in reuse and renewal. Innovative redevelopment activities include public campaigns to advertise living and working in the city, pilot projects to test new brownfield regeneration concepts, and work tools to aid in the redevelopment process (Federal Environmental Agency, 2005). The IBA Emscher Park Initiative further highlights creativity and innovation in public redevelopment. The regional authority that oversaw the project set specific environmental, social, and cultural goals and principles with a focus on regional modernization, but did not design all of the projects. Public and private developers, and local government agencies participated in a project design competition. The winning projects were unique, creative, and innovative. These examples support that public agencies in Germany are able to overcome the challenges and barriers to brownfield redevelopment.

The perception that the challenges and barriers to brownfield redevelopment are too complicated to be handled by public agencies in the US may question the approach to redevelopment and capacities of public agencies. The current approach in the US may be hindering the ability of public sector actors to overcome barriers. Similarly, public sector actors could be limited in innovation and entrepreneurial brownfield redevelopment by a lack of national level policies, funds, and incentives and a developed organizational network (Alexandrescu et al., 2014). This could be reflective of the lack of political interest in redeveloping urban cores in the US. According to Short and Mussman (2014), the lack of investment in industrial cities in steady decline speaks to the political climate. In addition, framing brownfield redevelopment as solely environmental remediation could be preventing

involvement and consensus-building in the seemingly complicated and technical project. The project seems complicated because very little information on the land, history, contaminants, costs, funding mechanisms, and regulatory process is available.

Despite these challenges, some public agencies in the US have been successful at bringing about change and supporting redevelopment. The Utica Community Complex project demonstrates the ability of a public agency to overcome redevelopment challenges. The city of Utica was the real champion of the project. A project champion is an individual, group of individuals, or organization that is involved in the project from the beginning and sees the project through to successful completion. The city acquired the parcels, retained ownership of the land, demolished the building that was on the property, and pursued a developer for the project. The public agency fought for the project, ensured that their internal regulatory process was not a limiting factor and made development a priority, contacted MDEQ to investigate environmental remediation funding, and involved the community. According to M. Bakun, the city, specifically the Downtown Development Authority, has been cooperative and instrumental in the success of the project so far (personal communication, October 21, 2015). This example suggests that public agencies in the US can overcome the barriers and challenges to redevelopment by increasing capacity in terms of knowledge, experience, enabling laws and regulations, and community and political involvement.

4.6 Conclusion

Trading the myths identified above for truths in Michigan could promote public investment in brownfield redevelopment. The tangible and intangible benefits of redevelopment for the environment, the residents, and the overall community exceed the costs of redevelopment. These benefits can be recognized by determining measures for evaluation purposes. Local

governments and public agencies should begin the brownfield redevelopment process with a community needs assessment that involves local residents to identify holistic community goals. Then measures should be determined to recognize benefits to the environment including the amount of green space, improvements to public health and well-being, the enhancement of neighborhood aesthetics, and the creation of a sense of community or place. Assigning values to these benefits would demonstrate their ability to exceed the costs of redevelopment.

Recognizing that brownfield redevelopment is more economical that brownfield redevelopment, the redevelopment of previously used urban land should be encouraged to save local units of government and the public money. Redirecting greenfield to brownfield redevelopment is a challenge today because local governments are willing to extend city services and infrastructure at less than full cost to the recipient which creates a market for sprawl, people have a personal desire for this development, and policies support the tax deductions of mortgage costs and real estate taxes, and low prices of gasoline (Burchell & Mukherji, 2003). To capture economic benefits, local governments should charge full cost to extend city services and infrastructure, raise property taxes, and offer incentives for development at greater densities in urban areas to help people and developers realize the real costs of sprawl.

Brownfield redevelopment is an effective use of public funds because it can successfully bring about change, helps accomplish holistic community development goals, and indirectly leads to economic development. The evaluation of the effective use of public funds in brownfield redevelopment should reflect social and environmental goals other than direct economic development. Currently, in the US, public funds are allocated based on the number of jobs that project create and the increase in property tax revenue that would result from development. As public funding for projects increase, it becomes harder to prove significant economic gains (De

Sousa, 2003). Projects that create community asset's in general do not generate the most jobs possible; as the job multiplier of such a land use is much lower. Therefore, these projects may not be awarded funds. Recognizing that brownfield redevelopment effectively produces social and environmental benefits which are indirectly tied to economic benefits, funding allocation should include measures of social and environmental development.

Brownfield redevelopment also leads to an in increase in tax revenue. Addressing this myth suggests the need for an evaluation mechanism that recognizes long term changes in property, income, and sales tax revenue generated in a community following brownfield redevelopment to defend public investment in such projects. Brownfield redevelopment can be a catalyst for development in a community which would lead to the generation of additional tax revenue.

Lastly, public agencies in the US could overcome the barriers and challenges to brownfield redevelopment by increasing capacity, altering the development approach, improving political and community involvement, and encouraging innovation in redevelopment practices. Making information readily available through programs like the Redevelopment Ready Communities program can help accelerate the planning and approval process and simplify the regulatory process. Local agencies interested in undertaking development projects can hire environmental consultants to assist with the redevelopment process. Consultants that are knowledgeable of environmental remediation, real costs, and financial and incentive pieces are commonly used by private developers. Their aid could increase the success of public agencies with limited knowledge and experience in brownfield redevelopment (M. Bakun, personal communication, October 21, 2015).

Increasing capacity could help conquer obstacles. In weak markets, to increase the development capacity of public agencies, researchers recommend restructuring the system of community development to enable non-profit developers to reuse vacant, abandoned, and contaminated property with enabling laws and regulations, strong positive political leadership, the development and empowerment of major city-wide institutions, and positive personal relationships (Dewar, 2009). Aside from developing properties, there are opportunities for nonprofit developers to become involved in the reuse of contaminated sites as a facilitator, pre-developer, or aid in reducing the developer's costs (Dewar, 2009). Increasing the development capacity of agencies such as non-profits, could minimize the challenges and barriers to development in a community.

Finally, for public agencies to overcome the community and political involvement and consensus-building barriers to redevelopment, citizen participation should be made a priority. Currently, the strategies and requirements for public involvement in the US differ by city and state, do not guarantee participation or stakeholder involvement, and lack permanent funding for participation efforts (Thornton et al., 2007). This leaves room for improvements. Since community and political involvement and consensus-building are required for successful brownfield redevelopment, redevelopment projects should ideally be viewed from a less scientific and technical approach than they are currently. Framing the project as a neighborhood revitalization or urban redevelopment initiative with positive benefits for the community encourages involvement and collaboration from members of the community. Research has found that resident participation and ownership of redevelopment projects increase when projects are framed this way. There are opportunities for increased public participation in redevelopment projects if the public is involved in the process from the beginning, they feel that the issue is

important, they trust the developer, and they perceive a direct benefit to the community (Greenberg & Lewis, 2000; Solitare, 2011). With these changes, successful brownfield redevelopment projects will be attainable for US public agencies.

CHAPTER 5: Conclusion

5.0 Limitations of this Study

This study is limited in scope due to research design, information availability, and language and geographic boundaries. Since the primary method of research was collecting information from scholarly journals and articles, and existing public documents and records, the study is limited by the information available. As is typical of case study research, qualitative results only consider the contexts of a limited number of projects. Only two projects in two specific locations within two countries were investigated. In addition, language and geographic boundaries limit this international comparison from a practical and contextual standpoint. Research primarily conducted in the US in English via an American IP address to access the internet may have excluded some German scholarly journals and articles, and existing public documents and records. Finally, although the researcher did visit Phoenix-See and the Ruhr region in Germany, extensive time was not spent in the area to develop a profound understanding. The understandings of the German context and the American context are not equal in this international comparative research.

5.1 Recommendations

It is known that the barriers and challenges, both real and perceived, of urban brownfields stem from health concerns from the contaminated soil, the issue of liability, high demolition and remediation costs, policies and regulatory mechanisms, negative social perceptions, financing, additional time and costs added to the development process, uncertainty of future risk, and pressure from competing land-uses (De Sousa, 2003; Adams et al., 2009; Medlen, 2012; Bacot & O'Dell, 2006; Goodstein et al., 2011; Thornton et al., 2007). Adelaja, Shaw, Beyea, and

McKeown (2010) point out that these large barriers may be responsible for the relatively slow pace of brownfield redevelopment in the US, despite the policies, tools, and incentives in place. This research highlights that these barriers are not solely responsible for the relatively slow pace of brownfield redevelopment in the US. The policies, tools, and incentives in place may not be having the desired effects at stimulating brownfield redevelopment.

The international comparison between the US and Germany suggests that the slow pace of brownfield redevelopment in the US is due to numerous factors. It is partially a result of the abundance of land resources which encourage greenfield development over the reuse of previously developed brownfields. In Germany, the population density is 231.25 people per square kilometer, whereas in the US, it is only 33.77 according to the United Nations. As the land resources to accommodate the population in Germany became scarce, the societal costs of sprawl increased and created a demand for the productive use of land. Today, land reuse and redevelopment is a priority for the German public sector, supported by equitable development goals, strict land use regulations, policies that limit sprawl, and available funding for redevelopment. The demand for land is increasing in the US as value is placed in preserving undeveloped land resources and the adaptive reuse of previously developed land.

To explain the slow pace of brownfield redevelopment in the US, specifically in the Midwest, it is also important to recognize the role of the political climate. Short and Mussman (2014) attribute the steady decline of industrial cities in the Midwest to a lack of investment in infrastructure, suburbanization, and the difficulties that limit annexation. To increase the pace of brownfield redevelopment, specifically public redevelopment in the US, this research reveals the following recommendations. The broad ideas presented here are only reflective of the policies,

programs, incentives, funding practices, and misconceptions explored in this research and do not consider the complexities of the federal, state, and local political climate.

Consider the carrot and stick model of government intervention in a free market system in relation to the government approach to brownfield redevelopment (Lyons & Hamlin, 2001). The laws related to contaminated soil have served as sticks to set a minimum standard of behavior and the programs and fiscal incentives that reward private investment, or carrots, have encouraged desirable behavior. Both should now be used to change the brownfield situation in the US by encouraging urban development and community revitalization, as well as to remedy environmental, economic, and social problems in post-industrial areas.

Policies and incentives should encourage the adaptive reuse of all contaminated, vacant, or derelict land to redirect growth and development to urban areas. US federal policies could encourage redevelopment on highly contaminated sites or where there is a weak real estate market. They could be used to require or incentivize specific reuses, such as the creation of green space or renewable energy production on brownfields (De Sousa, 2003). Financial incentives could encourage the retention and adequate reuse of buildings and infrastructure on sites or the sustainable reuse of brownfield soil and waste (Thornton et al., 2007). The availability of resources including grants and technical assistance could be increased at the national, state, and local levels. At the national level, funds could be made available for equitable redevelopment. At local or regional levels, public sectors should be empowered to take initiative to purchase parcels, remediate the contamination if necessary, and invest in infrastructure to improve the value of brownfields. Funding should be available to encourage local units of government to proactively increase the competitiveness of brownfields, regardless if there is committed private investment or if the project has a high profit margin. After all, research reveals that public

investment in brownfield redevelopment has an urban rejuvenating effect that eases the burdens in postindustrial cities regardless of the project's size and cost (De Sousa at al., 2009).

Government activities such as these laws, policies, programs, and incentives would nudge private activity to perfect the market. In post-industrial cities market demand is weak, public services are lacking, and residents are struggling from economic, social, and environmental forces. Even with adjustments, the funding programs may not provide enough of an incentive to change the market since the system is lacking national laws related to land use and development. There could be a need for increased government intervention or for the government to take over the market to create demand for previously developed urban land. The government could invest in communities with an abundance of brownfields, provide opportunities for housing, recreation, and employment, and meet community development needs.

Contaminated, vacant, and derelict land can be a problem. It can be a social, environmental, and economic problem, but it is indeed an opportunity. If the redevelopment potential of vacant land was recognized when assessing its value and urban development was encouraged, then struggling post-industrial with an abundance of available property would have an extensive urban resource for the future (Pagano & Bowman, 2004). Vacant land and abandoned structures offer potential, the potential for a city to reinvent itself; for community revitalization. It offers opportunities for the creation of a new city and for Michigan and the Ruhr region to embrace culture, art, industrial heritage, and public space.

5.2 Implications for Planning in the United States

This research brings to light the need for changes in public outlook, government policies and incentives in the US to encourage redevelopment: development that encourages innovative practices to restore usability to land previously used. The hottest topic in urban and regional

planning practice today is sustainability, yet redevelopment has not yet been made a priority. Redevelopment that creates community assets should be a priority, a national priority. However, assuming that the current planning, development, and land use system in the US is not going to change, this research suggests numerous implications for planning professionals to encourage brownfield redevelopment at local levels.

The American Institute for Certified Planners in the US holds urban and regional planning professionals under a Code of Ethics and Professional Conduct. Under the Code, planning professionals aspire to the principle of serving the public interest. Planners are responsible for attaining community consensus, and making decisions and taking action to ensure the well-being of the general public. This research suggests that brownfield redevelopment is in the public's best interest. According to research, the community consensus is that residents of urban neighborhoods would support public investment in contaminated, vacant, and derelict land to meet neighborhood revitalization goals. Therefore, it is the job of planning professions to encourage the creation of community assets from brownfields. In the creation of arts, entertainment, sports, culture, and services in post-industrial cities, planners are responsible for planning for current residents. While brownfields should be used to create venues that promote development and tourism, plans should begin with community-need assessments to identify how brownfields can be used to accomplish holistic community goals. From an individual project perspective, it is important to recognize that there is not a one-size fits all approach to redevelopment. Local planners should develop customized approaches for projects that encourage public spending and maximize community benefits. Planners are responsible for advancing local public health, safety, and welfare. Redirecting growth would promote these

values by reducing land consumption and encouraging the spending of public dollars on community assets.

Since development plans and decisions are made locally, to encourage brownfield redevelopment, local governments should ensure that appropriate plans are in place. Master plans, zoning ordinances, and regulations should promote redevelopment. Community master plans should have flexible local zoning and reflect local understandings and political culture. Opportunities to establish a BRA, develop brownfield plans, and participate in programs such as the Redevelopment Ready Communities program should be taken to encourage redevelopment and attract developers. To incorporate shared goals, the resulting BRA plans should connect to master plans and other local plans. A detailed inventory of city land that includes a history of uses, contaminants, and other details could complement redevelopment plans.

While the US lacks a framework for regional planning, local municipalities should take it upon themselves to collaborate at a regional level. Local units of government could partner with neighboring units of government to fund innovation and research in redevelopment strategies and solutions or incorporate county or state goals and objectives in redevelopment plans. It could be the role of the planner to bring these organizations together with local community groups, existing regional entities, and universities to share information and opportunities. Regional collaboration could simply provide an opportunity for neighboring communities to share the resources that worked for them to promote redevelopment within their own community. Additionally, collaboration could reveal opportunities for larger scale redevelopment and encourage recognizing the positive benefits of planning at a regional scale.

5.3 Implications for Planning in Germany

This paper focuses on recommendations based on German practices that can be adapted to the US context. On the other hand, US practices offer lessons for urban planners in Germany. Although there are many benefits to the German regional planning model, it may not be addressing all local government concerns. The US model of local planning highlights the benefits of empowering local units of government to direct their own future in terms of development. There could be opportunities for local planners in Germany to seek consensus, and write local community development plans and comprehensive plans to encourage redevelopment and attract the attention of the regional planning entity. This also brings to light opportunities for increasing local community involvement or public input in redevelopment plans. In the US, although local residents are not necessarily involved in the formation of individual projects, there are many opportunities for citizen involvement in the preparation of community plans, which promotes bottom-up planning based on local consensus. Rather than only bringing redevelopment projects to the public for comments after plans have been made, the planning process in Germany could include innovative public input sessions that encourage participation from individuals and local community organizations.

Finally, as public funds in Germany are over extended and the use of public-private partnerships in redevelopment projects becomes the dominant practice, the development model is more reflective of the US context. The German government could adapt US methods of incentivizing private investment and encouraging additional private sector involvement. In that case, there could be a need for stricter evaluation of public investments and greater rewards for private developers. However, it is recommended that the German government retain federal

development goals and objectives, regional planning practices, the public funding model, and a commitment to research programs.

5.4 Future Research

There are numerous opportunities for future research to expand the information gained in this study. To continue an American-German comparison, ideally a future researcher would be fluent in both the German and English language and live and conduct research in both countries. Future research could explore numerous redevelopment projects in each country from a quantitative perspective to evaluate public versus private investment in projects. From a quantitative perspective, detailed case studies on actual costs of redevelopment and remediation could support an assessment of costs and benefits. In addition, future research could evaluate the success of public redevelopment projects in terms of property value increases and jobs created. Or the researcher could work with community residents to evaluate increases in quality of life that result from the creation of community assets on contaminated, vacant, or derelict land. Since the effects of remediation and redevelopment are not immediately perceived in communities, there are opportunities for future research to evaluate the long term results of creating community assets. Further research in the US could develop a regional framework for planning or brownfield approaches or a public funding model for redevelopment projects.

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