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Employment Effects of Brownfield Redevelopment: What Do We Know From the Literature?

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The purpose of this review is to survey the literature addressing the employment effects of brownfield redevelopment. Economic development has emerged as a potential goal of the environmental cleanup process. The evolving literature (1) addresses the redevelopment and job creation that has followed the numerous cases of environmental remediation; (2) continues to debate whether brownfield redevelopment creates new jobs or leads to the spatial reallocation of existing jobs; and (3) documents emerging efforts to tie brownfield redevelopment benefits to local residents and the un- or underemployed.

The existing literature highlights the difficulties of moving from site cleanup to neighborhood revitalization. The literature is clear: site cleanup alone is typically not enough to stimulate neighborhood regeneration in the most distressed neighborhoods. There are tradeoffs between financial feasibility and tackling the most contaminated sites in the most distressed neighborhoods, and the redevelopment in these neighborhoods generally required large government subsidies. The literature highlights many positive developments and experiments. Apparent successes involve large scale plans that integrate site cleanup with wider community plans, the growing tendency to link jobs on brownfield sites to local residents, increasingly sophisticated subsidies and incentives, and the importance of design that integrates redevelopment with the existing neighborhood. To steer clear of gentrification, redevelopment strategies should focus on attracting employers who will hire local workers.

Key words: land cleanup, reuse, brownfields, employment effects
Subject Area Classifications: Hazardous Waste, Land Use, Economic Impacts

Employment Effects of Brownfield Redevelopment: What do we know from the literature?

Marie Howland[1]

This report surveys the literature addressing the employment effects of brownfield redevelopment. The report discusses: 1) the emergence of economic development as a goal of the environmental cleanup process; 2) what the literature tells us about redevelopment and job creation following environmental remediation; 3) the debate over whether brownfield redevelopment creates new jobs or leads to the spatial reallocation of existing jobs; 4) the effect of levels of contamination, neighborhood conditions, and the location of brownfield sites on development outcomes; 5) policy efforts to tie brownfield redevelopment benefits to local residents and the un- or underemployed; and 6) the status of efforts to model brownfield revitalization.

1) Economic Development and the Cleanup Process

When the U.S. Congress enacted the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in 1980, the law aimed both at identifying and cleaning up sites contaminated with hazardous substances and getting the parties who were responsible for the contamination to pay for the cleanup. To achieve these objectives, the liability for cleanup under CERCLA was retroactive, strict, and joint and several, where:

- "Retroactive" liability applies even to acts causing pollution years or decades before CERCLA became law.

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- "Strict" liability does not require the demonstration of any wrong-doing. Even actions that were legal at the time they were taken could result in the actors being held accountable for the costs of cleanup and environmental damage.
- "Joint and several" liability is shared among the many parties who could be held responsible for the pollution. CERCLA created three general classes of potentially responsible parties (PRP): (1) generators of hazardous substances; (2) owners and operators of the site where the contamination is found; and (3) transporters with the authority to decide on the site for disposal of hazardous substances. The "joint and several" provision means any one or all of these PRPs may be held responsible for the entire cost of cleanup. Subsequent to the 1980 law and prior to 1996 revisions, lending institutions and local governments could also be held liable as PRPs (VanLandingham and Meyer 2002).

CERCLA and its 1986 reauthorization (the Superfund Amendments and Reauthorization Act) made a legislative commitment to restoring sites to their "natural" condition and holding those responsible for the contamination financially responsible. Mired in controversy since its passage, reformers argued that the liability associated with redevelopment was driving the risks and costs of redeveloping so high that re-use was all but impossible. Critics of CERCLA argued it was necessary to remove barriers that were inhibiting economic development, especially at tens of thousands of lesser contaminated properties. Policy makers and analysts who were concerned about the deteriorating urban cores of U.S. cities were especially vocal. They argued that

CERCLA's strong liability provision presented a sharp disincentive for economic development on contaminated sites, and that this legislation was contributing to the poverty and breakdown of city economies (U.S. Department of Housing and Urban Development 1998; Wernstedt, Hersh, and Probst 1999; Hula 1999).

U.S. EPA responded by relaxing the notion that contaminated sites should be cleaned to their "natural" condition and by recognizing economic development as a legitimate goal. Less seriously contaminated sites were removed from the National Priorities List (NPL), the U.S. EPA relinquished authority over the cleanup standards of sites participating in many state-level non-Superfund Voluntary Cleanup Programs (VCP), and economic viability was established as a key factor in the granting of Federal EPA Brownfield Pilot grants.

Forty-eight states have now authorized Voluntary Cleanup Programs and more than eleven of these states have signed memoranda of agreement with the EPA to assume authority over cleanup standards (Bartsch and Deane 2002). The general framework of most state programs includes (1) relaxed liability for purchases of contaminated properties where the new owner is not responsible for the contamination; (2) increased reliance on voluntary cleanup rather than government enforcement; (3) more flexible cleanup standards allowing parcels to be cleaned to standards appropriate to future use; and (4) the provision of financial incentives. As of 2002, more than an estimated 30,000 sites entered state VCP programs (Bartsch and Deane 2002).

Hula captures this change in focus from purely environmental cleanup to economic redevelopment in his review of Michigan brownfield programs and interviews with public officials. One local development official stated:

> And so a lot of people call the Department of Environmental Quality today the "Department of Economic Development" because they wholly, at least at the upper administration levels, totally embraced the idea of doing whatever it takes to encourage business while still protecting the environment (Hula 1999, p. 15).

At the Federal level, economic redevelopment continues as a goal of environmental cleanup. The signing of the 2002 Small Business Liability Relief and Brownfields Act expanded both liability projection and funding, and in 2003, EPA provided $75 million in brownfield grants to states, local governments and non-profits (Heberle and Wernstedt 2006). In 2006, the U.S. House of Representatives passed an amendment to an appropriations bill that promises to restore millions of dollars for the continued cleanup of brownfield sites nationwide.[2] The bill, HR 3058, includes funding for the Department of Housing and Urban Development's Brownfield Development Initiative Program (BEDI). The goal of the BEDI program is to return contaminated sites to productive uses with an emphasis on creating substantial numbers of jobs for lower-income people in physically and economically distressed neighborhoods. The amendment increases grants available under HUD's Community Development fund by $24 million (U.S. Library of Congress 2006).

Aside from these Federal and state revisions in brownfields legislation, technological innovations in environmental cleanup methods; developer, lender, and government experience in coping with cleanups; and the evolution of liability insurance have all eased the path to redevelopment. For example, Howland (2004a) tracked the sales of contaminated properties in one industrial district in Baltimore. She found that

[2] Offered by Congresswoman Eddie Bernice Johnson to H.R. 3058 - the 2006 Transportation, Treasury, HUD, Judiciary, District of Columbia Appropriations Act.

sales of these properties accelerated over the decade of the 1990s, with only 10 percent occurring prior to 1995 and 90 percent occurring after.

2) Employment Creation on Brownfield Sites: What do we know?

The literature on the employment effects of brownfields redevelopment consists primarily of case studies that measure employment effects by counting the number of jobs planned or currently existing on remediated sites. Bartsch and Deane (2002) collected data on the number of sites cleaned and the reuse benefits of brownfields in the VCP's of the 50 states and Puerto Rico. In California alone, they report 315 properties that completed the state's voluntary cleanup programs and received "no further action" letters. These projects resulted in 21,000 new or relocated permanent jobs and $475 million in new or reallocated tax revenues. The numbers reported in the Bartsch and Deane study (2002) are based on telephone interviews, faxed responses and e-mail correspondence with environmental and/or economic development agency contacts. The questions asked of the agencies appear to have been open-ended because the content of the answers varies from state to state. Also, many of the states Bartsch and Deane interview do not appear to be tracking economic benefits at all.

A review of numerous case studies shows a similar methodology of collecting data from local and state economic and environmental officials and developers. Several of these studies are summarized in Appendix 1. While the number of cases reported in the literature has grown too large to summarize completely, a review of the case studies examined yields several conclusions:

1) The average project in which jobs are created appears to yield about 10 jobs per acre.

2) When jobs are created, the new use is most likely to be industrial and commercial. Residential and recreational developments are both less common and create fewer direct jobs.

3) The median public cost per job created is about $14,000 (Pepper 1997, Gilliland 1999, U.S. National Conference of Mayors 1999 and 2004, U.S. EPA 2006).

For our purposes, we learn more from what is not covered and the shortcomings of these cases, which are:

1) They do not identify whether jobs were newly created or reallocated across space. Even when the study reports jobs retained, we do not know where they would have gone if they moved.

2) The studies pay little attention to the number of jobs created in the remediation and construction phases of development.

3) The studies do not attempt to measure the share of jobs that went to the un- or underemployed.

4) No attention is paid to the quality of the jobs, i.e., whether there are opportunities for upward mobility.

5) No attention is paid to the stability of these jobs over time.

6) None of the cases report spin-off employment impacts in the surrounding community.

7) None of the studies track the wider neighborhood development impacts, e.g., rising incomes, reduced crime, etc.

Why are these cases limited to simply job counting on site? There are several reasons. First, state and Federal officials are anxious to show measurable successes that strengthen the case for continued or additional brownfield funding. Second, revitalization benefits are geographically diffuse, with impacts declining with distance. It is difficult to capture and attribute all effects that occur to one event, in this case a brownfield cleanup. Third, revitalization is a long-term process; it is difficult to attribute all positive outcomes that occur over time to one event, in this case a brownfield cleanup. With time more positive and negative events intervene. Moreover, brownfield redevelopment efforts are relatively new; as a result, there are few examples that would permit the long-term, post-cleanup analysis that the revitalization concept is trying to capture.

There are findings from the general economic development literature that can advance our understanding of the impact of brownfield remediation on job creation and neighborhood revitalization. A meta-analysis by Bartik (1991) reviews econometric studies that attempt to measure the impact of employment growth on local unemployment and labor force participation. Generally these studies find that many jobs from economic expansion go to in-migrants (new residents) to the metro area, but job growth does lower the unemployment rate and raise the labor force participation rate. These studies disagree, however, on the share of jobs that go to in-migrants versus the resident unemployed or new entrants to the labor market (Bartik 1991, p. 84). Based on a study of 25 metropolitan areas from 1972 to 1986 and an analysis of the labor market success of 44,000 adult males in 89 metropolitan areas from 1979 to 1986, Bartik (1991) finds that a one-time shock, i.e. a major investment project, lowers the area's unemployment rate and

raises the labor force participation rate for at least eight years after the shock. Advances in worker's occupational status continue after the eight years and the impact on earnings growth and income are greatest for blacks and low-income workers. Bartik also finds that growth raises property values, but this impact is more likely to be regressive since higher income individuals own property. While these results are suggestive of what we might expect with a redevelopment on a brownfield site, there are a number of limitations. First, the above studies apply to whole metropolitan areas, not smaller neighborhood areas. The likelihood jobs will be taken by residents who come from outside a neighborhood is much greater than for the case of a large metropolitan area. When drawing from a metropolitan labor market, firms are likely to find the skill mix they are looking for. This is less likely in a neighborhood. Second, the "shock" Bartik models is a 1 percent increase in metropolitan employment. This shock is larger than what we could expect from most brownfield redevelopments.

Many brownfield case studies report benefits to the wider community (Pepper 1997). However, a cursory review of the available case studies indicates that when wider revitalization is observable and measurable, this wider neighborhood revitalization is rarely solely attributable to the redevelopment of one brownfield. Rather, the revitalized brownfield is usually one piece to the larger puzzle. For example, Pepper (1997) reports that Wynadotte, an industrial town south of Detroit, has made a major comeback from economic decline. The remediation of the contaminated sites, BASF South and North Works, was one component of a massive city wide effort that included a golf course, the rehabilitation of 500 substandard residential buildings, the creation of open space and a

park opening up to the waterfront, and consolidation so that new, larger and more modern residential areas could be built (Pepper 1997).

This conclusion is supported by Hula (1999) in his review of the Michigan brownfield policy. Hula (1999, pp. 22-23) reports "no case was found where an initial brownfield investment plausibly led to a significant secondary development as predicted by brownfield renewal enthusiasts." The reason a single isolated project shows little measurable results are that (1) generally a single project occupies a small proportion of the community's land, (2) by the time of cleanup the area already has a history of poverty and social problems, and (3) the time lag for secondary redevelopment is too protracted to attribute any neighborhood spin-offs solely to the original site cleanup and redevelopment.

There is an economic development literature that explores the impact of subsidies and incentives on the redevelopment of distressed neighborhoods. To summarize, the results are mixed. Both Empowerment and Enterprise Zone programs provide tax and employment incentives to firms that are willing to locate in distressed zones of inner cities and some rural communities. Dewar's (2001) analysis of Detroit's Empowerment Zone program finds that employment growth in the zone, where incentives are offered, is no greater than employment change in the adjacent and equally distressed neighborhoods that did not receive development incentives and subsidies. Peters and Fisher's (1998) research fails to find evidence that zone incentives result in a positive impact on employment growth. They report that a wider review of the literature on this topic is consistent with their findings. They conclude that "[e]nterprise zones are not effective engines of economic expansion" (p. 190). They suggest that the absence of any impact

may be due to the fact Enterprise and Empowerment Zones are always located in the most distressed neighborhoods, plagued by crime, infrastructure deterioration, and low-skilled workers. It is likely the incentives do not make up for the negatives (p. 191).

In contrast, Bartik's review of the literature argues that incentives can influence firm location decisions and promote local labor demand and is more likely to be cost effective when applied to poorer places. The reason is the reservation wages are lower in high unemployment areas (Bartik 1991, Fisher and Peters 1998). Three conclusions can be drawn from this literature relevant to job creation and brownfield remediation. One is that remediation is a necessary but not sufficient condition to neighborhood revitalization (Howland 2000 and 2004b, Leigh and Coffin 2005). Revitalization will require additional incentives, subsidies, and social programs and even then, it is unrealistic to expect dramatic neighborhood revivals, falling unemployment, rising incomes in the short run.

3) Net New Jobs or Job Relocation

Researchers and policy makers in the economic development field debate the value of net new jobs to the economy versus a spatial reallocation of jobs and how to distinguish between the two. Is economic development a zero-sum game? Bartik argues that it is not a zero-sum game because the nation benefits when jobs go to high-unemployment areas rather than low-unemployment areas (Bartik 1991). The opportunity cost of an unemployed worker is lower than the opportunity cost of an already employed worker. Thus there is a greater net gain to the national economy. In the case of a brownfield cleanup, there is an additional net national gain because a

previous unused resource, land, is now added to the land supply and an operational business on this remediated site adds to national growth when previously unemployed workers are drawn into the labor force. Thus, a number of economists argue that from a national equity perspective the debate between net new jobs or spatial reallocation is a senseless one, as long a jobs move from less to more distressed areas (Bartik 1991). Overall national welfare is improved if jobs are reallocated to areas that are historically poorer, where residents are in greatest need of jobs and local governments in greatest need of tax revenues.

As suggested here, this literature is theoretical rather than empirical. There are empirical studies from the economic development literature that examine the impact of public subsidies to firms willing to locate or expand in distressed economies; does the subsidy lead them to start-up, continue operating when they might otherwise close, or to relocate from another site. The most common methodologies are to ask firms what they would have done "but for" the subsidy (Howland 1990) or observe behaviors in identical local economies where the subsidy was available and not available (Dewar 2001). The results show that where a subsidy has an impact, it influences new jobs, the relocation of jobs, and saves jobs. For example, in a study of subsidies to rural manufacturers, 72% of the firms said they would not have made the same investment in the same location without the subsidy (Howland 1990). While I could locate no study that addresses this question specifically for brownfield redevelopments, there is no reason to expect the results to differ on a redevelopment site subsequent to environmental cleanup.

The following section presents some of the complications of revitalizing neighborhoods surrounding brownfield sites.

4) Environmental Cleanup and Employment Effects in the Current Policy Environment

Contamination and Neighborhood Conditions

One of the major challenges in creating viable economies on and around former brownfield sites is that they are often to be found in distressed neighborhoods with concentrations of poverty, crime, deteriorating infrastructure, and low-skilled workers. In fact, negative neighborhood externalities are often most serious where toxic sites are largest and most hazardous. There is empirical evidence that residential and commercial property values drop in proximity to hazardous sites. The closer a parcel is to the contaminated site the greater the price discount. This pricing outcome is the result of higher income families choosing more distant locations and commercial businesses opting for locations where incomes are high and crime is low. Low income families with fewer housing options end up closer to sites that emanate health risks. Over time poverty rates rise, crime increases, school quality declines, and infrastructure deteriorates. Once cleanup of the noxious site is complete, redevelopment efforts often require dealing with the historical legacy of a stigmatized, depressed neighborhood.

The empirical studies employ contingent valuation and hedonic price models to estimate the impact of contamination on surrounding land values. Hedonic models control for the effects of various housing and neighborhood characteristics on housing values so that the effect of distance can be isolated. Distance from toxic sites and years prior to and post public recognition of the presence of the contamination are typically included as independent variables. Because of data limitations, these studies are

restricted to the impact of contaminated sites on residential land values, to the exclusion of industrial and commercial properties. Medelsohn, Hellerstein, Huguenin, Unsworth, and Brazee (1992) used panel data on repeat sales of residential properties near a PCB contaminated harbor in New Bedford, Massachusetts. They compare residential land values before and after the pollution came to the public's attention in 1982. They found that as residents became aware of the contamination, relative housing values fell, and prices fell more the nearer the residence was to the most polluted portion of the harbor. The price discounts ranged between $7,000 and $10,000 per residence depending on distance. Ketkar (1992) took a sample of 64 municipalities with 129 hazardous waste sites in New Jersey. Using a community level hedonic model, he found that as the number of hazardous waste sites in a community increased by 1, the median housing value fell by $1,255, or 2% of the total value. Longo and Alberini (2006) found commercial property values declined with distance from superfund and state mini-superfund sites in Baltimore, but industrial properties were unaffected by proximity to these sites.

When surrounding price discounts are sole reflections of the health hazards and negative amenities of the contaminated site, cleanup should eliminate these price discounts. However, when price discounts reflect longer-term neighborhood externalities and deterioration, price discounts won't disappear after cleanup, at least in the short run. McCluskey and Rausser (2003) examined whether long-term stigmas affected property values surrounding a former hazardous smelter site in Dallas, Texas. They developed separate hedonic pricing models for four time periods. Period one was prior to 1981, when the smelter operated but health risks were not identified or publicized. From 1981

to 1986, health risks from contaminants were identified, and cleanup was initiated and completed. In the period 1987 to 1990, cleanup was ruled complete, and from 1991 to 1995, additional health hazards were identified and additional cleanup occurred. Their results show an improvement in land prices in the post-cleanup period. However, even in the post-cleanup period, prices still declined with proximity to the previous brownfield site. Long and Alberini's (2006) result for commercial properties is consistent. When a Baltimore site was taken off the superfund list, either because of remediation or absence of serious contamination, property value continued to decline with proximity to the site. However, the land price decline was not as great as for the actively contaminated sites.

McCluskey and Rausser (2003) case study found that higher income households were willing to bid more for housing further from the smelter, even after the site had been remediated. The authors attribute this to the negative externalities of poverty closer to the smelter site. The authors argue that this is due to the long-term stigma associated with neighborhoods surrounding a previously contaminated site. Their results show that the neighborhood externality effect is strong and the stigma may be long term (McCluskey and Rausser 2003).

McGrath (1995) and Howland (2004a, 200b) both found that property values on contaminated sites in Chicago and Baltimore were discounted to compensate for the costs of remediating and owning a polluted site. How do these findings square with the Longo-Alberini results? Perhaps distance to a superfund or state mini-super fund sites doesn't affect industrial property values, because proximity to a contaminated site doesn't affect industrial productivity. Whereas, ownership of a contaminated site affects the businesses bottom line. In residential and commercial areas, land contamination appears to have

influenced the social and economic make up of the surrounding population; industrial areas don't face the same social complications. The implication is that the revitalization of a site in a residential or commercial area will face all the challenges of revitalizing any distressed neighborhood. Redevelopment in an industrial area that remains industrial is less complicated.

Brownfield remediation is often sold as a double benefit, providing both a cleaner and safer environment and new jobs (Dixon 2000). However, there is often a trade-off between government's spending scarce resources on cleaning the most toxic sites and remediating sites for economic development potential. Most observers realize brownfield regeneration has often been slowed by weak demand for redevelopment on the most contaminated sites (VanLandingham and Meyer 2002). In traditional manufacturing locations where some of the most toxic sites are located, manufacturing has moved away, leaving behind unemployed workers. Local governments have failed to maintain roads and infrastructure; the middle-class has moved away, leaving behind the least employable workers and concentrations of poverty; school quality has declined; crime has increased; and the housing stock has deteriorated. This pattern of economic obsolescence and decline in older manufacturing areas leaves behind major economic development challenges even after a cleanup. Generous public funding and creativity can make this tradeoff less complicated, but scarce public dollars and the political need to show job creation results often lead planners and policy makers to decide to clean less-contaminated sites in areas with more redevelopment potential.

Walzer and Hamm (2004) conducted case studies of brownfield cleanups across the state of Illinois. They surveyed local government officials and concluded

> It is clear that many city redevelopment projects start because of perceived potential investment possibilities. While these findings do not suggest that health and safety hazards are unimportant, they make clear that aesthetic and economic considerations are more important. (p.iii)

Thus the brownfield success cases often occur in the most desirable locations, not on the most toxic sites. The remediation and redevelopment of the American Can project in Baltimore is an example. Held up as one of the city's model brownfield successes, this project required minimal cleanup and is located near the waterfront across from new high-end condominiums. In all these cases, government went with the sites that gave the most economic development with the least public subsidy. Where cleanup costs are minimal and development potential is the greatest, employment success arrives more quickly with smaller public subsidies.

Thus, the economic development challenges at a brownfield site often extend beyond site cleanup. Where job skills are low, poverty rates are high, schools are of lower quality and residents possess weak job skills, redevelopment is complex. The more contaminated and noxious the site, the more likely community redevelopment will be complicated by concentrations of poverty, crime, low-levels of education, and poor work skills.

Tradeoffs between Achieving Brownfield Redevelopment vs. Environmental Justice

Because the most toxic sites often correlate with the most distressed neighborhoods, policy-makers are likely to face a tradeoff in their pursuit of both environmental justice and economic development. Several researchers have documented that low income communities and minorities tend to reside in closer proximity to

hazardous waste sites, industrial facilities releasing toxic pollutants, and facilities using toxic chemicals in industrial production.

A recent study of Milwaukee compares the location of brownfields with the residential location of African-Americans, Hispanics, and low-income families. The concentration of minorities and low-income families in the most contaminated neighborhoods is clear. For example, the City's 50 census tracts where more than 80% of the total population was African American comprised 12% of total City land area, but 25% of the City's brownfields. The census tracts with an above average proportion of families below the poverty level comprised 32% of City land, but 56% of the City's brownfields (McCarthy, 2006).

A study for the Committee on Environmental Justice notes that "there is evidence that minorities and lower-income groups face higher levels of exposure to environmental hazards and, therefore, potentially higher rates of adverse health outcomes" (ICMA 2001, p. 81). Similarly, a study conducted by the Commission for Racial Justice of the United Church of Christ (1994) found that people of color were 14.4 percent of the population in zip codes with no commercial hazardous waste sites, 29.5 percent of the population in zip codes with one hazardous waste site, and 45.9 percent of the population in zip codes with three or more hazardous sites, an incinerator, or large landfill. In their literature review, Banzhaf and McCormick (2006) find a correlation between locally unwanted lands uses (LULUs) and the concentration of minorities and poor residents. In a meta-analysis, Rinquist (2005) summarizes the results of 33 studies and finds a correlation between noxious facilities and minority populations.

Again, this tradeoff is often ignored when we focus on employment creation and economic revitalization in the brownfield literature. For example, Dixon (2000) states "[s]ince many brownfields are located in low-income communities, areas particularly likely to suffer from unemployment and lack of economic opportunities, brownfield redevelopment can create jobs where they are most needed." Dixon is correct, but fails to recognize the difficulty, challenges, and cost of cleaning a site in a poor neighborhood with a history of social problems and low education levels. Neighborhood revitalization does not readily follow a site cleanup. When the International City Managers Association (ICMA) reports on best practices for brownfield development, it recommends "targeting the low hanging fruit" (1999). Again, contaminated sites in the most distressed minority neighborhoods are generally not "the low hanging fruit".

This tradeoff is also recognized in a June 2006 cover story in Brownfield News, which points out that there are two brownfield markets demarcated by an economic divide (Brown 2006). On one side are growing population centers with robust real estate markets where developers are competing to find land and build big projects. In these areas, environmental concerns get worked out because the economics of the deal are favorable. On the other side of the divide are declining population centers characterized by blight, few employment opportunities, little development interest and little investment of outside capital into the community.

McCarthy's (2006) study of Milwaukee found evidence that even though brownfields were disproportionately concentrated in minority and low-income neighborhoods, the City's 69 financially supported brownfield redevelopment projects initiated between 1990 and 2005 were concentrated in the non-minority, non-poor census

tracts. The author calls this "finding particularly alarming because it occurred in a city whose brownfield efforts include area-based efforts such as in the 30th Street Industrial Corridor and Menomonee River Valley" (p.22). Both of these projects were are high profile redevelopment efforts in distressed areas of the City.

The EPA and state VCP's report a growing number of examples where disadvantaged communities appear to have used cleanup and local development programs as the spark to redevelop blighted areas, create new economic opportunities and give renewed hope to their residents. While objective and detailed case studies of these sites have yet to be developed, the available literature suggests that they share certain characteristics: (1) the redevelopment plan incorporates a large enough site so that negative neighborhood externalities are internalized, (2) government subsidies are substantial, involve long term public commitments and a constant flows of funds, (3) there is on-going technical assistance, and (4) the location offers amenities such as proximity to transportation or waterfront.

Two touted examples include a redevelopment initiative in North Birmingham, Alabama and East Palo Alto, where both strive to achieve brownfield redevelopment and environmental justice goals. In Alabama the city has undertaken a major 900-acre area redevelopment effort in Birmingham's distressed North Birmingham area, a former heavy industrial district. The second case is located in East Palo Alto, California. This area is a pocket of poverty in the midst of Silicon Valley. The neighborhood includes well over 95 percent of the city's minority population, and continues to have the highest levels of poverty and unemployment in San Mateo County. For years, East Palo Alto was the

region's dumping ground, stuck with all of the county's unwanted land uses, including salvage yards, a wood burning site and a chemical waste facility. The city put in place a brownfield revitalization plan that has leveraged Federal funding with private investment to create a new shopping center, a new IKEA store, the city's first full service bank, new housing to serve all income levels and a new Four Seasons luxury hotel. However, as yet there have been no unbiased studies of job creation for local residents or documentation of neighborhood redevelopment surrounding these sites.

Many disadvantaged communities continue to face significant barriers to redevelopment. They face the challenge of bringing private investment into areas where property values are low, the market for redevelopment is weak, infrastructure is deteriorating, skilled labor is in short supply and the lack of basic assets or amenities repel private investment (Tyson 2005, Heberle and Wernstedt 2006). These communities lack the financial resources needed for cleanup and redevelopment, and the information about the funding resources and finance tools that do exist. Moreover, many disadvantaged communities must grapple with the challenges associated with redeveloping smaller sites like abandoned gas stations and corner lots that blight neighborhoods and are often difficult to redevelop due to economies of scale. Finally, they must wrestle with the challenge of how to ensure that current community residents receive their fair share of the benefits of redevelopment, such as new jobs and housing.

While one of the goals in brownfield remediation is to rectify the injustices to poor and minority communities by cleaning the hazardous sites in their neighborhoods, when we focus solely on the employment creation and revitalization goals of a cleanup,

environmental justice can be compromised. The lack of economic vitality and the lack of local resources and capacity in these disadvantaged areas exacerbate the brownfield problems because cleanup and redevelopment is not profitable (Tyson 2005, Brownfield News 2006).

An important environmental justice consideration is ensuring that local residents benefit from successful redevelopment. Lance Stokes in Brownfield News (2006) notes:

> "Disadvantaged residents, who once occupied the brownfield or surrounding area prior to redevelopment, are seldom the individuals who occupy it after the redevelopment. Although there is no question that contaminated properties sustain the patterns of poverty that plague disadvantaged people, brownfield redevelopment is not a rescue program for disadvantaged individuals as purported. Brownfield redevelopment is about what makes financial sense."

Employment Creation vs. Level of Cleanup

A third tradeoff is the compromise between spending scarce public money on remediating a site to a pristine condition versus cleaning only to a standard that limits permitted uses to industry or retail, requires specific site designs, and excludes residential uses. Linking a site's potential land use, cleanup standards, and remediation strategy can promote economic development while lowering public subsidies.

This tradeoff includes an environmental justice component as well. With many of the most contaminated sites in low-income neighborhoods, efforts to retain the highest cleanup standards will squeeze economic feasibility and possibly rule out redevelopment.

On the other side of the argument, some critics see concessions on cleanup standards as a sign of environmental injustice. For example, critics of the Michigan brownfield initiative see the implementation of less stringent residual contamination

standards, designed to promote economic development, as creating patterns of environmental injustice. That is, minority and low-income residents are put at greater health risks simply because of their proximity to redevelopment sites that are not cleaned to the highest standards (Hula 1999).

One example is being implemented in the Camden Crossing housing project in Baltimore, where supplementary covenants put restrictions on parcels that limit the way an owner interacts with the property into the future. In spite of the heavy levels of contamination on this 9-acre site, the city agreed with local citizens to allow a residential end use. Located in the seriously distressed "Pig Town" neighborhood, remediation of this site supports city goals of environmental justice. However, limitations on both city funding and constraints on final housing sales prices meant that land could not be cleaned to a standard that permitted human contact with the dirt in the townhouse backyards. Maryland's Department of the Environment (MDE) signed off on institutional controls, which forbid residents from breaking the concrete seal that developers are placing in their backyards. Critics, including some MDE staff, believe this cleanup standard is not high enough and goals of environmental justice are not met for the sake of economic development (Howland 2003). Other researchers and policy-makers question as well whether institutional controls ultimately work to protect public safety (Wernstedt et al.1999).

Baltimore's experience also highlights the complexity of cleaning a highly contaminated, previously industrial, site to residential standards and the relative ease of remediating an equally contaminated site for industrial use. At the same time the Camden Crossing residential project languished and proved costly to the city, two other

developers across town cleaned their site, rebuilt and remodeled facilities for industrial and warehouse uses, created new jobs, and are paying taxes - all with minimal public subsidy (Howland 2003).

Not surprisingly, a majority of the case studies in the literature indicate final industrial and retail land uses. For example, Walker's (2004) study of brownfield projects in St. Louis, MO found that although the state VCP program was not limited to industrial and commercial redevelopments, the majority of new business investments on remediated sites fell into these categories. She reports two reasons: (1) the cost of cleaning up to residential standards, and (2) the location of a preponderance of projects in old industrial areas, which makes housing a less viable final use. Moreover, state incentives are limited to projects that are financially feasible. Thus the projects with the greatest financial feasibility, even with public subsidy, are in the majority of cases commercial and industrial projects. While Walker does not report the number of jobs created, commercial and industrial redevelopments are more likely to retain and create new jobs than a residential reuse.

Wernstedt, et al. (1999) found that in the last several years, examples of residential level cleanups in clearly industrial or commercial areas have not been as common as they were in the earlier years of the Superfund program. The presumable explanation is EPA's willingness to modify cleanup standards, eliminating the feasibility of housing on the site, in order to promote economic development.

In recent years EPA has shown an increasing sensitivity to the cleanup level - economic development tradeoff. One approach available within the framework of Superfund is the consideration of risk management techniques to control costs (Wernstedt

and Hersh 1998). With this approach to remediation, site managers can control costs by addressing the most contaminated areas of a site with aggressive treatment, while treating other portions of the parcel less aggressively. Many states have picked up on EPA's lead and have implemented regulations that recognize the use of multiple techniques to address site risks (Graves 1997). Any time remediation costs are lowered, economic development prospects are improved.

Linking potential land uses and remediation remedies is appealing from an economic development perspective. Remedies tied to future land use have the potential of reducing cleanup costs, encouraging re-use and site redevelopment, and promoting neighborhood revitalization. However, Wernstedt and Hersh's (1998) case study of the Industri-Plex site in Woburn, Massachusetts highlights a "troubling lack of integration" between the accepted remedy and the development of institutional controls that will insure the long-run integrity of the site's safety and protection of the public.

Designing Projects so they have the Greatest Development Spin-offs

A potential tradeoff occurs in selecting projects with more immediate redevelopment payoff versus giving a higher priority to projects with greater long-term potential for economic revitalization and improvement in neighborhood property values (Black 1995, Iannone 1996, Meyer 1999, Simons, Bowen and Sementelli 1997, Leigh and Coffin 2005). Pepper (1997) emphasizes the importance of selecting brownfield sites that will lead to further economic revitalization. This was the case of the Medical City Project in Worcester, MA. The local development authority worked to consolidate 32 parcels over 24 acres in one of Worcester's most distressed neighborhoods. The project required a minimum of $42 million in public funding. Citizens participated in the project

design, and their input resulted in integrating the project with the existing neighborhood. For example, the entrance to the complex was moved from the east to west side so that the development interacted with the city's downtown area and public spaces were added to the design (Pepper 1997). The size of the project, its downtown location, and the alterations in design increased the spinoff benefits to the surrounding community.

5) Linking Jobs to Local Residents

Site redevelopment and wider neighborhood benefits will occur with less friction when the employers attracted to the redeveloped site's workforce needs match the skills of the local labor force. When businesses hire local residents there should be increased local tax revenues, better public services, and a reduction in antisocial activities, such as crime, or personally destructive activities, such as drug abuse. Moreover, where an employer can take advantage of the local labor force, he or she is more likely to invest, expand, and thrive in the locale. To what extent do newly created jobs go to local residents and what policies promote local hiring?

The literature indicates that brownfield redevelopments where new jobs are committed to local residents have evolved out of projects with community participation and public sector involvement. The literature also indicates that such linkages are becoming increasingly common and sophisticated.

EPA has launched a campaign to require that applicants for brownfield funds notify and actively involve the local community in planning decisions surrounding the use and design of brownfield redevelopments. Where state and local government funding is central to a project, community involvement is increasingly encouraged at the local

level as well. When the community is involved, it is more likely that newly created jobs on brownfield sites will be reserved for local residents. There are at least four methods used to link residents to newly created jobs: 1) public or private sector initiated workforce training to prepare local residents for the new jobs coming on-line; 2) training to improve local resident job search and interview skills; 3) financial incentives for businesses to hire local workers; and 4) formal community or government agreements with businesses to hire a proportion of local residents.

Training programs

Job creation can occur at four stages: remediation, construction, operation, and then in multipliers to the wider community. The EPA has provided national leadership in encouraging local residents' involvement at the remediation phase of development. In 1994, EPA initiated Brownfields Job Training Grants. EPA provides funds to create local environmental job training programs as one way to ensure that the economic benefits derived from brownfields revitalization efforts remain in local neighborhoods. EPA has awarded 56 job training grants totaling $10.7 million. As of May 2003, more than 1,300 people had completed training and more than 900 obtained employment in the environmental field, with an average hourly wage of $12.55. EPA currently awards up to $200,000 per job training grant (U.S. EPA 2001, NEIHS 2004).

Several state and locally sponsored projects have also promoted local hiring. In the St. Paul, Minnesota Crosby Lake Business Park project, St. Paul's Port Authority launched an innovative job training program, the Employment Connection. This program ties brownfield redevelopment to neighborhood wealth creation through customized employment training. The port works with businesses to determine employment

requirements and creates customized training packages for employers. Businesses pay 10 to 15 percent of the costs for the training package, with the balance provided by state government and private corporations and foundations. This program helps ensure that area residents are properly trained for job openings at the Crosby Lake Business Park (Pepper, 1997). There has been no follow up on any of these promising efforts. We should find out whether these local hires stayed on the job? Did they work out for the employer?

One argument against training grants to funnel local low-income residents into remediation jobs is that it encourages their employment in occupations with elevated health risks. This argument contends that because minorities and low-income residents are already more likely to live in hazardous areas, working in such areas does not promote environmental justice (Ellis et al. 2002).

Provision of job search skills

Aside from job training, local training can focus on such skills as resume writing and interviewing.

Financial incentives

Local hiring is also encouraged through state and municipal tax incentives. Florida takes the most aggressive stand on linking jobs to brownfield remediation. The state offers certain businesses a $2,500 tax credit – "a brownfield bonus" – per job created at a remediated site. In 2002 the legislature modified the "brownfield bonus," making it available to companies that create jobs at any site within a designated brownfield area. In addition, a company may also qualify for a tax refund of at least 20 percent of the average wage of the jobs created, provided that they provide benefits to

their employees, make a capital investment of at least $2 million, and create at least 10 jobs (Register 2001, Bartsch and Deane 2002).

The North Birmingham Economic Revitalization Corporation works to ensure that primarily local residents are hired for jobs on the remediated site at the North Birmingham Industrial Redevelopment Project in Birmingham, Alabama. One of the first EPA brownfield projects, the site is within a state enterprise zone where tax benefits encourage local hiring. In addition to the tax incentives, community organizers and local residents work with each potential new tenant on the site to ascertain how much employment and what types of skills the company will require so that local people can be trained beforehand. Job training and assistance programs for local residents are being established. Dixon reports that of the 200 jobs created, half are filled by local residents. However, there is no formal agreement between the employers and the local community that guarantees local residents access to the new jobs. "Thus, their claim on the employment 'asset' remains tenuous" (Dixon 2000, p. 8).

Many brownfield redevelopments receive public funds, and Krumholz argues that such subsidy agreements should include a condition for local hiring. Additional requirements might give the highest priority to residents who have been unemployed for longer periods of time, or could mandate reimbursement of the city or state (i.e., a "clawback" provision) when a business fails to follow through on promises for local hiring. Several cities, not necessarily in brownfield redevelopments, have used this strategy (Krumholz 1995).

End user hiring commitments

Taking community input a step further; some brownfield projects have included formal agreements with end users that commit the latter to a certain percentage of local hiring (Dixon 2000). Community groups can work with the developer to promote community benefits such as targeted job training and local "first source" job agreements that require site developers to reserve a percentage of newly-created jobs for local residents.

Although they still need proper training and skills, hiring agreements give local residents a leg up in the hiring process. One example is the Quarry Retail Project in Minneapolis, which removed a significant environmental hazard from a low-income neighborhood, brought needed retail services to the community, and also increased the number of jobs on the site from less than 250 to 2000. The developer of the site agreed to reserve 20% of jobs for minority and local residents. While the city provides some funds for training, the local retailers conduct most training in-house (Pepper 1997, Dixon 2000).

East Palo Alto has also implemented a "first source" hiring program to benefit local residents. Under the program, the city has required all employers in its redevelopment projects to commit to a hiring process aimed at drawing 30 percent of new hires from a pool of low-income East Palo Alto residents. The program, run in conjunction with a tailored job-training program, has provided 1,200 new jobs to East Palo Alto residents (U.S. EPA 2006b).

Although community groups generally benefit from citizen participation in the brownfield redevelopment process, several authors have pointed out complications. In

some cases, citizens may oppose redevelopment when they are afraid it will lead to gentrification (Solitare 2003). Greenberg and Lewis (2000) surveyed over 200 residents of largely Hispanic census tracts in Perth Amboy, New Jersey to determine their preferences for outcomes in the brownfield development process. Residents preferred an end use of recreational, cultural, and community facilities, followed by housing. Even though they create more jobs, industrial and commercial activities were of lower priority because of gentrification fears.

Citizens may also press for uses that are not economically feasible on a site, given its location or contamination levels. Wernstedt et al. (1999) point out that community groups who have no financial stake in the cleanup may argue for cleanup to the highest standard both to increase their property values and to permit a wider range of development options at the site.

6) Modeling the Neighborhood Impact of Redevelopment

BenDor and Metcalf (2003) have constructed a dynamic simulation model of urban brownfield development; the model is illustrated in Figures 1 and 2. Using the 2003 U.S. Conference of Mayors brownfield survey and probabilities of moving from stage to stage in the brownfield remediation and redevelopment process, the model estimates the cleanup and redevelopment of brownfield acreage over time. It predicts that the quantity of redeveloped brownfields will increase from just above 10,000 acres in 2003 to about 20,000 acres in 2030. Of particular relevance to economic development, the model also estimates the job creation and tax base impact of redevelopment. It

translates developed acres into 10.4 jobs per acre, with an annual tax flow of $5,470 per job. As the local tax base increases, net migration into the neighborhood rises.

While this type of modeling is a step forward in measuring the costs and benefits of brownfield redevelopment, there are many immeasurable and non-economic goals that should also factor into the decision process. For example:

1) How do we take into account the site's context, i.e. is it in a high amenity area on the water front or in a long distressed region?
2) What is the impact of residential or recreational developments where no new jobs are created? Surrounding property values should increase, tax revenues should rise, and revitalization should follow.
3) How much weight should we put on projects that occur in the lowest income neighborhoods or that achieve "smart growth" goals of preserving prime agricultural land or open space on the city fringe?
4) How do we control for other public and private actions in the community (for example, a plant closing in a neighboring area) that reinforce or undermine brownfield cleanups?
5) How do we capture the diffuse benefits, such as reductions in crime and drug addiction?

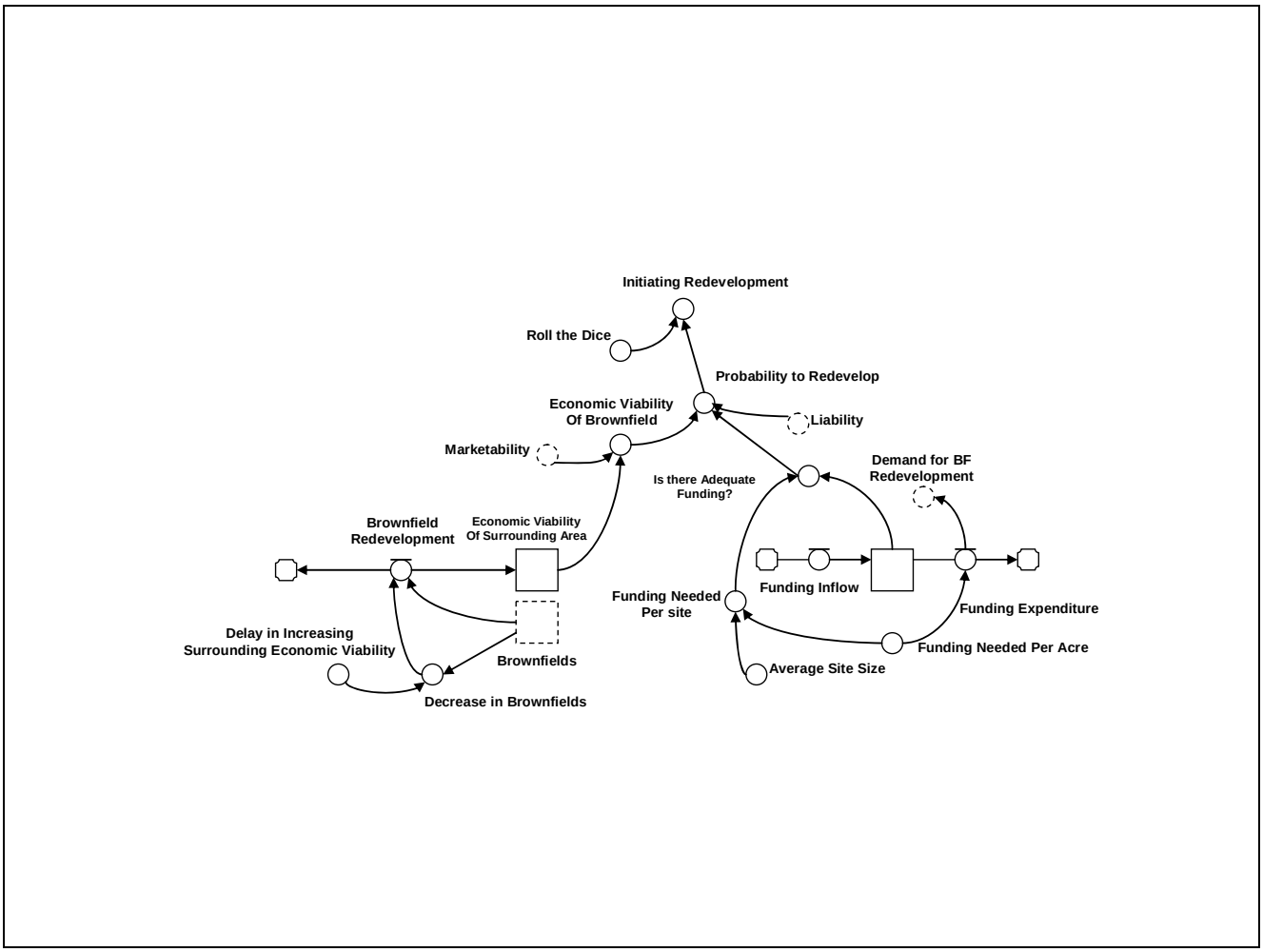

Figure 1: BenDor and Metcalf Model of Redevelopment Drivers

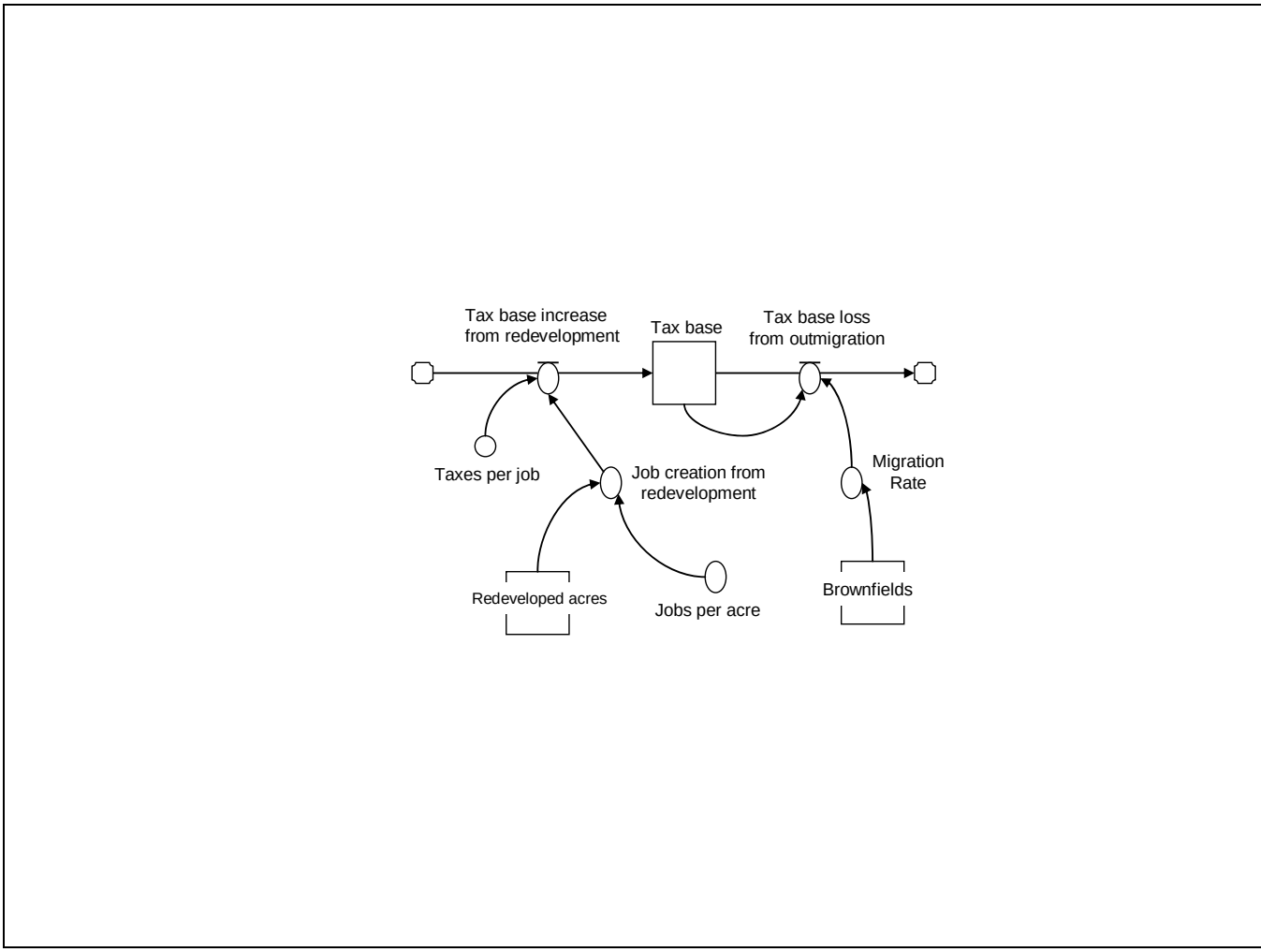

Figure 2: BenDor and Metcalf Model of Tax Base Impact of Redevelopment

Conclusions

Now that legislation and innovations in Federal and state policies have eased many of the liability, technological, and financial barriers to brownfield redevelopment, it is time to tackle the next set of issues. How do we attract private investment and develop supporting programs that promote neighborhood redevelopment and revitalization? The existing literature highlights the difficulties of moving from site cleanup to neighborhood revitalization. The literature is clear: site cleanup alone is not enough to stimulate neighborhood regeneration, especially in the most distressed residential neighborhoods. There are tradeoffs between financial feasibility and tackling the most contaminated sites in the most distressed neighborhoods, and heavy government subsidies are required to scale these tradeoffs towards the latter. In industrial areas, where there is still demand for industrial land, redevelopment is easier to tackle. Updating infrastructure, improving services, consolidating parcels, and eliminating conflicting uses will need to follow clean up in order to revive aging industrial districts.

The case study literature has exploded, citing cases where cleanups were the precursor to neighborhood turnaround. However, these individual cases fail to dissect the actions that were critical, important, or irrelevant to revitalization and track only short-run effects. We still don't know what happens 10 to 20 years down the road. Does crime decline, do local residents improve their economic standing, or does gentrification displace the previous residents? The answers to these questions will take a more long-range analysis than we have seen so far.

Another direction is the refinement of the modeling approach proposed by BenDor and Metcalf. Refinements could include better estimates of the spin-off benefits in neighborhoods with diverse characteristics.

The literature does highlight many positive developments and experiments. Apparent successes involve large scale plans that integrate site cleanup with wider community plans, the growing tendency to link jobs on brownfield sites to local residents, increasingly sophisticated subsidies and incentives, and the importance of design that integrates redevelopment with the existing neighborhood. In many cases, redevelopment strategies should focus on attracting employers who will hire local workers. Disadvantaged communities and government also face the challenge of ensuring that brownfields are redeveloped with sustainable projects using clean manufacturing and renewable energy, and not replaced with facilities that will create more blight for the next generation.

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Appendix I: Articles and Case Studies That Report Numbers for Job Creation										
City/Project	**Author**	**Citation**	**Actual Number of Jobs on Site**	**Expected Number of Jobs on Site**	**Site Size in Acres**	**Number of Indirect Jobs**	**Methodology**	**New Use**	**Previous Use**	**Citizen Involvement or Offical Agreement for Local Hiring**
Industrial Redevelopment, North Birmingham, AL	Dixon, K.A.	*Reclaiming Brownfields: From Corporate Liability to Community Asset, Political Economy Research Institute, University of Massachusetts, Amherst, MA, Working Paper No. 10, 2000*	Three companies created 200 jobs/ half went to local residents.	More than 2,000 jobs expected	900	NR	Case Study	Mixed Use	Industrial	Enterprise zone to encourage local hiring tax break
Quarry Retail Project, Minneapolis, MN	Dixon, K.A. and Edith M. Pepper	*Reclaiming Brownfields: From Corporate Liability to Community Asset, Political Economy Research Institute, University of Massachusetts, Amherst, MA, Working Paper No. 10, 2000 and Lessons from the Field, Unlocking Economic Potential with an Environmental Key, Northeast-Midwest Institute, 1997*	250 retail jobs to 2000, agreement to hire local residents. City set goals of 20% local and minority hiring but exceeded this goal.			NR	Case Study	Retail	Quarry	City set goals of 20% local and minority hiring, but exceeded this goal
LTV Steel Southside Works Site, Pittsburgh, PA	Dixon, K.A.	*Reclaiming Brownfields: From Corporate Liability to Community Asset, Political Economy Research Institute, University of Massachusetts, Amherst, MA, Working Paper No. 10, 2000*		6000 new jobs expected	130	NR	Case Study	Mixed Use	Steel Mill	Yes

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City/Project	**Author**	**Citation**	**Actual Number of Jobs on Site**	**Expected Number of Jobs on Site**	**Site Size in Acres**	**Number of Indirect Jobs**	**Methodology**	**New Use**	**Previous Use**	**Citizen Involvement or Offical Agreement for Local Hiring**
General Model, No Specific City	BenDor, Todd K. and Sara S. Metcalf	*Conceptual Modeling and Dynamic Simulation of Brownfield Redevelopment, Department of Urban and Regional Planning, University of Illinois at Urbana-Champaign, 2003*		The model assumes 10.4 jobs per acre, which translates into $5,470 in property taxes per job		NR	Redevelopment, leading to job creation, tax increases, slowdown of population loss	Promotes economic development through job creation		
Florida Policy	Register, B. Roger	*"Brownfields in Florida, Designation Process and Incentives for Redevelopment and Sustainable Reuse," Florida Department of Environmental Protection, Brownfield Liaison, Tallahassee, Florida, 2001*				NR	Description of policy			
City of Fayette, NC	United States Conference of Mayors	*Brownfields Redevelopment: A Compendium of Case Studies, Volume I, U.S. Conference of Mayors, 2004*	17	NR	8.5	NR	Case Study	Museum	Mixed Use	
City of Lewiston, ME	United States Conference of Mayors	*Brownfields Redevelopment: A Compendium of Case Studies, Volume I, U.S. Conference of Mayors, 2004*	1200	5000	1.2 million sq. ft.	NR	Case Study	Mixed Use	Textile Mill	

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City/Project	**Author**	**Citation**	**Actual Number of Jobs on Site**	**Expected Number of Jobs on Site**	**Site Size in Acres**	**Number of Indirect Jobs**	**Methodology**	**New Use**	**Previous Use**	**Citizen Involvement or Offical Agreement for Local Hiring**
Fallon/St. Vincent Medical City, Worcester, MA	United States Conference of Mayors; Edith Pepper	*Lessons from the Field, Unlocking Economic Potential with an Environmental Key, Northeast-Midwest Institute, 1997*		3000	24	5500	Case Study	Hospital	Industrial	State tax credits up to 100% of remediation costs based on projected number of new jobs
Carol Cable Site, Warren, RI	Pepper, Edith M.	*Lessons from the Field, Unlocking Economic Potential with an Environmental Key, Northeast-Midwest Institute, 1997*	75	125	240,000 sq. ft.	NR	Case Study	Industrial	Industrial	
Scott Peterson Meats, Chicago, IL	Pepper, Edith M.	*Lessons from the Field, Unlocking Economic Potential with an Environmental Key, Northeast-Midwest Institute, 1997*	100	NR	NR	NR	Case Study	Industrial	Industrial	
Acetex Corporation, Detroit, MI	Pepper, Edith M.	*Lessons from the Field, Unlocking Economic Potential with an Environmental Key, Northeast-Midwest Institute, 1997*	100	NR	2	NR	Case Study	Industrial	Industrial	
Madison Equipment, Chicago, IL	Pepper, Edith M.	*Lessons from the Field, Unlocking Economic Potential with an Environmental Key, Northeast-Midwest Institute, 1997*		6 to 8	NR	NR	Case Study	Industrial	Industrial	

Appendix I: Articles and Case Studies That Report Numbers for Job Creation										
City/Project	**Author**	**Citation**	**Actual Number of Jobs on Site**	**Expected Number of Jobs on Site**	**Site Size in Acres**	**Number of Indirect Jobs**	**Methodology**	**New Use**	**Previous Use**	**Citizen Involvement or Offical Agreement for Local Hiring**
Crosby Lake Business Park, St. Paul, MN	Pepper, Edith M.	*Lessons from the Field, Unlocking Economic Potential with an Environmental Key, Northeast-Midwest Institute, 1997*		350	40	NR	Case Study	Light Industrial	Industrial	
Holden-Leonard Mill, Bennington, VT	Pepper, Edith M.	*Lessons from the Field, Unlocking Economic Potential with an Environmental Key, Northeast-Midwest Institute, 1997*	200	NR	NR	NR	Case Study	Light Industrial	Industrial/ Textile Mill	
American Axle Plant and Northeast Buffalo Parkway, Buffalo, NY	Pepper, Edith M.	*Lessons from the Field, Unlocking Economic Potential with an Environmental Key, Northeast-Midwest Institute, 1997*	1000	1800	NR	NR	Case Study	Industrial	Industrial	
Ernst Steel Site, Cheektowaga, NY	Pepper, Edith M.	*Lessons from the Field, Unlocking Economic Potential with an Environmental Key, Northeast-Midwest Institute, 1997*		150	NR	NR	Case Study	Commercial	Industrial	
Federal Courthouse, Sacramento CA	Pepper, Edith M.	*Lessons from the Field, Unlocking Economic Potential with an Environmental Key, Northeast-Midwest Institute, 1997*		200	2.6	1,000 construction jobs	Case Study	Government Building, Offices, and Parking	Rail Yard	

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Louisville Dryer, Louisville, KY	Pepper, Edith M.	*Lessons from the Field, Unlocking Economic Potential with an Environmental Key, Northeast-Midwest Institute, 1997*		40 to 50		NR	Case Study	Industrial	Plating/Industrial	
Bryant Electric Plant, Bridgeport, CT	Pepper, Edith M.	*Lessons from the Field, Unlocking Economic Potential with an Environmental Key, Northeast-Midwest Institute, 1997*		300 to 400	7	NR	Case Study	Mixed Use	Electric Plant	
City of St. Louis, MO	United States Conference of Mayors	*Brownfields Redevelopment: A Compendium of Case Studies, Volume I, U.S. Conference of Mayors, 2004*	1000s	NR	20	NR	Case Study	Light Industrial	Mixed Industrial	
Clearwater, FL	EPA	http://www.epa.gov/docs/swerosps/bf	500	1000	1800	NR	Case Study	High Tech./Industrial	Commercial-Industrial-Residential	
Glen Cove, NY	EPA	http://www.epa.gov/docs/swerosps/bf		1700	196	NR	Case Study	Environmental Consulting	Commercial-Industrial	
Southern Pacific and Union Railway Properties, Sacramento, CA	EPA	http://www.epa.gov/docs/swerosps/bf		40,000	NR	15,000 construction and environmental cleanup	Case Study	Mixed Use/Commercial	Rail Yard	
U.S. Steel Site, Worcester, MA	EPA	http://www.epa.gov/docs/swerosps/bf	50	NR	2.4	25 construction jobs	Case Study	Hotel	U.S. Steel	

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Crane Pottery Factory, Trenton, NJ	EPA	http://www.epa.gov/docs/swerosps/bf	25	NR	1.5	NR	Case Study	Light Manufacturing	Pottery Factory	
Shreveport, LA	EPA	http://www.epa.gov/docs/swerosps/bf		4000	20	NR	Case Study	Convention Center	Industrial	
Smithville, TX	EPA	http://www.epa.gov/docs/swerosps/bf	7		3	NR	Case Study	Furniture Manufacturing	Industrial (Boat Parts)	
Chicopee, MA	EPA	http://www.epa.gov/docs/swerosps/bf	100 relocations and "several" new jobs	NR	3.75	NR	Case Study	Digital Broadcasting	Industrial	
Charlotte, NC	EPA	http://www.epa.gov/docs/swerosps/bf		12 retained and 6 new	NR	NR	Case Study	Retail/Restaurant	Industrial (Radiator Shop)	
Bridgeport, CT	EPA	http://www.epa.gov/docs/swerosps/bf	360	NR	NR	NR	Case Study		Industrial	
Rural Communities Across Illinois	Walzer and Hamm	*Returns to Brownfield Investments*	An average of 66 jobs per project across 37 projects				Case Study	Mixed	Mixed	

NR = not reported