GREEN REDEVELOPMENT OF BROWNFIELD SITES: A BRIEF GUIDE TO BENEFITS AND BEST PRACTICES

Susan Kaplan and Sustainable Brownfields Consortium - December 2013

WHAT IS GREEN (SUSTAINABLE) REDEVELOPMENT OF BROWNFIELD SITES?

Brownfields, according to federal law, are 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. These are typically sites that were polluted prior to enactment of the environmental laws of the 1970s, or that may not be polluted but are abandoned, blighted or otherwise raise concerns about contamination. A brownfield may range from an abandoned corner gas station to a former auto plant or steel mill. Often, the perception of possible contamination may be as great a hindrance to redevelopment of a brownfield as any actual issues.

There have been laws and programs to clean up and reuse brownfields in place since the 1990s. Research has consistently found that it is more environmentally sustainable and economically sensible to clean up and reuse a brownfield than to build on an unused green space. Brownfields tend to be more centrally located, closer to transportation options, with infrastructure already available, and sometimes with a building that can be rehabilitated and reused. Redeveloping brownfields acts as a counter-weight to sprawling suburban and exurban development that takes farmland out of production and reduces habitat and open space.

In the last 10 years or so, there has been a move to reap even more environmental and economic benefits beyond redressing negative environmental and public health impacts of contamination, by promoting not just reuse of brownfields for building housing, offices or other uses, but doing so in as “green” a way as possible – so that the site and its uses will be as environmentally benign as possible in the future. Green redevelopment strategies can also
generate additional returns on investment, for site developers as well as the community as a whole. Green, or sustainable, redevelopment may include one or more of the following elements:

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<th><strong>Green building</strong></th>
<th>such as building to specifications of the U.S. Green Building Council's Leadership in Energy &amp; Environmental Design (LEED) program. Often includes energy efficiency, locational efficiency siting (such as near public transit), and use of low-emitting materials. LEED has several standards, including for new construction, existing buildings or larger areas (<a href="http://www.usgbc.org/neighborhoods">http://www.usgbc.org/neighborhoods</a>). The Sustainable Sites Initiative focuses on the area around buildings (<a href="http://www.sustainablesites.org">www.sustainablesites.org</a>).</th>
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<td><strong>Energy Efficiency</strong></td>
<td>for example, designs that are thermally efficient and include more natural light, lights and mechanical systems that are automatically regulated by electronic controls, and integration of solar, wind or geothermal energy systems. Some buildings have been able to achieve a net-zero energy use profile, generating as much or more of the energy used on-site. The ENERGY STAR program promotes superior energy efficiency (<a href="http://www.energystar.gov">www.energystar.gov</a>).</td>
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<td><strong>Water efficiency</strong></td>
<td>for example, low- or dual-flush toilets and “greywater” recycling, in which water from bathroom sinks, showers and washing machines is reused for uses like watering plants. Advanced designs using Integrated Water Management strategies are approaching net-zero water use, similar to the target for energy use. U.S. EPA’s WaterSense program focuses on saving water (<a href="http://www.epa.gov/watersense/">www.epa.gov/watersense/</a>).</td>
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<td><strong>Stormwater management</strong></td>
<td>absorbing more rainfall on the site so that less washes into the sewers and needs to be cleaned by a water treatment system. Examples include bioswales, rain gardens, and permeable pavement. Restoring some of the natural hydrology of a site reduces the impact on publicly funded infrastructure systems and often results in improved water quality.</td>
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<td><strong>Recycling or reuse of a building and/or materials.</strong></td>
<td>Studies find that much of a building can be reused, keeping materials out of landfills. New construction of buildings can specify the use of recycled content materials, reused steel and bricks, or materials from nearby suppliers that have a smaller transportation footprint. Several calculators are available that can help with this process (for example, see <a href="http://epa.gov/epawaste/conserve/tools/warm/index.html">http://epa.gov/epawaste/conserve/tools/warm/index.html</a>).</td>
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<td><strong>Development of greenspace</strong></td>
<td>like a pocket park or playground that can be enjoyed by tenants or shared with the community. The aesthetic value of a brownfield that is redeveloped as a greener site can add value to surrounding properties.</td>
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<td><strong>Walkability and/or bikability</strong></td>
<td>walking or biking paths or trails, or connections to existing trails; bicycle racks or storage; showers for bicycle commuters, etc. Location efficiency is achieved when a brownfield is within easy walking or biking distance from regular transit service, something that is much less likely to be the case at a greenfield site.</td>
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<td><strong>Community/environmental uses</strong></td>
<td>for example, hiring locally and training for green jobs, leasing space to local and/or green businesses, sending market signals about the type of development expected, sharing meeting space and greenspace with neighborhood groups.</td>
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WHAT ARE THE BENEFITS OF SUSTAINABLE REDEVELOPMENT OF BROWNFIELD SITES?

Sustainable redevelopment of brownfield sites has benefits for the environment, public health and the economy. Some of the benefits accrue to the developer of the site, but other benefits are enjoyed by the community as a whole. Numerous studies have examined the multiple benefits of brownfields redevelopment, but fewer have looked specifically at the benefits of a green redevelopment approach to brownfields. But evidence is emerging that many of the benefits apply equally to brownfield and sites that are not brownfields.

Economic benefits

Property values. Cleaning up brownfields increases property values of nearby properties. The Sustainable Brownfields Consortium analyzed sites in Illinois and found that issuance of a "No Further Remediation" letter – meaning the site was cleaned up or found to not require cleanup – for a brownfield 0.25 miles away raises the value of a property by about one percent compared to an otherwise identical property. There may be larger effects – perhaps as much as two percent. These increases equate to additional tax revenues for municipalities. Although a 1-2 percent increase in value may not seem like much, when applied to the large base of property value within a quarter-mile radius, it can be millions of dollars. These increases—or stabilization of falling property values in some cases—benefit adjacent property owners, but also local jurisdictions that generate taxes based on property value.

In addition, in a preliminary study of sites in the Bronx in New York City, the Consortium found that the impact of sustainably redeveloped brownfield sites on property values was even greater, leading to a 6.6% increase in property values located up to 1.9 miles away from these sites. That was nearly three times as much as the studies that found that redevelopment using conventional methods leads to a 2.3% increase in neighboring property values. Green redevelopment of a brownfield may also generate leverage of additional private investment in an area, by restoring a blighted site to productive use and signaling an area that is on the economic rebound.

This enhancement of property values can be a significant factor for sustaining public investments in brownfield cleanup and redevelopment. In some cases, the increase in property values is essential to the use of tax increment financing that funds brownfield cleanup and is repaid from the additional property taxes generated by the site over time. A green approach to brownfield redevelopment may generate more of this “tax increment” and hasten the point at which the investment in cleanup is returned.

Sustainable redevelopment of brownfields sites creates additional economic benefits, including increased tax revenues, job creation, and siting of businesses. For example, according to project reports, the Brockton, MA “Brightfield” project, in which a former gas plant was redeveloped as a “solar farm” that generates solar power, has generated nearly $145,000 in annual revenue for the city, which goes towards paying off the cost to build and maintain the brightfield. A recent report examining the progress of the large, mixed-use Atlantic Station project in Atlanta, GA (formerly a steel mill) toward achieving environmental goals found that the project’s cleaner modes of commuting – with pedestrian areas, bicycle lanes, and plans for transit access – reduced commuting costs by $158,233 in 2010. This is a dual benefit to the economy and the environment (as well as public health) and retains discretionary dollars in the local economy to support local commerce and improve household standards of living.

As another example, several companies have noted informally that the incorporation of sustainable elements in development of Milwaukee’s Menomonee Valley, formerly a rundown and polluted industrial zone, was a deciding factor in choosing to locate there because its sustainability goals complement their missions. The marketing and public relations benefits from a green approach, and an accelerated rate of leasing and site development, can be tangible and substantial economic advantages to a brownfield developer.
In addition to the traditional measures of economic benefit, other benefits of sustainable forms of brownfield redevelopment include expedited approval processes provided by some states and municipalities for such projects, enhanced community relations, product differentiation of a redevelopment as green, accelerated lease-up or occupancy, and reduced future liability risks that could result from aspects of conventional redevelopment.

Atlantic Station, Atlanta, GA  
Brockton Brightfield, Brockton, MA

### Environmental benefits

Sustainable redevelopment of brownfields has environmental benefits above and beyond those realized in conventional/non-green redevelopment of brownfields sites, including reduction in energy use and vehicle miles traveled. They can also “catalyze” additional sustainable redevelopment projects by setting a standard that later development projects feel they must meet or exceed.

The Sustainable Brownfields Consortium conducted a life-cycle analysis of the Chicago Center for Green Technology (CCGT), a former industrial property redeveloped by the City of Chicago as a model sustainable brownfield project (see http://www.uic.edu/orgs/brownfields/research-results/). The analysis examined the cumulative energy required to complete the brownfield assessment and remediation, building rehabilitation and site development, and data from 10 years of operating the Center. The results find that the combination of several aspects of sustainable redevelopment of the site — preservation and rehabilitation of the existing building rather than demolishing the existing and building anew, the installation of renewable energy systems (geothermal and photovoltaic) on site, and the use of more sustainable building products — resulted in avoided energy impacts equivalent to 14 years of operational energy for the site.

Additional sustainability elements at CCGT include design to maximize energy efficiency, resulting in 40% less energy use than a minimally code-compliant building of the same size, producing annual operational savings of $29,000. For example, low-emission windows and doors designed to reflect solar radiation during the summer and absorb it in the winter decrease heating and cooling costs throughout the year. A “smart” lighting system regulates indoor lighting based on the amount of natural sunlight in a room, contributing to energy conservation.

Water efficiency strategies at CCGT absorb rainwater, then filter runoff, in order to reduce the impacts of the building on the environment. These include a green roof that absorbs rainfall as a way to manage stormwater on-site, cools the building during the summer months and has an insulating effect in winter, and extends the life of the roof system by protecting it from the elements; cisterns that collect and store excess rainwater that drains from the building’s roof, which is then used to irrigate landscaping; and bioswales, or heavily planted ditches, that funnel rainwater from the parking lot to a reconstructed wetland that uses a natural system to remove pollutants from rainwater. These and
other strategies reduce the amount of rainwater runoff entering the sewer system by 50% — stormwater that would otherwise have to be treated by the city’s wastewater treatment system, a process that itself uses energy. The systems also reduce water bills by reusing rainwater—rather than clean drinking water—for irrigation.

Green brownfield redevelopment projects can also function as catalysts for other sustainable projects. For example, Atlantic Station’s “New Urbanist” approach stressing walkability, bikeability, access to transit, and a mix of uses influenced the design of other projects in Atlanta. CCGT is at the heart of an emerging “eco-industrial park” in which businesses can achieve efficiencies through materials exchanges, water reuse, and energy cascading (using the residual heat in liquids or steam from one process to provide heating, cooling, or pressure for another process).

**Public health benefits**

Sustainable redevelopment of brownfields has public health benefits beyond those realized in comparable “conventional” redevelopments, including reduction of contaminants and more walking, bicycling and transit use.

For example, Atlantic Station, with its density and mix of uses so that homes, jobs and shopping are located closer to each other, enhances pedestrian mobility and mitigates vehicle congestion and the energy use and air pollution it entails. According to the Atlantic Station Transportation Control Measures 2010 Performance Update (http://www.atlanticstation.com/pdf/Atlantic_Station_Project_Udate_2010.pdf), vehicle miles travelled within Atlantic Station were significantly lower than the regional average. The Atlantic Station Health Study found that nearly twice as many people reported that they walked as their transportation mode in Atlantic Station, compared with the number of people who said they did this type of walking in their old neighborhoods. This is significant due to the potential for these types of changes to the built environment to change how people get around and consequently the rate of obesity and its related diseases and health care costs.

Environmental improvements at these sites lead to public health benefits. For example, CCGT’s green roof and gardens reduce the urban heat island effect, in which pavement and roofs in cities retain heat in the summer, increasing urban temperatures, ozone levels, and the frequency of heat–related illnesses. The Sustainable Brownfields Consortium compared the change in vegetation cover at 90 remediated brownfield sites in Cook County, IL between 1975 and 2006. During that period, the loss of vegetation at remediated sites was lower than at other sites in the county, and this benefit was more pronounced at four sites where LEED buildings were reportedly built.

There are few studies in the academic literature on health outcomes associated with brownfield remediation. The Sustainable Brownfields Consortium analyzed 10 remediated sites in Cook County (IL), ranging from former gas stations to municipal streetcar and transit bus hubs. Analyzing files from the Illinois Environmental Protection Agency, under whose voluntary site remediation program the sites were cleaned up, we found that cleanup and redevelopment of the sites in a population of 10,000 would result in 10 avoided cancer cases. Although these risk reduction benefit estimates for a given site appear small, their impact for a large urban geographical area with thousands of sites should not be underestimated. However, the estimates have many uncertainties, particularly in the exposure assessment component of the risk assessment process, stemming in part from the difficulty of gleaning needed information from large state files.
BEST PRACTICES FOR SUSTAINABLE REDEVELOPMENT OF BROWNFIELDS

What factors enable a sustainable redeveloped brownfield project to be successful? The Consortium’s case studies – based on available project reports and structured interviews with key stakeholders – indicate that such projects incorporate clear goals related to sustainability in their project teams and earliest stages of design and engineering. They also tend to seek funding from many sources; request and incorporate feedback from the community; and are based on strong public–private partnerships. Local government often plays a central facilitating role and works more closely with a developer than might be the case in a conventional project.

Menomonee Valley, Milwaukee, WI

The Menomonee Valley, a 1,200-acre site in the heart of Milwaukee, suffered from unemployment and pollution after its major industries left in the decades following World War II. The City of Milwaukee started planning for redevelopment in the late 1990s, with public outreach and stakeholder participation efforts revealing that many wished to see new and existing industries remain and expand in the Valley. There was also support for green space for flood protection, biking, and walking, and to enhance the look of the area.

One of the City’s initial actions was to establish the Menomonee Valley Partners (MVP), a public–private partnership that convenes businesses, neighborhood groups, and public and non-profit partners in efforts to revitalize the Valley. MVP’s board of directors includes over 20 active participants committed to the Valley’s future and with a direct stake in its success. Incorporating sustainability broadly into the visioning process was important to stakeholders. The Sixteenth Street Community Health Center worked with MVP and the City to develop the Menomonee Valley Sustainable Design Guidelines (http://www.renewthevalley.org/categories/11-development/documents/30-sustainable-development-guidelines), which address site design, energy use, indoor environmental quality, and operations, among other areas. Twelve companies that have located in the Valley have incorporated green building elements into their projects, and in 2011 one million square feet of facilities had been built using the guidelines.

MVP also established a living wage target for the Valley that was based on sustaining a typical family. It recommended that employers recruit a workforce reflective of Milwaukee’s population and recruit workers via several local nonprofit organizations as a way to steer jobs to local residents.
To track progress, the Sixteenth Street Community Health Center works with the University of Wisconsin-Milwaukee on the Menomonee Valley Benchmarking Initiative (http://epic.cuir.uwm.edu/mvbi). This information clearinghouse provides data and analysis on environmental, economic, and social indicators, raising community awareness about the state of the Valley and stimulating research on this urban environment laboratory. Benchmarking is starting to show the overlapping and reinforcing nature of individual sustainability strategies as more development occurs.

Benefits of the Valley redevelopment include an increased tax base and added employment in the central city, as well as indirect benefits associated with more dollars multiplying in the local economy and steady increases in surrounding property values. Anecdotally, clear guidelines for sustainable elements in development of the Valley have been a factor for several companies in choosing to locate there because it complements their mission and reinforces their company brand. Land sales in the Valley are ahead of forecasts. Notably, these outcomes took place during a recession. The City and partners are now working on The Valley 2.0 to plan the next phase of development.

South Portland Waterfront, Portland, OR

The South Waterfront District redevelopment project is transforming an underutilized and isolated brownfield into a mixed-use, transit-oriented neighborhood that will implement Portland’s economic, social and environmental growth objectives through an integrated and sustainable approach.

The vision of the area as an urban, mixed-use neighborhood was influenced by the principles of Smart Growth, which emphasize compact growth, a mix of land uses, and public transit, cycling and pedestrian options. Public policy objectives for the project included affordable housing, job growth, new green space, more transportation options, sustainable practices, and a platform for the city's research universities to act as an economic engine.

Green elements include a new streetcar extension, construction of an aerial tram connecting Oregon Health and Sciences University’s existing campus with new facilities in the District, a greenway expansion, new neighborhood park, public access to the waterfront, and a blend of market-rate and affordable housing. Developers are pursuing Leadership in Energy and Environmental Design Neighborhood Development (LEED-ND) certification for sustainably designed communities. While the South Waterfront District represents less than one percent of the City's land area, it is projected to provide 4.7% of the City's job growth upon build-out and 2.5% of its housing and residents, while potentially preserving more than 4.4 acres of public open space.

A number of policy tools and mechanisms helped to implement the project vision and support broader public objectives. For instance, South Waterfront Urban Design Guidelines (http://www.portlandoregon.gov/bps/article/58749) were developed to achieve the desired mix of uses and satisfy housing, employment, and public open space aims.
HOW CAN I SUPPORT GREEN REDEVELOPMENT OF BROWNFIELDS IN MY COMMUNITY?

Increasingly, case studies and examples of best practices for sustainable redevelopment of brownfields (and all sites) identify ways of supporting green redevelopment projects. A few suggestions for supporting green redevelopment projects in your community are as follows.

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<th>Support “green” policies and incentives in your city or town as a way to send clear market signals to developers about the community’s expectations for redevelopment of its brownfields.</th>
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<tr>
<td>Encourage projects to include public amenities such as accessible greenspace, community meeting space, management of stormwater from larger areas, infrastructure for community-wide waste management and recycling initiatives, etc.</td>
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<td>Make sure that the societal benefits from green redevelopment are quantified and included in a “community balance sheet” for a proposed project in addition to the “developer balance sheet”.</td>
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<td>Assist developers with partnerships and relationships that will give them access to community resources, technical assistance and funding sources for aspects of sustainable redevelopment.</td>
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<tr>
<td>Define a threshold level of sustainability for brownfield redevelopment and offer developers expedited approvals, tax abatements, fee waivers or other incentives for their project.</td>
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<td>If you attend a hearing or submit comments on a proposed redevelopment project, suggest that it include sustainable elements and include a plan for evaluation of the project’s impacts.</td>
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Sustainable redevelopment of brownfields often starts with one high-profile project that becomes a learning opportunity for the community. For example, the successful implementation of green design principles in the development of the Chicago Center for Green Technology provided the City with the momentum to expand their application in future projects. This was accomplished through changes to City building codes, site planning, and zoning requirements to address stormwater management and the urban heat island effect on a site by site basis. The City of Chicago now offers numerous benefits for developers, like expedited permitting, and possible reductions in permit fees, if they incorporate green elements in their projects.

In Portland, multi-agency development of design guidelines for the South Waterfront project, adoption of Smart Growth principles, and public leadership – along with strong public support for inclusion of sustainability in this and other projects in Portland – led to success in sustainable redevelopment of the Waterfront brownfield.
The Sustainable Brownfields Consortium has posted on its website suggested sustainability benchmarks for projects that received U.S. EPA pilot funding to incorporate sustainable elements – see http://www.uic.edu/orgs/brownfields/research-results/. These could be broadly applicable to other projects.

Finally, it would be extremely helpful for policymakers, communities and researchers to assess the impacts of brownfields cleanup and redevelopment programs – including sustainable strategies – if there was a standard data collection form completed for all cleaned-up sites nationally and submitted to U.S. EPA. Currently, different cities and states collect different kinds of information about brownfields, and in varying formats. Standard data collection of information like past use, contaminants cleaned up and green redevelopment features would help all stakeholders to better understand what works well in brownfields cleanup and sustainable redevelopment in terms of economic, environmental and public health impacts and what the return on investment is for various strategies.

FOR FURTHER INFORMATION

Sustainable Brownfields Consortium – www.brownfields.uic.edu. The Consortium’s best practice case studies for sustainable redevelopment of brownfield sites, as well as our other research studies on green redevelopment of brownfields, are posted at http://www.uic.edu/orgs/brownfields/research-results/.


U.S. EPA Region 5 Brownfields Program – http://www.epa.gov/region5brownfields/


Chicago Brownfields Initiative –

Chicago Metropolitan Agency for Planning – Brownfields: http://www.cmap.illinois.gov/strategy-papers/brownfields

University of Wisconsin–Milwaukee Brownfields Research Consortium –
http://www4.uwm.edu/milwaukeeidea/ceo/brownfields/

Menomonee Valley Benchmarking Initiative – http://epic.cuir.uwm.edu/mvbi/


National Brownfield Association – http://www.brownfieldassociation.org/

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The Sustainable Brownfields Consortium is an interdisciplinary group of researchers and technical advisors who are analyzing best practices for sustainable redevelopment of brownfields and the environmental, economic and public health benefits that can result. Funded by a grant from U.S. EPA, the project is a collaboration of the University of Illinois at Chicago (where it is based), University of Illinois at Urbana-Champaign, University of Wisconsin-Milwaukee, Ryerson University, Resources for the Future, and Kandiyo. The project website is at www.brownfields.uic.edu.