LAND REUSE AND REDEVELOPMENT:
CREATING HEALTHY COMMUNITIES

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention
Agency for Toxic Substances and Disease Registry

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Agency for Toxic Substances and Disease Registry, USA

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IN MEMORIAM

This book is dedicated to Christopher Kochtitzky, who passed away unexpectedly in May 2020. Chris was a beloved colleague, a public health champion, an active BROWN member, and a contributing author to this book.

FOREWORD

Since the early 1970s, environmental improvement has not only benefitted the health of our ecosystems and communities but also raised awareness of the need to maintain our precious planet and its resources. Agencies like the Agency for Toxic Substances and Disease Registry (ATSDR) increase this awareness.

ATSDR promotes healthy and safe environments and prevents exposures to environmental contaminants. Our mission is to protect communities from harmful health effects related to exposure to natural and man-made hazardous substances.

One aspect of protecting community health is examining how land is used—and reused. ATSDR's National Land Reuse Health Program addresses public health concerns and issues related to the restoration of contaminated properties. Land reuse and redevelopment sites such as Brownfields may have a history of unknown contamination that can affect a community's physical, mental, environmental, and economic health. Our Land Reuse Health Program promotes health, community involvement, partnerships, communication, and education.

As we do this important work, our partnerships help us excel. This book is the result of such partnerships in which we elevate awareness of land reuse sites to create Healthfields. Healthfields are former land reuse sites that have been transformed from underused, potentially contaminated properties into vibrant areas. The co-authors are partners from a variety of federal, state, local, academic, private, individual, and non-profit sectors. Committed to Healthfields, they are all members of ATSDR's Brownfields and Reuse Opportunity Working Network (BROWN), a coalition of stakeholders with a wide range of expertise in redevelopment.

Land Reuse and Redevelopment: Creating Healthy Communities is a free textbook and community resource providing guidance on reusing land safely. It's also about resilience, partnerships, and sustainability. As ATSDR's Associate Director, I hope you enjoy this book, developed by so many land reuse partners who freely gave their time and wisdom. I welcome you to join us and our partners in our quest to include community health considerations in land reuse and redevelopment.

Christopher M. Reh, Ph.D.

Associate Director, Agency for Toxic Substances and Disease Registry

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1 Contributors are listed by their professional affiliation at the time this book was written.

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INTRODUCTION

Laurel Berman

How land is used and reused can affect **public health**. There are hundreds of thousands of potentially contaminated sites that were formerly used as industrial, commercial, or residential properties. These sites are called brownfields or land reuse sites. Former gas stations, manufactured gas plants, factories, dry cleaners, and abandoned properties are typical sites that may have people living or working in close proximity to them. Unfortunately, many of these sites are contaminated with harmful chemicals or may even have been redeveloped without proper environmental oversight. These sites may lead to harmful chemical **exposures** for children and adults.

TERMINOLOGY

Land reuse sites are potentially contaminated properties that may be abandoned, underused, or formerly used industrial, commercial, or residential properties. These include brownfields, federal facilities, Resource Conservation and Recovery Act (RCRA) sites, Superfund sites, underground storage tanks, and sites such as landfills. Brownfield sites are real properties, the expansion, development, or reuse of which may be complicated by the presence of a hazardous substance, pollutant, or contaminant. These sites are typically eligible for funding for assessment, cleanup, and other activities by the US Environmental Protection Agency (EPA). The EPA estimates there are over 450,000 brownfield sites in the United States. This number is only a guess, and with foreclosures and manufacturing downturns, these sites continue to increase (US Environmental Protection Agency, 2017).

In this book, we sometimes refer to land reuse sites as brownfield/land reuse sites, or simply brownfield sites. "Brownfields" has become an internationally-recognized term to designate land reuse sites that may encompass many types of potentially contaminated sites, ranging from previous industrial sites that are now vacant to sites that have definite and known contamination, such as illegal dumping sites to actual EPA-recognized brownfields. Each of these types of land reuse sites has different regulatory steps and processes for redevelopment. For example, some land reuse sites such as Superfund sites may require years of legal battles and remediation before redevelopment begins, whereas sites like brownfields may have little or no contamination and can become productive reused properties in a short time.

LAND REUSE SITES

Brownfields. Brownfields are real properties, the expansion, development, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.

Federal Facilities. Federal facilities are properties owned or operated by the US Government that may contain environmental contamination from unexploded ordinance, radioactive waste, or other hazardous substances.

Landfills. Landfills can receive specific kinds of wastes, including municipal solid waste, construction and demolition debris, and hazardous waste.

Resource Conservation and Recovery Act (RCRA) Regulated Sites. RCRA establishes the framework for a national system of solid waste control. Subtitle D of the Act is dedicated to non-hazardous solid waste requirements, and Subtitle C focuses on hazardous solid waste. Solid waste includes solids, liquids, and gases and must be discarded to be considered waste.

Superfund Sites. EPA's Superfund program is responsible for cleaning up some of the nations most contaminated land and responding to environmental emergencies, oil spills, and natural disasters. Superfund sites are listed on the **National Priorities List**, which is the list of national priority sites.

Underground Storage Tanks. Underground storage tank (UST) sites are sites that contain contamination from petroleum products or Superfund hazardous substances that were released from underground storage tanks.

Source: **https://19january2017snapshot.epa.gov/enforcement/types-contaminated-sites_.html**.

LAND REUSE SITES AND COMMUNITY CONDITIONS

Land reuse sites can weigh heavily on communities. The effects of blight and potential contamination can reduce property values and increase the potential for exposures to harmful chemicals. Possible contamination stigmatizes land reuse properties, making them unattractive to developers and eyesores to communities.

Communities affected by land reuse sites, particularly those with multiple sites, tend to have environmental, economic, and social **health disparities**, which can affect overall **community health status** and can result in multiple public health and socioeconomic issues. The effects are far reaching and include increased crime rates, loss of **social capital**, substance abuse, lack of **green spaces** or areas for recreation, decreased access to healthy foods, poor air quality, contaminated soil or water, elevated blood-lead levels, and asthma prevalence.

Image of a fenced brownfield site.
Source: Lloyd DeGrane, 2014.

Environmental health professionals have learned from experience that people who lived near hazardous waste sites suffered adverse health effects. As an example, Herculaneum, Missouri residents living near the Herculaneum **Lead** Smelter were exposed to lead from smelting operations. The Missouri Department of Health and Senior Services (MDHSS) and ATSDR documented lead contamination associated with the smelter throughout the community of 2,805 people. Lead contamination was found in yard soils, air, and street dust. In 2001, MDHSS and the Jefferson County Health Department screened a non-random population of nearly 1,000 residents, including 118 children under age 72 months, for elevated blood lead levels. They found that people living closest to the smelter had significantly elevated blood lead levels. Children and women of childbearing age were at the greatest risk of adverse health impacts from ongoing exposures to lead. MDHSS classified the Herculaneum Lead Smelter site as an urgent public health hazard (Missouri Department of Health and Senior Services, 2001). As another example, the experience of redeveloping Love Canal, the former industrial waste site, into a residential neighborhood in Niagara Falls, New York, without first cleaning up the contamination caused reproductive health effects—particularly preterm births—in the female population that lived there (Austin, 2011). Other studies draw attention to associations between adverse child health outcomes and environmental exposures to chemicals. These exposures included lead, **methylmercury**, **polychlorinated biphenyls**, **dioxins**, **polycyclic aromatic hydrocarbons**, some pesticides, air **toxins** (especially **particulate matter**), proximity to hazardous waste disposal sites, and **volatile solvents** (**volatile organic compounds**), among a host of other exposures (e.g., tobacco smoke) (Wigle, 2007). Liu et al. (Liu, 2012) reported that people living near industrial sites such as fuel-fired power plants and hazardous waste sites had higher rates of respiratory diseases.

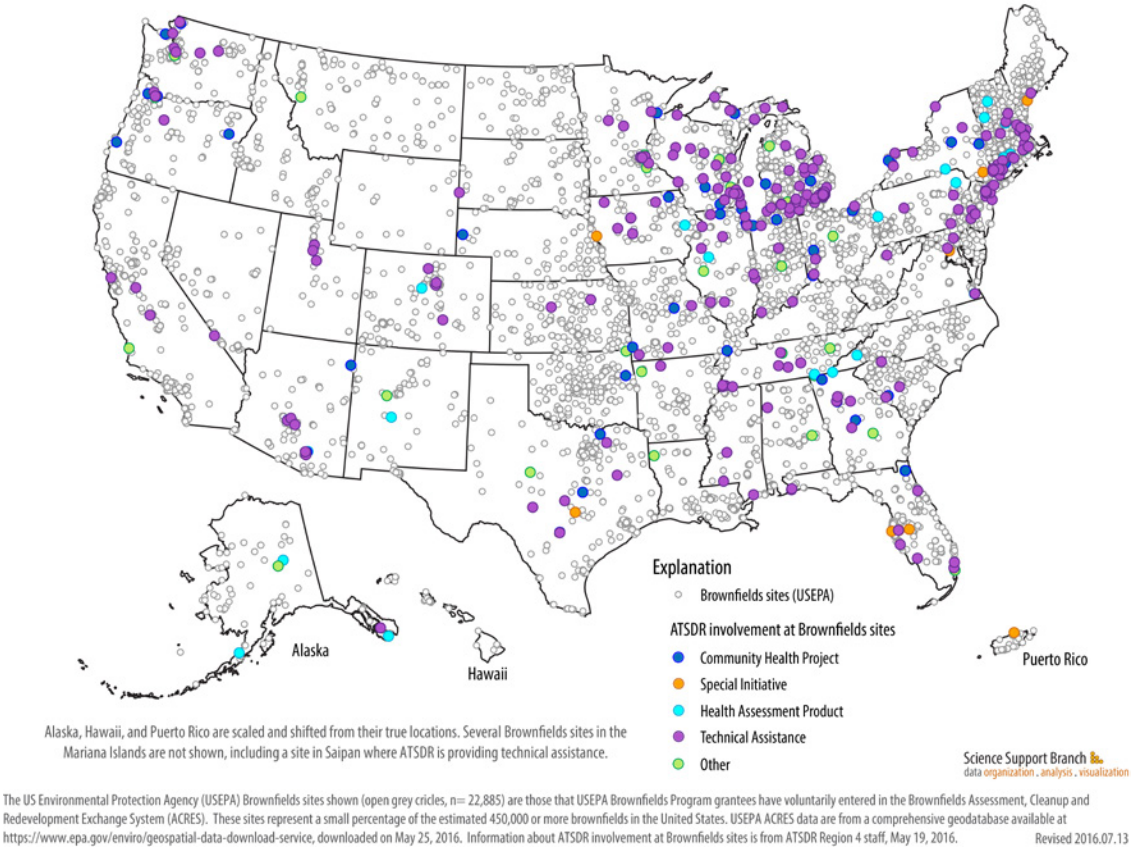
While these studies document some effects of land reuse sites on health, particularly from large-scale sites, it remains difficult to prove that in general, land reuse sites have caused health and other disparities (Kah, 2012). Yet the disparities are present. For example, Martuzzi et al. (Martuzzi, 2010) cited a tendency for poorer, less educated, and disadvantaged populations or ethnic minorities to live closer to waste treatment facilities. Adverse health effects associated with this proximity were often compounded with the adverse effects of social disadvantage.

The tendency for communities to have multiple land reuse sites, such as vacant lots, abandoned industrial facilities, former gas stations, or under-used but active facilities (e.g. a metal scavenging yard adjacent to a residential neighborhood or pre-school), and the potential exposure to site contaminants creates a host of socioeconomic community conditions that, combined, make it difficult to isolate individual causes of health disparities. The **ATSDR Land Reuse Health Program** emphasizes the safe reuse of land to improve the environment, address health disparities, and improve health. During redevelopment of potentially contaminated sites, ATSDR wants to make sure that people are not exposed to harmful chemicals. At the same time, they want to ensure that the redevelopment fits the needs of the community and offers opportunities to improve public health and social well-being. For public health specialists, this is a step beyond assessing contaminated sites and their potential effects on people. We now connect the redevelopment of potentially contaminated sites to planning and policy.

THE EXTENT OF THE LAND REUSE PROBLEM

There are estimates of 450,000 brownfield sites across the United States. In the map below, the gray circles represent over 22,000 brownfield sites that have been entered in the EPA Assessment, Cleanup and Redevelopment Exchange System (ACRES) database by federal EPA Brownfields grantees. The sites designated by colored circles are communities with brownfield sites where ATSDR has implemented a community health project, provided technical assistance, performed health assessment, launched a special initiative (e.g. a soil sampling event or “soilSHOP”), or provided other services to address concerns about contamination.

Brownfield Sites in the United States map



This map shows that brownfields exist everywhere throughout the United States. However, these are only a fraction of the total number of sites. The world of sites like brownfields continuously expands as more sites are created through bankruptcies, foreclosures, or abandonment. Other sites are "legacy" sites, which have been contaminated in the past and may be discovered during land expansion and development projects or when people become sick, smell odors, or suspect previous contamination. Of the 2700 **public health assessments** performed by ATSDR to date, 274 have been on brownfields, and 42% of the time these assessments indicated a public health hazard.

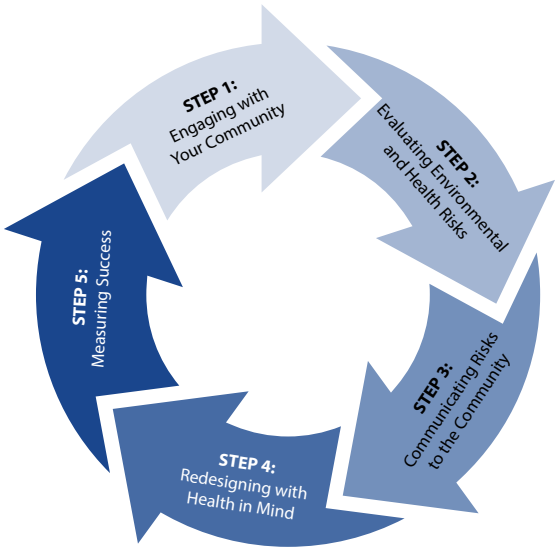
RETHINKING LAND REUSE SITES: A 5-STEP STRATEGY TO SAFELY REUSE LAND AND IMPROVE HEALTH (5-STEP LAND REUSE MODEL)

By creatively redesigning a community to incorporate positive health benefits and outcomes, we can address the health disparities associated with land reuse sites. We can also turn "negatives" into positive opportunities for healthier communities.

There are typically several brownfield sites in one community, creating a need for a multi-faceted public health approach to address community health concerns and issues. Addressing risks of

contamination is only one aspect of redevelopment. We have learned how important it is to engage communities in land reuse and redevelopment to ensure the healthiest, most sustainable redevelopment outcomes. ATSDR developed a 5-Step Land Reuse Strategy to Safely Reuse Land and Improve Health (5-Step Land Reuse Model).

ATSDR 5-Step Strategy to Safely Reuse Land and Improve Health (5-step Land Reuse Model)



The strategy can help us achieve "Healthfields"—redevelopment that aims to improve health. The strategy is simple:

Step 1: Engage the Development Community

The Development Community includes everyone with an interest in redevelopment of a community, including officials, developers, redevelopment authorities, community supporters, and residents. Sometimes the Development Community may be referred to as the community **stakeholders**. Engaging the Development Community is a key element of land revitalization planning. When they work together, they can take a more well-rounded approach to building a better community.

Step 2: Evaluate Environment and Health Issues

Learning about environment and health issues at the beginning of the project can help ensure a safer project. It can show opportunities for the project to promote a healthier community.

Step 3: Communicate Risks or Health Issues to the Development Community

Talking about risks of contaminants or hazards associated with land reuse sites can help community members learn more about how revitalization projects can address health and environmental issues.

Step 4: Redesign the Community with Health in Mind

To redesign a community with health in mind, it is important to ask questions to build a healthier community (i.e., what are the benefits?). Redevelopment can be planned to promote healthier places to live and work.

Step 5: Measure Success: Environment and Health Change

Make the best use of your resources by measuring health factors that affect the community, such as assessing the number of sites that are slated for redevelopment, counting the number of grocery stores, or mapping sites with known contamination that are close to residential properties. Then, you can re-measure to determine if your project successfully improves community health.

Through engagement, assessment, planning, and policy, Development Communities are creating programs that aim to turn potentially contaminated sites into opportunities to improve the social and environmental conditions in which residents live, learn, work, and play. Sites such as former gas stations, dry cleaners, auto shops, and industrial-employment hubs provide real and tangible opportunities for reuse to improve health.

A strong Development Community can work together to assess, clean, and re-envision land reuse sites. Through the diverse partnerships and collaborations that Development Communities offer, public health and planning can lead the effort to reshape America, recycling and improving land and serving as a resource for creating healthy communities.

HOW TO USE THIS BOOK

This book is a resource guide to help communities understand and learn all the elements of how to reuse land to create healthier communities. The authors of this book work in multiple and varied aspects of land redevelopment and reuse. They are affiliated with the **ATSDR Brownfields and Reuse Opportunity Working Network** (BROWN). BROWN members have expertise in community engagement, environmental protection, health, housing, agriculture, and development sectors. We all have a common vision to create Healthfields to improve community health through safe land reuse and revitalization. By coming together to write this book, we hope to share with you some of the tools, resources, and successes we use to create healthier places to live, work, and play.

In addition to our partnerships with BROWN and others who seek to improve health through land reuse and community revitalization, in 2020, our special certification course, Environmental Health and Land Reuse and Redevelopment Certification Program will be available through NEHA.org. Through this effort, we hope to ensure that environmental professionals, students in public health or planning, and anyone who has a vested interest in community revitalization can build a solid foundation to integrate health in land reuse and redevelopment.

Sections of this book are organized around the five steps of the ATSDR 5-step Land Reuse Strategy to improve community health through safe land reuse.

Section I. In Section I, we focus on step 1 of the 5-Step Land Reuse Strategy: *Engage the Development Community*. The chapters in this section describe community understanding, community engagement, and community assessment. We include tools and resources to organize, engage with, and assess the Development Community.

Section II. In Section II we present step 2, *Evaluate Environment and Health Risks,* including how we obtain and use data to assess neighborhood conditions and health effects. We also present step 3, *Communicate Risks or Health Issues to the Development Community*. In this step, we ensure that the community understands how land reuse sites may create community conditions that adversely impact community health.

Section III. In Section III, we describe step 4, *Redesign the Community with Health in Mind*. Land reuse sites present opportunities to successfully revitalize communities and improve health. We present practices such as increasing access to healthy food, agriculture, recreation, and housing as part of the redevelopment process and overall health improvement, including economic growth and social cohesion.

Section IV. In Section IV, we demonstrate step 5, *Measure Success – Environment and Health Change*. We emphasize how a framework for health improvement can lead to measurable changes associated with revitalization.

Glossary. To provide definitions for terms that may be unfamiliar, we have provided a glossary that follows Section IV. Terms in the glossary appear in **bold green font** at first use and can be accessed in alphabetical order in the Glossary chapter.

ATSDR published this book to highlight the village approach to redevelopment that BROWN members exemplify. We hope that this book can be used both as a community resource as well as in educational settings. As a cost-free resource guide and textbook, we encourage Development Communities, and professors and students in public health, environmental science, urban planning, and public policy to use this book to help create Healthfields, shaping the future of community development.

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SECTION I OVERVIEW:

Engaging with the Development Community

Laurel Berman

Nobody understands community needs better than the people who live there. Community members frequently know the history of sites and how sites were used. For example, a vacant lot could have been a former gas station and have some issues with potential petroleum contamination. Or, a vacant school might have had a boiler insulated with **asbestos** containing material that now poses a threat due to vandalism of the vacant property. Community members can be a valuable resource for community revitalization plans, and they can drive development. Through partnerships with local, state, and federal agencies; non-profits; businesses; healthcare; and schools, community members can be part of a strong Development Community: the diverse players engaged in land reuse and redevelopment.

GETTING STARTED: THE DEVELOPMENT COMMUNITY

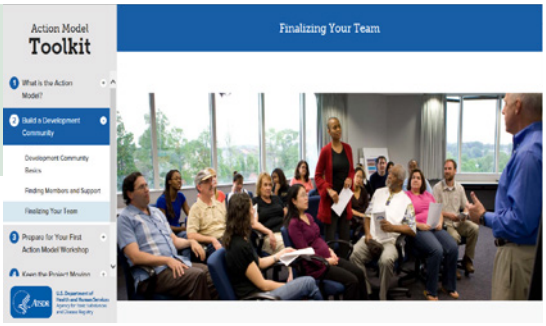
Typically, people come together around a shared concern. Forming and Engaging the Development Community is based on this shared concern. In the case of land reuse, the Development Community members are quite diverse, ranging from residents to urban planners, from private developers to local healthcare providers, from municipal managers to local health agencies, and a host of other people and agencies who all commonly care about community revitalization.

Image: Development Community members in Detroit, MI. Source: ATSDR, 2012.

Your Development Community might include:

- Other concerned citizens
- Business owners
- Developers
- Planners
- Government agencies
- Local or state health departments
- Non-profit groups

There is usually a municipal manager or a community leader who wants to address contaminated sites and wants to engage their community in this process. They usually start with local resources or organizations, like the Chamber of Commerce, community centers, local hospitals and clinics, and the City Council. By inviting people to the planning process early and often, the Development Community can form and grow. The diverse partners ensure that there are a multitude of resources to assist with redevelopment plans. At the local level, planning departments and local health agencies can address concerns about **environmental health**, contaminated sites, health data, and economic development issues. State or tribal partners such as the state-level environmental protection agency and the state health agency can lend assistance and expertise to address environmental and health issues. At the federal level, funding and technical assistance is available through a variety of agencies, including the Environmental Protection Agency (EPA), the Agency for Toxic Substances and Disease Registry (ATSDR) and several other agencies, such as the US Department of Agriculture (USDA), the US Department of Housing and Urban Development (HUD), and many others.



Screen shot of the Action Model Toolkit with Development Community. Source: CDC/ATSDR stock image. http://www.atsdr.cdc.gov/sites/brownfields/actionmodeltoolkit/build-a-development-community/

The **ATSDR Action Model Toolkit** provides guidance for building the Development Community. You may find it useful to follow this guidance to form your own Development Community.

DEVELOPMENT COMMUNITY ENGAGEMENT

Redeveloping underused or formerly contaminated sites as part of a community revitalization plan can improve overall community assets and lead to health benefits. Reusing sites can save development of green space, boost tax revenues, create jobs, increase property values, and decrease crime rates. As properties are redeveloped, neighborhood improvements can domino, with similar improvements in community health status. To reap these benefits, a community plan that is created by the Development Community ensures the community is engaged throughout the redevelopment process and can result in a sustainable plan that ensures health benefits continue for many years.

Effective community engagement often includes public meetings, websites, fact sheets, press releases, as well as developing information sensitive to the various needs of your community e.g., multi-language materials. Community members often have developed their own groups which welcome inclusion in the redevelop decisions. Outreach efforts are often targeted to such groups as: neighborhood organizations, citizens' groups, religious groups, civic organizations, senior centers, local advocacy organizations, the YMCA, local universities and colleges, local business organizations, chambers of commerce and/or other economic based organizations.

The chapters in this section demonstrate the unique aspects of forming a Development Community. Topics include engaging the Development Community, understanding communities, community engagement and assessment tools, and special considerations.

CHAPTER 1

Engaging the Development Community

Elizabeth Truslow Evans

The environmental benefits of land reuse and redevelopment extend beyond cleaning up property and halting exposure risk. Redevelopment in a community often includes or spurs improvements in infrastructure and community services. Redevelopment projects can create new economic, social, and recreational opportunities for area residents and businesses. As environmental and health professionals, we strive to engage a diverse Development Community, from the early planning stages for redevelopment. We focus on communities: how we define communities and capitalize on a community's unique assets, such as culture, demographics, physical features, and social systems. In addition, we explore the importance of, and challenges encountered when, engaging communities and measuring change in redevelopment efforts.

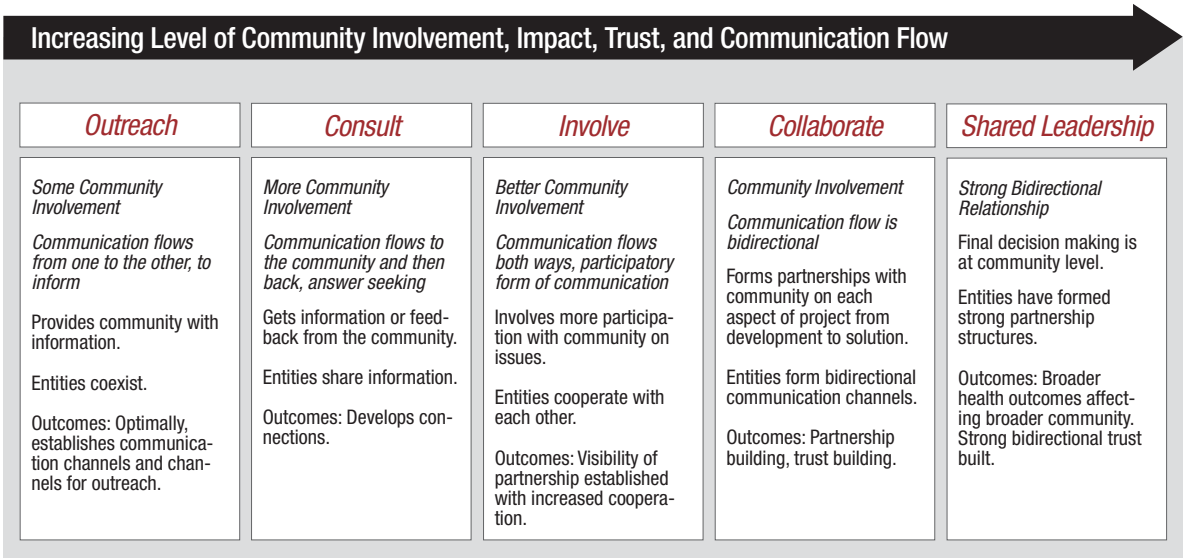
ENGAGING WITH COMMUNITIES

Successful redevelopment projects engage the community that the revitalization efforts will affect. Community residents are often the backbone of a strong Development Community. Engaging community residents early in redevelopment discussions can: help the city base redevelopment goals on community needs (perceived or real), build consensus or support for large redevelopment projects, track changes in the community that are related to the redevelopment, and build community stewardship for future sustainability of efforts. At the most basic level, early community engagement can prevent a developer or municipality from spending additional time or resources on a redevelopment project that does not have community support or that the community actively opposes.

Engaging communities in redevelopment can be complex but also beneficial for a sustainable, long-term redevelopment plan that reduces environmental hazards and may ultimately improve community health. There are tools available (at little or no cost!) to the Development Community to facilitate their engagement. Many of these tools are described in Chapter 3. Community engagement is key to ensuring that redevelopment plans address the needs and desires of the existing community as well as the greater city or town's vision and the needs of the developer. Community engagement is not always easy, however. Many groups have a stake in redevelopment, and each group may play a different role based on their perspective as community advocates, municipal entities, or federal, state, and local environmental and health agencies.

Community engagement can be a spectrum of community involvement. From initial outreach to shared leadership, each step of the spectrum can engage and involve communities increasingly (see Figure 1.1). Agencies, non-profits, residents, and many other groups and individual people are all equal partners when engaging communities in projects. Community engagement takes time. Moving through the steps of outreach, consult, involve, collaborate, and shared leadership shown in Figure 1.1 may take months. It is not unusual to learn from municipal leaders, such as mayors or city administrators, that they began community engagement around redevelopment issues two years before a project was undertaken. Then, when the project was launched, they had the trust and support of their community members.

Figure 1.1. Community Engagement Continuum (ATSDR, 2011, https://www.atsdr.cdc.gov/communityengagement/pce_what.html)



COMMUNITY ENGAGEMENT GOALS

Community engagement typically has multiple goals. Here are three goals specifically geared to community engagement in redevelopment projects:

Recognize real and perceived community needs. First and foremost, engaging the community in discussions about land reuse properties or redevelopment projects allows a municipality to learn about the real and perceived needs of the community as they relate to the proposed redevelopment. Communities often can provide information about exposure pathways and suggest ways to minimize exposure risks from harmful chemical contaminants associated with redevelopment.

Provide a community voice regarding property clean up and redevelopment plans. Second, community engagement offers communities an opportunity to become a part of the decision-making process and to be stewards to ensure future sustainability of projects. Early inclusion of communities may reduce the cost and resources needed overall for the decision-making process because developers provide feedback early in the process on plans that the community may see as incompatible. As the community witnesses the effect of their voice, they are more likely to take ownership of the projects for the future success of the community and organize future redevelopment efforts.

Identify measurable redevelopment endpoints. Third, as part of the engagement process, communities can identify and select measurable redevelopment endpoints. Endpoints allow the municipality to evaluate the success of a redevelopment project and use this information to leverage funds and resources for future community improvements. Redevelopment endpoints may relate to economics, heath, physical safety and security, buildings and infrastructure, or the environment. Examples of some economic endpoints include number of new jobs created, new revenue from businesses created, and housing values. *Health* endpoints could include more or better access to health services, more access to fresh fruits and vegetables by creating a farmer's market or community

garden, and decreased childhood lead-poisoning rates. Examples of *physical safety and security* endpoints are fewer vacant lots that attract vagrancy, improved crime statistics, and safer routes to schools. Some endpoints that show improvements in buildings and infrastructure include repaired sidewalks to prevent trip-and-fall hazards, more acres of parks and green spaces for recreation, and better lighting at night. Finally, *environmental* endpoints could include better water quality in a river that flows through downtown, decreased concentrations of contaminants in soil, and improved air quality. Community members and community groups can take an active role in tracking these endpoints, ensuring the sustainability and success of the overall redevelopment.

CONCLUDING THOUGHTS

As a health educator who worked for years with a state health agency, I have experienced first-hand the benefits and successes of communities involved in the redevelopment process in several projects in Wisconsin. These projects engaged communities that ranged from small rural populations of a few hundred people to large urban areas with over 90,000 residents. Regardless of the size of the community, community engagement occurred early, was inclusive of anyone who wanted to have a stake in the redevelopment plan, and encouraged sharing of resources among a diverse Development Community. In the long run, I have seen positive changes in community health result, such as increased access to recreation, greater awareness about contaminated sites and the benefits of safely cleaning up and reusing these sites, the conversion of potentially contaminated sites into community amenities, and greater trust among parties who do not typically work together.

CHAPTER 2

Working with Others: Understanding Communities

Michelle Heacock and Beth Anderson

"You cannot conduct environmental health research without involving the community."
—Linda Birnbaum, PhD, DABT, ATS, Former Director of the National Institute of Environmental Health Sciences (NIEHS) and the National Toxicology Program

Communities vary by demography, geography, size, environmental impacts, health status, and cultural differences. These variances make communities unique yet different from each other; still, communities are also similar. Community residents care about children, a population who is sensitive to environmental exposures. They care about their environment, and they want safe neighborhoods and clean air, soil, and water. These community members are vital to the Development Community. Yet we must understand communities before engaging them in land reuse and redevelopment plans. We need to ensure that we are culturally sensitive, and that everyone who wants to have a voice in developing a community vision is included.

IMPORTANCE OF ENGAGING COMMUNITIES

Over the last several decades, as a nation, we have placed increasing importance on how a community's environment affects it. The community's perspective is especially relevant as we consider the implications on human and environmental health when developing plans to reuse land contaminated with hazardous substances. The nature of the contamination can vary widely, as can the effects on the community's health and the environment. Accordingly, we must frame each plan for revitalization taking into account the individual community's circumstances.

EVOLUTION OF LARGE RESEARCH PROGRAMS TO INCLUDE COMMUNITY ENGAGEMENT

Involving the community in environmental health research not only informs affected communities, but also creates a mutual relationship that aligns researchers and their research with the community's values, priorities, and needs. The basis of this relationship stems from both researchers and community wanting to know what the potential contaminant exposures are, and how these exposures may affect the community's health and its environment.

Clearly most communities share a concern for their health and environment with other affected communities, and each community has unique knowledge and understanding of the shared issues as well as a distinct set of circumstances that sets it apart. At first, these factors may be underappreciated, but researchers must consider them to ensure a meaningful impact and accepted outcome. Through interaction, a natural appreciation for working together can evolve as both researchers and communities begin to see the value of partnership in the research process. Their collaboration can create action and outcomes that will address problems and create solutions.

The National Institute of Environmental Health Sciences (NIEHS) Superfund Research Program (SRP) is a program that funds university-based, multi-disciplinary research on human health and environmental issues related to hazardous substances. The SRP is an example of the

SUPERFUND RESEARCH PROGRAM

The NIEHS Superfund Research Program (SRP) funds university-based multidisciplinary research on human health and environmental issues related to hazardous substances. The central goal is to understand and break the link between chemical exposure and disease. In keeping with the NIEHS mission, teams of diverse professionals develop, test, and implement unique, solution-oriented approaches to address complete environmental health problems. They are improving the understanding of environmental contaminants, which may lead to lower environmental cleanup costs, reduced risk of exposure, and improvements in public health.

For more information, see: https://www.niehs.nih.gov/research/supported/centers/srp/index.cfm

successful evolution of research programs that adds benefits to research when the process includes and embraces community engagement. The decision to include community engagement activities in SRP research evolved from **research translation** activities that explain these activities using language generally accepted by diverse communities, thus establishing a foundation for interacting effectively with all communities. The research translation interactions provided insight into the benefits gained when the affected communities were involved and participated in the research process. This community engagement provided a better, more informed understanding of the research problem that enabled researchers to address the appropriate questions. To provide insight on understanding the countless perspectives involved when working with a community, logic dictates that we look to successful models of other community-integrated programs. In this chapter, we provide models based on SRP experiences in environmental health research that provide readers context for understanding the nuanced challenges of working with different communities.

ENGAGING COMMUNITIES TO IMPROVE OUTCOMES

While land use and redevelopment are positive actions, the land first must be evaluated for contamination. For instance, does the land require further remediation, or does the nature of the contamination preclude its use for **sensitive populations**? **School siting** is an example where the choice of land reuse can adversely affect children, a population more vulnerable or sensitive than others to environmental exposures (see Chapter 9, Protecting Children's Health). Such a choice took place in Providence, Rhode Island, where an elementary/middle school was built in 1999 atop a former city dump, with little or no input from the community. The site was contaminated with lead, **arsenic**, volatile organic compounds, and mercury. Parents of students attending the school and nearby residents filed a civil action lawsuit citing environmental racism (78% of the student body were non-white students), environmental inequities, and inadequate public notice. Despite this history, the city then built a middle school atop another dump in 2000, and the city selected an industrial site for a new high school in 2005.

The site for the proposed high school was the old Gorham silver factory. Once America's premier silver manufacturer, Gorham closed the factory in 1986. The land had several owners before the city of Providence seized it in 1992 for unpaid taxes. Subsequently, the city subdivided the 37-acre lot into four **parcels**, one of which became the proposed home of the school. The site was heavily contaminated with polychlorinated biphenyls (PCBs); a **slag** heap containing lead and copper; ground- and surface-water **tetrachloroethylene** (TCE); and **perchloroethylene** (PCE). In the mid-2000s, the proposal of a high school site on this contaminated property sparked heavy community resistance.

Shortly after the school was proposed, Brown University SRP teamed with the community to strike a careful balance among the needs of the multiple stakeholders—the Rhode Island Department of Environmental Management, legal advocacy groups, community-based environmental health organizations, and the surrounding community. The Brown University SRP dedicated substantial resources to this problem. Dr. Laura Senier, the lead in this effort, and her Brown University SRP colleagues educated the community about the site contamination. They worked in middle school classrooms, teaching students about environmental health and public speaking so they could take their concerns to the city and the school board. While the Brown University SRP engaged community stakeholders on these projects, Brown University faculty worked to better characterize

the potential for vapor intrusion at the site. Vapor intrusion occurs when chemicals trapped in soil pores or groundwater can vaporize into cracks of foundations or drains, through basements for example. Dr. Senier pointed out that because Brown University SRP had relationships with all parties, "We were also able to bring stakeholders together by convening a statewide panel to develop new guidelines for brownfields redevelopment that mandate community involvement, to prevent situations like this from occurring in the future." In the end, the school was built, but monitors were installed to detect vapor intrusion. Through this multi-pronged approach, the community members felt that their concerns were heard. In addition, they were better prepared to express their concerns and participate in the decision-making process. Currently, there is an active community group, the **Urban Pond Procession** that continues to bring awareness to the community. Clean-up of site contamination has also progressed.

Distressed property on Bay Street in Triverton, RI. Source: http://tiverton.patch.com/groups/politics-and-elections/p/bay-street-activists-to-be-honored-for-environmental-leadership

EMPOWERING COMMUNITIES THROUGH KNOWLEDGE

Contamination not only can cause adverse health effects; it also can have negative economic effects. A Bay Street neighborhood in Triverton, Rhode Island, experienced this combination of effects through potential negative health effects and unexpected financial obstacles. After the residents of this neighborhood discovered their homes were built on land fill from a **coal gasification** plant, they created the Environmental Neighborhood Awareness Committee of Triverton (ENACT), with the assistance of the Brown University SRP. ENACT was formed as a grassroots community group to advocate for more extensive discovery and cleanup of coal gasification wastes. Their efforts resulted in the Rhode Island Department of Environmental Management testing the soil, which revealed high levels of heavy metals and volatile and semi-volatile organic compounds. In March 2005, ENACT filed a lawsuit against the New England Gas Company to force **remediation**.

The ENACT committee was forced to contend with the impact of the contamination on residential property values. Residents of the Bay Street neighborhood struggled to obtain home equity loans—lenders believed the property to be under-valued even though the town continued to tax these properties at the same assessment value as before the contamination was discovered. The onus was on the community to demonstrate that the contamination in the neighborhood was due to the contaminated landfill. Brown University SRP investigators assisted ENACT in their efforts to locate current and former residents who witnessed land fill dumping there, or persons the gas plant or town might have hired to deliver the landfill. Based on the findings, ENACT was able to advance legislation that mandated a fund to ensure home equity loans so that residents could maintain their property and consequently enhance property values.

The partnership between Brown University SRP and ENACT facilitated establishing a larger network of community groups. Through this group network, the Brown SRP discovered several other communities that coal-gasification waste had affected. These networks continue to be good resources for communities with technical questions about cleanup or developing strategies to engage with gas industries effectively to achieve the desired outcomes. The networks also provide moral support and advice in what promises to be a lengthy struggle.

ADDRESSING CULTURAL DIFFERENCES

The United States is composed of a variety of cultures. Some cultural differences can be as simple as the choice of foods and how they are prepared, and others can be intimately rooted to a sacred piece of land. No matter the difference, community engagement can begin only when trust has been established. This trust comes from respect and acceptance of a community's cultural values. This respect and trust was created between Anna Harding, PhD, and colleagues at the Oregon State University (OSU) SRP and the Confederated Tribes of the Umatilla Indian Reservation (CTUIR). This community engagement sanctioned a formal agreement between the OSU SRP investigators and the tribe. This agreement recognized and addressed the unique concerns of the tribe, and included **institutional review board** approvals on natural-related resources and health resources, specification of sovereignty, research ethics, sharing and ownership of data, and **informed consent** (Harding, 2012, 120[1]). Using the agreement as the basis for community engagement, Harding and her OSU SRP colleagues led a study that assessed polycyclic aromatic hydrocarbon (PAH) exposure based on actual tribal practices. The OSU SRP group conducted the study, which was the first to look at the health effects of PAH exposure resulting from the traditional Native American practice of smoking salmon with smoldering wood for as long as three days. The CTUIR rely on smoked salmon to use for food and trading. In the study, tribal participants wore personal air-sampling devices during the entire salmon-smoking process. The research team collected urine samples from the tribal participants before, during, and after the salmon-smoking process. Training videos produced by the OSU SRP group showed the participants how to use the air-sampling devices. The research team also used passive sampling devices in the smoking structures. Additionally, the research team collected samples from spring-run Chinook salmon that were smoked using different conditions in a woodshed or a tipi and using apple or alder wood. The OSU SRP researchers determined that levels of PAHs present in salmon smoked using traditional Native American methods could pose elevated cancer risks if the salmon consumption rates were high over many years. The OSU SRP group now is engaging the community and developing culturally appropriate risk-reduction approaches and outreach strategies that improve the health of the CTUIR.

CAPTURING THE EXPERTISE OF LOCAL RESOURCES

A growing number of environmental concerns exist along the arid United States and Mexico border. Residents of Northern Mexico and Southern Arizona are at risk of exposure to contaminants such as arsenic, trichloroethylene, lead, pesticides, and particulate air pollutants, which are a result of inadequate environmental infrastructure, uncontrolled disposal of hazardous waste, and widespread exposures to heavy metals from mining and metal processing. As environmental contamination does

not suddenly stop when it reaches a country's border, the residents' health and the environment on either side should be protected and the residents must be informed of the risks. However, cultural and language differences can hinder effective communication of health risks. Using **promotoras**, female Latina health advocates, in the communication efforts can help bridge these differences.

Because promotoras are accepted members of the community, they are viewed as people the residents can relate to and trust. In 2013, Denise Moreno Ramirez from the University of Arizona SRP engaged promotoras to help develop training modules. These modules would teach the community about health risks involved with exposure to chemicals, including pesticides and arsenic, and explain how the chemicals moved through the environment. Through careful multi-directional interactions with the affected communities, the promotoras and Moreno Ramirez addressed community concerns appropriately and effectively. While the efforts can be time consuming, the results are rewarding; these promotoras helped establish a powerful network for continued community engagement long beyond the original activity. These relationships between University of Arizona SRP staff and promotoras also contributed to a successful partnership between the University of Arizona SRP scientists and Mexican scientists. This partnership continues to collaborate, exchange and transfer environmental expertise, and develop coordinated strategies to assess exposure and characterize health effects. The scientists also are developing preventive measures that both Mexico and the United States can use and applying remediation technologies to remove hazardous wastes. In these instances, the expertise of the promotoras was key to facilitating critical communication in community engagement.

PRESENTING DATA THAT IS UNDERSTANDABLE

Often scientists speak a "foreign" language when it comes to communicating technical research results so that the community clearly understands it. The Gardenroots project led by Monica Ramirez-Andreotta, PhD, and Mark Brusseau, PhD, from the University of Arizona SRP (Ramirez-Andreotta, M., Brusseau, M. L., Artiola, J .F., Maier, R. M., 2013 [443]) is one striking example where NIEHS was able to translate science to help the affected community understand it. Ramirez-Andreotta and Brusseau initiated the **community-based participatory research** (CBPR) project, Gardenroots, because of a potential health hazard (see Chapter 3 for a description of CBPR). The concern was that edible plants on or near the Dewey Humboldt Superfund site could absorb arsenic from the site, presenting a potential health hazard that could affect home gardeners. Community members who lived near the site provided soil and vegetable samples from their gardens to be tested for arsenic. Ramirez-Andreotta tested soil and different types of vegetables from the local gardens and compared them with a controlled greenhouse environment; she found that the amount of arsenic accumulated in the edible portion of the plant in certain vegetable families is associated with the arsenic soil concentration. Although the community was actively engaged in this project, the success of the project was due largely to the trust that Ramirez-Andreotta earned from the community; she constantly re-evaluated and tweaked the approach and program to fit and reach the community members. Ramirez-Andreotta began extensive and comprehensive recruiting efforts to reach out to the community by going where they went, attending community markets on the weekends, and providing clearly written, non-technical materials. She recruited participants of the CBPR Gardenroots project through close personal involvement. She held community forums and

made herself approachable and available to assist the community in navigating through the project. Most importantly, Ramirez-Andreotta personalized the findings (measured arsenic levels in soil and vegetables) and made recommendations for each community member and presented them in an easy to read format with both text and readily interpretable graphics. To ensure community members understood the results, she followed up with them. The success of her project is evident in a follow-up study (evaluation) by Ramirez-Andreotta that revealed a change in behavior for those residents whose property had arsenic levels higher than the threshold.

CONCLUDING THOUGHTS

Engaging communities in the environmental health research process is critical—contamination scenarios are diverse and often pose unknown issues until people who are most affected provide input and feedback. The examples in this chapter demonstrate how engaging the right parties, empowering communities, considering culturally appropriate factors, involving local expertise and networks, and being personally involved can be effective approaches for designing holistic solutions to community hazardous-substance exposures. The NIEHS SRP has found that when communities are involved and their SRP investigators tailor their approaches to the specific community's concerns, the results are truly relevant and, thus, more on target and more likely effective.

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CHAPTER 3

Community Engagement Tools

Contributors: Mary Dereski, Candace Rutt, Katherine Hebert, Christopher Kochtitzky, Laurel Berman, Cory Kokko, and Melissa Frisbie

Engagement cannot occur without partnerships and transparency among the Development Community. Many resources are available for community engagement. Resources that are low-cost, easy to implement, and efficient can keep up with the pace of development deadlines and enhance the overall process. Several resources are highlighted in this chapter, including community-based participatory research, health impact assessment, Protocol for Assessing Community Excellence in Environmental Health, and the Brownfields/Land Reuse Action Model, among others.

COMMUNITY-BASED PARTICIPATORY RESEARCH

Mary Dereski describes Community-based Participatory Research and how this method can be used to engage communities in land reuse plans.

Studies have shown a growing divide in health status based on socioeconomic status, race and ethnicity, and location (urban versus rural communities). Many low-income and minority population communities have a disproportionate number of health concerns due to a variety of cultural, social, economic, and environmental factors.

While researchers often attempt to address community health problems, traditional research methods typically seek little or no involvement from members of the study communities. Because of this oversight, a gap often exists between research findings and actual intervention, policy creation, and social change. To counteract this error, many researchers are turning to more inclusive, participatory strategies to address local health concerns and inform potential interventions.

WHAT IS COMMUNITY-BASED PARTICIPATORY RESEARCH?

Community-based Participatory Research (CBPR) is a partnership approach to research that involves equitable collaboration between academic researchers, people or groups, and partners that share decision-making power and ownership. These groups typically include:

- Public health professionals
- Community-based organizations or groups (e.g., churches, schools, advocacy or policy groups, and social organizations)
- Community members

CBPR encourages contribution of their expertise from each member of the partnership during every step of the process. This approach brings together partners with different skills and knowledge and enhances the significance and application of research data. Communities with projects can effectively use CBPR to overcome potential distrust of the research system.

WHAT ARE THE KEY CHARACTERISTICS OF CBPR?

CBPR:

Recognizes community as a unit of identity

A shared interest or characteristic such as a family, social network, or geographical neighborhood links community members. CBPR strengthens a sense of community through collective engagement.

Builds on strengths and resources within the community

CBPR identifies and builds on strengths, resources, and relationships that exist within a community to increase the capacity of people, social networks, and organizations to address communal health concerns.

Facilitates a collaborative, equitable partnership in all phases of the research

CBPR is an empowering and power-sharing process that addresses social inequalities by developing relationships based on trust and mutual respect. All partners participate in and share decision-making power with control over all stages of the research.

Fosters co-learning and capacity building among all partners

All partners bring diverse experiences to the partnership. CBPR allows partners to participate in an exchange of skills, knowledge, and capabilities, all of which build their capacity.

Integrates and achieves a balance between generation of knowledge and interventions that benefit all partners

CBPR translates research findings effectively for the community and addresses health concerns through appropriate interventions, policy changes, and community action.

Focuses on local public health problems with a perspective that addresses multiple determinants of health

CBPR focuses attention on people and social networks in a community and addresses public health problems with an interdisciplinary approach.

Involves systems development using a cyclical and iterative process

The CBPR approach includes:

- Community assessment
- Problem definition
- Research design
- Data collection and analysis
- Data interpretation
- Dissemination of research findings
- Determination of intervention and policy strategies
- Taking action

Involves all partners in disseminating research findings

CBPR involves all partners in disseminating research findings and distributes findings in an understandable, respectful way that acknowledges ownership of research.

Involves a long-term process and commitment to sustainability

The CBPR process requires a commitment to partnerships that extends beyond a single research project or funding period.

COMMUNITY PARTNERS

Public health problems are often both complex and very specific to a particular community. While the level and nature of community participation varies from one CBPR project to the next, community partners can aid the research process in many different, important ways. For example, two communities may face the same health problem, but for very different reasons. These instances dictate why it is critical for planners who are proposing and facilitating CBPR to recognize the specific community context in which they are working to improve public health in that community.

Community is an Identity

A key characteristic of CBPR is that it recognizes the term "community" as a unit of identity. Academic researchers, who generally fall outside of that community of identity, are not likely to have the same knowledge of the community as its residents.

People with first-hand knowledge and experience in a community may provide information that can prove crucial to the success of a research study and any future public health interventions. For example, residents of a community may have key information about:

- **Demographics** of the community
- What community members think about a research study's subject
- Specific health concerns
- Local resources that may help address the problem
- Social factors that may affect the research or public health interventions
- Real or perceived causal behaviors related to the topic
- Relevant knowledge, attitudes, practices, values, and beliefs
- Cultural habits, preferences, and sensitivities
- Possible barriers to **behavioral change**
- Effective motivators, incentives, and social support networks

Outsiders who are not familiar with the "day-to-day" of a community may not have access to this type of information, especially if a history of distrust between the community and the researchers exists. Community members or groups may help researchers:

- Raise awareness about the research in their community
- Recruit participants for testing
- Analyze data collected during the study

- Explain research findings
- Translate research results into clear, actionable steps
- Advocate for the dissemination and use of research conclusions
- Co-author resulting publications
- Continue education and dissemination of research findings in the community

This specific knowledge allows community members to play a critical role in CBPR.

CHALLENGES TO CBPR

Partnerships

Lack of trust and respect between researchers and community members is the most common challenge when conducting research using a CBPR approach. This circumstance can be a serious obstacle to implementing meaningful public health interventions if community members feel that the actual research is more important than the community's improvement to the researchers. Distrust between partners can arise from many different reasons, including:

- Unequal distribution of power and control
- Conflicts over funding
- Lack of commitment to the time-consuming process
- Disagreements over who represents the community
- Disagreements over how "community" is defined
- Differences in perspectives, priorities, assumptions, values, beliefs, and language

Truly sharing responsibilities, power, and a common goal can build trust over time. Once established, it is crucial that none of the partners—particularly the academic researchers—take this trust for granted. Researchers must prove their trustworthiness continually to community partners.

Methodologic Challenges

How researchers conduct CBPR and translate the findings into public health interventions can generate further challenges between CBPR partners.

Barriers can include:

- Academic disregard of questions from partners about the quality of the research
- Difficulty measuring and proving the success of interventions in communities where multiple interventions are conducted simultaneously
- Inability to specify fully all aspects of the research upfront
- Difficulty balancing research analysis and actionable interventions

- Time demands
- Interpreting and integrating data from multiple sources

All partners agreeing on inclusive research principles and guidelines at the beginning of a CBPR project can prevent many barriers early on.

Identifying leaders in the community also can help break down barriers. Properly training leaders within community groups allows the community to oversee research processes and effectively carry out responsibilities without the aid of an expert. This "train-the-trainer" approach gives the community the capacity to continue sustainable interventions even after research has officially ended.

The Backgrounds and Outside Demands of Partners Can Produce Difficulties

For academic researchers, the backgrounds and outside demands of partners can include institutional or funding demands that might require them to devote time to other research or limit resources for their CBPR work.

For community partners, these issues are generally social or cultural. Dynamics in the community may create differences in the values and goals of partners and cause competition among community groups. Additionally, community members may be reluctant to participate in research activities that could be perceived as "selling out" to a university or a government agency.

Academic researchers clearly defining their priorities and constraints up front can keep expectations of community partners realistic. Identifying common goals and maintaining ongoing communication among all partners at the outset of the project can override potential difficulties.

CBPR IN RURAL COMMUNITIES

Conducting CBPR in rural communities may present extra challenges when community members:

- Live far from each other
- Live far from healthcare facilities or large research universities
- Do not use the Internet

Factors such as these can make it difficult to schedule community meetings and facilitate ongoing communication.

CBPR IN ACTION: A CLOSER LOOK

Learn more about CBPR by looking at the following case studies.

WAYNE STATE UNIVERSITY'S HEALTH, EDUCATION, LONGEVITY, AND PREVENTION CLINIC

Detroit, Michigan, is home to Wayne State University (WSU). WSU launched their clinic, the Health, Education, Longevity, and Prevention (HELP) Clinic, in 2010. The goal of the WSU HELP Clinic was to evaluate the health status of people in Southwest Detroit. The clinic was a collaborative effort between the WSU Institute of Environmental Health Sciences (IEHS) and the WSU Physician Assistant Studies (PAS) program.

The clinic partnered with local community leaders to disseminate information and recruit clinic clients. Community members distributed information through church bulletins, marquees, ads in local newspapers, door-to-door fliers, and placards placed in local business and churches.

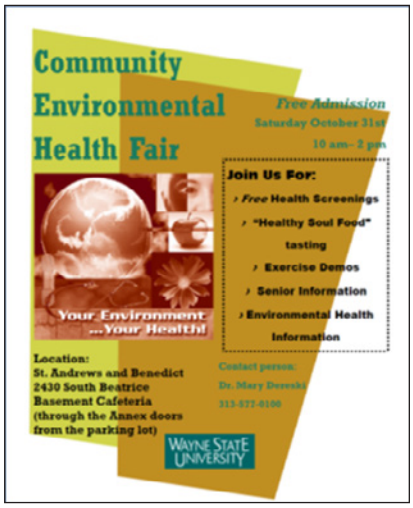
Wayne State University HELP Clinic Services. Source: ATSDR, 2010.

The WSU HELP Clinic focused their interactions on personalized health education and monitoring chronic illnesses. The clinic served 67 people in Southwest Detroit for one year before closing due to inconsistent patient numbers and lack of funding. Challenges faced by the clinic's clients related mostly to the lack of health insurance or home healthcare, low incomes, and poor living environments.

WAYNE STATE UNIVERSITY'S COMMUNITY HEALTH FAIR

Residents from one of the ZIP codes of Detroit perceived to have the most pollution approached WSU researchers to address environmental health concerns. Together, they formed an advisory group to identify approaches for researchers to connect and work with local residents effectively.

The main goal of the partnership was to complete an area health-needs assessmentaddress environmental health concerns and guide future environmental health endeavors. To reach this goal, the partnership planned an environmental health fair with the help of community residents; non-profit organizations; school board representatives; and city, state, and regional departments. Staff from several departments at WSU helped with the fair, and a local church's school donated their cafeteria to house the health fair.



The partnership conducted the health fair in October 2009. It offered free lead screening for children younger than six years, and screened blood samples of nine children for lead. Forty-three adult community members attended the fair and participated in health and nutrition education and screenings for various illnesses or conditions, including hypertension, cholesterol, body mass index, and visual acuity.

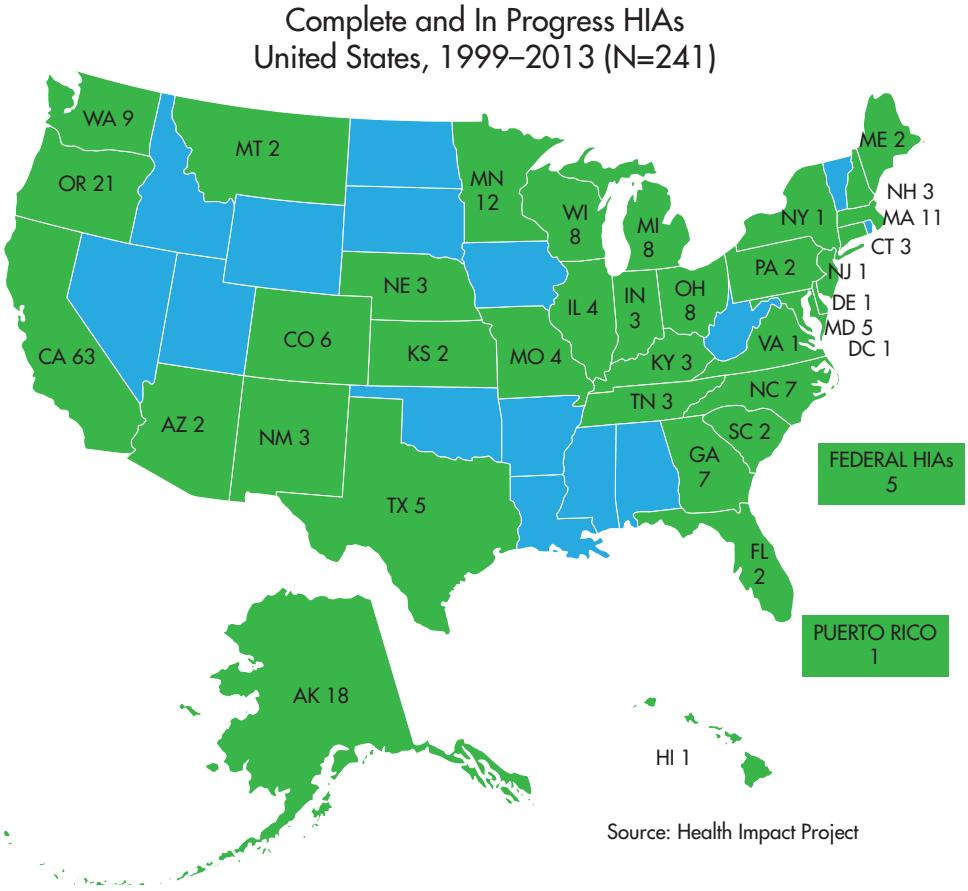
Community members who attended the fair reported that they were grateful for the health screenings and educational opportunities, and that they would like to have similar events in their community in the future. In addition, some people reported a lack of culturally sensitive health materials for the largely African-American community. Community members also said they hoped data collected at the health fair—and data collected from future studies—would strengthen their voice in making decisions about environmental health issues in their community.

HEALTH IMPACT ASSESSMENT

Candace Rutt and Katherine Hebert define Health Impact Assessment and describe how it can be used for land reuse planning.

A Health Impact Assessment (HIA) is a structured process that uses scientific data, professional expertise, and stakeholder input to identify and evaluate public health consequences of proposals and suggests actions that can minimize adverse health impacts and optimize beneficial ones (National Research Council, 2011). The field of HIA is growing rapidly. In 2007, 27 HIAs had been completed; to date, more than 181 HIAs have been completed and 82 are in progress. In the map, Figure 3, shown below, the green states are states where HIAs have been conducted. The blue states are states where HIAs have not been conducted.

Figure 3.1. Health Impact Project. Map of Health Impact Assessments completed and in progress in the United States. 2013. (Source: https://www.pewtrusts.org/en/research-and-analysis/data-visualizations/2015/hia-map?sortBy=relevance&sortOrder=asc&page=1)



HIAs are important because they often examine policies, programs, or projects outside of the traditional public health and health-care sectors that can affect individual and population health immensely. HIAs are not used to make the case for why a policy, program, or project should be proposed, nor are HIAs used as an assessment to understand the impacts once a project has been implemented. Instead, HIAs are meant to be proactive and inform a proposal under consideration, before it is implemented.

HIA STEPS

HIA consists of six steps: screening, scoping, assessment, recommendations, reporting, and evaluation/monitoring.

Screening. Screening determines which project, policy, or program should be selected. Some important issues to consider are:

- When is the decision going to be made?
- Will the HIA add value to the decision-making process?
- Will the decision makers accept the results of the HIA?
- Does the community support and buy-in to the HIA?

Scoping. The purpose of scoping is to outline the expected impacts, methodologic approach, expected challenges, and resources needed to conduct the HIA. The scoping process should produce a detailed roadmap for the analysis to follow. The literature, local experts in relevant fields, and the concerns of the community, policymakers, and stakeholders should inform this roadmap.

Assessment. Assessment includes establishing the community's baseline health conditions and characterizing the effects of the policy or proposal under consideration, and how the policy or proposal will affect the community's health. Assessing the baseline health status of the affected population provides a reference point with which to compare the predicted changes in health status. Once the baseline conditions have been identified, several sources such as peer-reviewed literature, gray literature (typically refers to reports that have not been peer reviewed), **geographical information systems**, **health surveillance systems**, expert opinion, and community input can be used to determine the expected effects. For each health outcome, a decision will be made on the direction of the effect (positive, negative, or neutral), the likelihood of the outcome based on the available evidence, the magnitude of the effect, and whether any vulnerable subpopulations will be affected disproportionately.

Recommendations. Based on the results of the assessment, a series of recommendations are made to inform decision makers on how to maximize the positive aspects of the project, policy, or program and minimize the negative health outcomes. Recommendations should be responsive to predicted impacts; specific and actionable; experience-based and effective; enforceable; trackable; technically and politically feasible; and cost-effective and implementable within local regulatory, administrative, and legislative rules and laws.

Reporting. Reporting is used to disseminate the findings of the HIA to the various stakeholders, including community members and decision makers. Reporting can be provided in various formats from formal presentations and community meetings to report briefs.

Evaluation/Monitoring. The final stage is evaluation and monitoring. The different types of evaluation that can be used are process, impact, and outcome evaluation. Process evaluation considers whether the HIA was conducted according to the plan of action and applicable standards.

Impact evaluation helps determine the impact of the HIA itself on the decision-making process. Outcome evaluation focuses on the change in health status or health indicators caused by implementing the proposal. Lastly, monitoring tracks long-term outcomes over time and identifies the partners that are responsible for implementation and mitigation efforts.

HIA is a participatory process. It includes gathering stakeholder input and involving the community at every stage. HIA emphasizes considering the needs of people a policy or program decision (such as placement of a new road or opening or closing of a park) may affect most adversely. Perhaps most importantly, HIA is proactive and offers recommendations to promote positive health impacts and prevent or mitigate negative health impacts. Therefore, the HIA must be completed before a decision is made, preferably early enough to incorporate the HIA findings into the decision-making process.

We conduct three types of HIAs: rapid, intermediate, or comprehensive. Selecting the appropriate type of HIA depends on the amount of time available before making a decision and determining the resources that can be dedicated to the HIA. **Rapid HIAs** can take from a few days to several weeks to complete, limit the use of resources, and typically provide a broad overview of potential health impacts without collecting new, site-specific data. **Intermediate HIAs** can take from several weeks to several months to complete, involve a greater degree of community engagement, and provide more detailed information than a rapid HIA. If a thorough assessment of the potential health effects is warranted (usually in the case of major projects or policies that affect many people or that are considered politically controversial), a **comprehensive HIA** should be conducted. Comprehensive HIAs commonly involve collecting new **qualitative and quantitative data** and engaging the community at a high level; these HIAs are labor intensive and can take years to complete.

BEST USES AND IMPACTS OF HIA

An HIA can build community support and reduce opposition to a proposed policy, project, or plan. By making decisions with full attention to community concerns, HIAs help reduce conflicts that can delay projects.

HIAs facilitate collaboration across sectors. HIAs provide a structured, pragmatic way for public health officials to collaborate with officials in other agencies and sectors, ensuring that they have the health data they need to make better decisions.

An HIA is not always necessary. If health is already the focus of a proposed policy or project, or if the potential health effects are too hypothetical, an HIA may not offer any new information to decision makers.

In a recent survey by the Health Impact Project, HIA practitioners reported that most HIAs take from six weeks to a year to complete and cost from $10,000 to $200,000—a fraction of the time and resources that often go into environmental studies and permitting procedures (Health Impact Project, 2010).

HIA IN PRACTICE: THE ATLANTA BELTLINE REDEVELOPMENT PROJECT

The Atlanta BeltLine HIA is an example of a comprehensive HIA that included examining brownfields. The Atlanta BeltLine in Atlanta, Georgia, is one of the largest redevelopment projects in U.S. history. The BeltLine is expected to convert 22 miles (35.4 kilometers) of abandoned railway into a combination of trails, parks, light rail transit, residential buildings, and commercial development. The oval loop, measuring 2–4 miles (3.2–6.4 kilometers) from Atlanta's city center, travels through 45 distinct neighborhoods and each of Atlanta's council districts. The project is expected to improve 700 acres of existing parks and add 1,300 acres (5.3 square kilometers) of new green space, including 33 miles (53 kilometers) of trails. Construction along the BeltLine is expected to produce 12 million square feet (slightly more than 1 million square meters) of office, retail, light industrial, and public or private institutional space; create 29,000 housing units; and remediate 1,100 acres of brownfields. The **Tax Allocation District** established to fund the BeltLine is expected to raise $1.7 billion over the next 25 years, while increasing the overall tax base by $20 billion within the same period (The Atlanta BeltLine, 2013).

In 2005, the Georgia Institute of Technology's Center for Quality Growth and Regional Development, with funding from the Robert Wood Johnson Foundation and technical assistance from the Centers for Disease Control and Prevention (CDC), embarked on a comprehensive HIA that took more than a year to complete. The HIA study area consisted of 30,500 acres (234.4 square kilometers) (35 percent of the city's land area), forming a half-mile (.8-kilometer) buffer around the BeltLine's Tax Allocation District. The HIA considered the following health impacts:

1. access and social availability as they related to parks and trails, transit, housing, and healthy food;
2. physical activity levels, particularly in the southeast, southwest, and west-side areas where mortality rates were higher because of the prevalence of chronic disease;
3. safety from injury and crime;
4. social capital; and
5. environmental factors such as air and water pollution, noise and vibration, and the cleanup of formerly polluted sites (Ross, 2007).

Because of the vast differences in the social and economic characteristics of the areas through which the BeltLine passes, and distribution of the associated health impacts were critical components of the HIA. The southeast, southwest, and west-side populations are primarily non-white and, compared with the north-side and northeast populations, are younger, have almost twice the level of poverty, and own significantly fewer cars. Vulnerable populations identified within the HIA included low-income populations, children, older adults, people with disabilities, renters, and people who did not have access to a car. To assess the current brownfield presence in the BeltLine Study Area, the HIA team created a demographic profile for all people living near a brownfield site in the study area. One of the key findings of this data indicated a correlation between living near a brownfield site being non-white and having a lower per capita income. After a series of public workshops and surveys, detailed health-data collection, and an intensive literature review, the HIA team reported on more than 50 recommendations for improving the health of people along the BeltLine.

HIA SUCCESS STORY

In San Francisco, California, (population 810,000) **gentrification** led to increased land values and rents, and the involuntary displacement of tenants. High housing costs also forced households to choose whether to pay rent and purchase food, clothing, transportation, and medical care, or to accept unhealthy housing. In 2002, the San Francisco Department of Public Health's Program on Health, and Sustainability (PHES) launched a process to respond to land-use conflicts in several neighborhoods (San Francisco Eastern Neighborhoods Community Health Impact Assessment, 2014). Working closely with community organizations, PHES conducted workshops and collectively identified pathways among health, environmental, economic, and cultural conditions and public policies. In 2003, tenants at risk of eviction challenged an environmental impact assessment on a proposed project to replace 377 rent-controlled housing units with new market-rate condominiums. PHES conducted an HIA on the project and corroborated the testimony of tenants, providing empirical evidence of the likely adverse health impacts of unaffordable housing and displacement. Ultimately, in response to community demands, the developer promised to offer lifetime leases in the new building to existing tenants, to maintain rents at present rates, and to delay demolition until sufficient replacement units were located. Consequently, PHES created the Healthy Development Measurement Tool (HDMT) in part as a comprehensive metric for evaluating future projects of this type.

The overarching purpose of an HIA is to give decision makers accurate and scientifically based information and recommendations concerning the potential health impacts of their decisions. HIAs typically increase awareness of community health concerns and collaborations across multiple disciplines, lead to better-informed decisions, and provide a better understanding of each discipline's influence on the social determinants of health.

ADDITIONAL RESOURCES

Health Impact Assessment is a resource related to HIA:

- **http://www.health.gov.on.ca/en/pro/programs/heia/tool.aspx**
- **http://www.wellesleyinstitute.com**

PROTOCOL FOR ASSESSING COMMUNITY EXCELLENCE IN ENVIRONMENTAL HEALTH

Christopher Kochtitzky describes Protocol for Assessing Community Excellence in Environmental Health and how this framework has been applied in community-based health assessment.

The National Association of County and City Health Officials (NACCHO) collaborated with CDC's National Center for Environmental Health (NCEH) to develop a method for facilitating community-based environmental health assessments. This collaboration generated the ***Protocol for Assessing Community Excellence in Environmental Health*** (PACE EH) (Protocol for Assessing Community Excellence in Environmental Health, 2014). PACE EH provides a step-by-step method to help local public health officials facilitate a community-based environmental health assessment. The process focuses on:

1. characterizing and evaluating local environmental health conditions and concerns;
2. identifying populations at risk of exposure to environmental hazards;
3. identifying and collecting meaningful environmental health data; and
4. prioritizing local action to address environmental health problems.

PACE EH METHOD

The PACE EH method has 13 tasks and requires an assessment team to identify local environmental health priorities, establish relevant indicators (measures), and coordinate significant short- and long-term interventions. NACCHO provides a free, online PACE EH training in their Toolkit at **https://www.cdc.gov/nceh/ehs/docs/pace-eh-guidebook.pdf** . This training introduces PACE EH and provides descriptions of each of the 13 following tasks:

- Task 1: Determine community capacity
- Task 2: Define and characterize the community
- Task 3: Assemble a community-based environmental health-assessment team
- Task 4: Define the goals, objectives, and scope of the assessment
- Task 5: Generate a list of community-specific environmental health issues
- Task 6: Analyze the issues with a systems framework
- Task 7: Develop locally appropriate indicators
- Task 8: Select standards against which local status can be compared
- Task 9: Create issue profiles
- Task 10: Rank the issues
- Task 11: Set priorities for action

- Task 12: Develop an action plan
- Task 13: Evaluate progress and plan for the future

The NACCHO Toolkit provided additional examples for many of the 13 tasks at: **http://toolbox.naccho.org/pages/**

Public health agencies across the United States are using the PACE EH, and it is proving a useful tool. For health agencies with limited resources and funding to implement PACE EH, gaining familiarity with the 13 tasks and modifying the process may still be a great benefit to engage health agencies in land-reuse planning.

HOW PACE EH IS USED TODAY

Numerous large and small communities are using PACE EH to optimize the health of vulnerable populations through community design.

The Florida Department of Health has adopted PACE EH. For the past several years, the **Bureau of Environmental Health in the Florida Department of Health** has encouraged county health departments to work with their communities and address environmental health concerns. County health department projects across the state have become national models that address built environment and urban planning issues as environmental health issues. For example, environmental, economic, and age vulnerabilities are important in Wabasso, a small (population approximately 900), low-income, minority-population community in central Florida. In 2000, Wabasso had twice the national proportion of residents older than 65 years, and of persons with a disability. Community septic systems were experiencing a 70% failure rate, many older residents' streets were unpaved and had no streetlights, and approximately 80 dilapidated homes were in the project area. Using PACE EH, residents identified their top "health" issues as septic system failures and the lack of the following: safe and healthy housing, violence-free communities, street lighting, safe physical-activity areas, safe drinking water, and a municipal wastewater system. Beginning in January 2004 with an initial $30,000 public health grant, the community leveraged almost $2 million of non-public-health funds to install sidewalks and streetlights, construct a walking trail, connect homes to county water, improve wastewater treatment systems, demolish abandoned houses, and construct safer and healthier housing.

Community youth in Wabasso, FL, helping to improve the community. Source: CDC, 2014, http://www.cdc.gov/nceh/ehs/Docs/Factsheets/PACE_EH_CEHA.pdf

THE ATSDR BROWNFIELDS/LAND REUSE ACTION MODEL

Laurel Berman and Cory Kokko describe the ATSDR Brownfields/Land Reuse Action Model and how it has been used to integrate public health in redevelopment plans.

The ATSDR Brownfields/Land Reuse Action Model (Action Model) is a community assessment tool designed to foster communication and shared vision among the diverse members of the Development Community. The Action Model framework helps assess the effects of redevelopment on public health with a goal of achieving positive, sustainable improvements in overall community health. It is a grassroots model, designed to be simple and easy to use by any member of the Development Community.

Development Communities may use the Action Model at any stage of redevelopment, but it is particularly useful at the beginning stages of planning to enable tracking of changes in public health status over time. The Action Model framework encourages the Development Community to focus on broad public health topics that affect overall community health such as physical and mental health, environment, education and economy, planning, safety and security, and communication and risk communication. By selecting indicators of community health status, communities can track redevelopment changes in the community over time.

USING THE ACTION MODEL

The **Action Model Toolkit** advises holding a public workshop to introduce the Action Model framework as a first step. During the workshop, members of the Development Community focus on these four questions:

1. What are the issues in the community?
2. How can redevelopment address these issues?
3. What are the corresponding community health benefits?
4. What data are needed to measure change?

Through brainstorming, answering these four questions creates a framework for incorporating public health endpoints into redevelopment plans. The first two questions typically are answered rapidly. The third and fourth questions take a bit more time, but members of the Development Community can use their expertise to guide the process. For example, local health agency representatives are good resources for identifying health benefits and data sources in steps three and four of the model.

It may be helpful to develop themes such as Physical and Mental Health, Safety and Security, Economy and Education, Communication and Risk Communication, and Environment to focus your discussions. Within each category, the four questions can be addressed.

FINDING DATA SOURCES

To measure changes in the community's health status (step four of the model), the Development Community should pick freely available data sources. Typically, different members of the

Development Community already maintain or have access to databases that can provide information for tracking changes in community health status. Other sources of information include community surveys and state or federal websites. For example, state environmental agencies often provide environmental data on their websites. Local health departments frequently maintain databases, such as blood-lead levels in children, regarding community health. City agencies may maintain databases regarding crime rates, property values, rentals, and housing condition. Federal government websites such as those of the U.S. Census, CDC, and the Environmental Protection Agency (EPA) can provide information also.

ESTABLISHING AN ACTION MODEL STEWARD

To ensure that the Action Model measures are tracked over time, a steward should be selected. The steward should typically be a team of people who can stay with the project over the long term. Local colleges and universities may be selected as stewards. These institutions may have a vested interest in community outreach projects, and typically will have students available who can track measures as part of school projects.

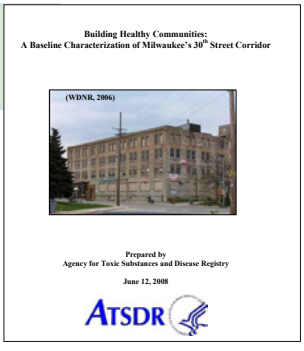
IMPLEMENTING THE ACTION MODEL IN COMMUNITIES

When ATSDR first developed the Action Model, they piloted the framework in the 30th Street Corridor of Milwaukee, Wisconsin. The corridor is a dense urban area with 90,000 residents. The Development Community focused on seven community issues and 19 corresponding indicators to assess how redevelopment might affect the overall health status within the corridor. The project is described in the report (ATSDR, 2008): *Building Healthy Communities: A Baseline Characterization of Milwaukee's 30th Street Corridor.*

To assess the utility and adaptability of the Action Model, ATSDR used the model in two additional brownfields and community health projects in communities that were very different from each other. The first community was in Baraboo, Wisconsin; the second community was in Detroit, Michigan. These projects showed that the model was flexible and could be applied in both large and small, and urban and rural, communities.

Since its use in the Milwaukee, Baraboo, and Detroit projects, the ATSDR Action Model has been used by over 40 communities, from New York to Oregon and including communities in Florida, Navajo Nation, Nebraska, and many others. Projects undertaken in these communities led to the development of a common set of core brownfields/land-reuse public-health indicators associated with contaminated sites and redevelopment that may be applied broadly by other communities.

Building Healthy Communities: A Baseline Characterization of Milwaukee's 30th Street Corridor (Jul 2008) [PDF, 506 KB]



CASE EXAMPLE: JOPLIN, MISSOURI ACTION MODEL

The Action Model was used as a planning tool in Joplin, Missouri, after Joplin was devastated by a tornado in 2011. EPA assisted Joplin with a **"Complete Streets"** plan for development, a plan to ensure that streets are safe for all users—bicyclists, walkers, and drivers. ATSDR gathered community input and used the Action Model to establish a plan for reaching redevelopment goals. In addition, ATSDR used the **Healthy Community Design Checklist** to address Step 2, Redevelopment Approaches, during the Action Model process.

Joplin, Missouri, originally founded as a lead and zinc mining community in 1873, was devastated on May 22, 2011, by a category EF-5, multiple-vortex tornado. The tornado cut a nearly 1-mile-wide path across the city, was approximately 22 miles long, and took the lives of 161 people (according to the city of Joplin). As the tornado tracked eastward, it intensified along Joplin's 20th Street Corridor, a major east-west connecting artery for the city, and surrounding areas. Virtually every residential property, institution, and business along that stretch was heavily damaged or destroyed. Instead of bemoaning this tragedy, Joplin looked at the opportunity to enhance and expand community development during the rebuilding process.

Cory Kokko, ATSDR Region VII Representative, facilitating an Action Model process at a community meeting in Joplin, MO. Source: ATSDR, 2011.

In 2011, ATSDR provided the Brownfields/Land Revitalization Action Model to the citizens of Joplin to guide decisions that impacted health during this revitalization process. The ATSDR Action Model highlighted the health benefits of green infrastructure and sustainable development on the 20th Street Corridor and other areas in Joplin. Joplin High School resides on this connector and the city has plans to develop a new library, performing arts center, and cinema here as well. The ATSDR Action Model also complemented the EPA Complete Green Streets project for Joplin that included plans for a road diet (lane reductions) and green infrastructure, including storm-water drainage and sidewalks along this corridor. Citizen participation facilitated the development of the Action Model, and residents provided feedback at health engagement activities conducted at community meetings and during a popular Joplin Third Thursday street event downtown. The Joplin Action Model concentrates around the following themes:

1. Access to Nature,
2. Getting Outside and Being More Active,
3. A Cleaner Environment Free of Toxicants and One That is More Accessible to All People,
4. Healthier and More Affordable Food Choices,
5. Feeling Safer in the Community,
6. Getting Around Without a Car,

7. Other Health Issues,
8. Communication Considerations,
9. Employment and Educational Considerations, and
10. General Considerations.

An excerpt of Joplin's Action Model follows. The full model is available at: **http://www.atsdr.cdc.gov/sites/brownfields/docs/JoplinWorkPlan.pdf**

More information about the Action Model is available at: **http://www.atsdr.cdc.gov/sites/brownfields/model.html**.

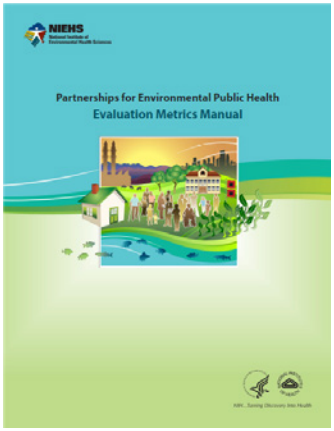
Image is an excerpt of Joplin's Action Model.

Community Issues	Redevelopment Approach	Health Benefit	Measurement (Indicator)	Comment/ Sources of Data
There has been a loss of trees due to the tornado and the situation has been exacerbated with drought conditions.	Inventory of trees that have been planted. Require developers to plant trees. Require developer to provide SHADE trees in conjunction with sidewalks. Summarize and upgrade a city ordinance re: planting of trees. Encourage participation in Arbor Day. Connect Tree plantings to Arbor days. Is there a Joplin forestry board/ arbor society? Connect tree plantings to school activities to increase children's awareness of the importance of trees.	Trees can improve the environment, improve aesthetics, reduce heat island effect, provide shade for people, trap pollutants, promote green space, and increase walkability. Need in Joplin for shade during summer months on 20th St corridor if sidewalks put in- this is important to avoid heat stress for walkers.	Forestry Board/ arbor activities expressed as numbers of specific types of activities. Count the number of programs in place. (Habitat for Humanity, tree donation groups). Count the number of grassroots efforts in place.	Is there a map with tree locations and types of trees?
Parklets may be an effective way to bring a sense of nature. Parkscape the sidewalk landscape along 20th St Corridor. (Parklets and parkscaping is to add nature and green features to a sidewalk area by adding trees, landscaping, benches, shade, and general ambience.	Consider incorporating parklets into sidewalk/ streetscape in order to give residents a place to sit, converse, relax.	Community health and connectivity to others is important for mental health well-being.	See master plan.	Having access to nature and getting outside/being more active were listed as number 1 and 2 on the Joplin Health Engagement Activity. See Appendix A: Joplin Health Engagement Activity.

Taking Action: Rebuilding Joplin after the Tornado **8** *Using the ATSDR Brownfields / Land Revitalization Action Model*

ADDITIONAL COMMUNITY ENGAGEMENT RESOURCES

Metrics Manual



Partnerships for Environmental Health Evaluation Metrics Manual. The National Institute of Environmental Health Sciences produced the Evaluation Metrics Manual for their Partnership for Environmental Health (PEHP) grantees across the United States to create standard measures for planning and evaluation. The PEHP grantees include several environmental health programs and centers such as Obesity and the Built Environment; Superfund Research Program; Environmental Public Health Core Centers: Community Outreach and Engagement Programs; and Environmental Health: Partnerships for Communication Program. While the metrics are designed to fit the themes of these programs and centers, they are focused on community engagement and overlap with many of the issues encountered in land-reuse communities. Redeveloped communities that wish to engage residents in developing community health indicators over the course of revitalization may find this metrics manual very useful. As an example, a first step for redevelopment communities is to form the Development Community. It is not unusual for a Development Community to expand to include more partners to help create redevelopment approaches. Some of these following metrics under "Identify partners" could be incorporated in this process.

EXAMPLE METRICS FOR ACTIVITY 1: IDENTIFY PARTNERS

- Number of partners identified
- Number of additional identified partners that could be added in the future
- Number of contacts made with potential partners
- Number of potential partners who express interest in the project
- Number and description of needs of each partner
- Number and description of resources that each partner can contribute
- Description of benefits each partner may receive
- Description of project goals as related to partnerships
- Description of potential or perceived benefits of the partnership to each partner (e.g., increased visibility, increased access to priority populations, increased networking opportunities, technical assistance, connections to key partners, funding, improved images)
- Description of historical trust concerns between partners and how these concerns will be addressed

Melissa Frisbie describes Photovoice, Public Participatory Geographic Information Systems, Interactive Mapping, and Sidewalk Assessment community engagement tools she uses in her work with New York State Department of Health.

PHOTOVOICE

Pictures can transcend language barriers, cultural differences, and present real evidence of what is real or not. Pictures can be powerful tools for spearheading change with the greater community, policymakers, governing agencies, and others who can effect change. **Photovoice** is a form of photography that harnesses the power of pictures and community participation to spur critical thinking and create change. First developed by Drs. Caroline Wang and Mary Anne Burris in 1997 (Wang, C. and Burris, M., 1997), Photovoice engages communities to offer their own perspectives on their community's strengths and challenges. Using Photovoice, a group of participants first engages in a discussion about their community and possible themes of their Photovoice project. Members of the group follow up on these discussions by taking pictures in their neighborhood related to the identified themes. The community member who took the picture narrates when the picture is presented so that viewers can understand the photographer's perspective. The group decides on the final display project, which could be a poster, a collage, individual pictures posted on a bulletin board, or a slide show. Photovoice is a useful tool for communities, often capturing community interest better than could other methods, and providing a comfortable platform for community participants who may otherwise hesitate to speak.

Photovoice Example

New York State Department of Health (NYSDOH) staff trained residents of several communities across New York State, including Niagara Falls, Rochester, and Rome, on the use of Photovoice. NYSDOH staff developed training materials and used a "train-the-trainer" approach. This provided the community with a sense of ownership and skills to use in the future. Themes emerging from NYSDOH projects included public safety, vacant housing, litter, poor lighting, and access to food and transportation. The materials and training have been refined over time to provide community members with a fun, engaging, and sustainable tool that will help give them a voice.

Photovoice Example: Niagara Falls (NYSDOH, undated).

PUBLIC PARTICIPATORY GEOGRAPHIC INFORMATION SYSTEMS

Using Public Participatory Geographic Information Systems (PPGIS) empowers communities by bringing the more traditionally professional GIS mapping practices to a community level, especially to people who usually have little voice in the public arena. PPGIS is a grassroots community-engagement tool usually used in projects such as neighborhood planning, resource management, and other traditional government responsibilities. PPGIS often involves using accessible technology like smart phones, tablets, and online or paper surveys to map specific community environmental or health-related concerns. PPGIS is based on the idea that community residents have specific knowledge of their neighborhood aspects that might provide a more helpful and targeted perspective for change. PPGIS can be used for projects such as mapping vacant houses or land, assessing sidewalk conditions, assessing community environmental conditions, and evaluating neighborhood walkability. NYSDOH used its GIS experience and skills to assess the walkability of a community in the city of Rensselaer, New York. Participants used mobile technology on smart phones and tablets. The end result was a map of walkability issues and obstructions for Rensselaer leaders to consider cataloging, prioritizing, and repairing.

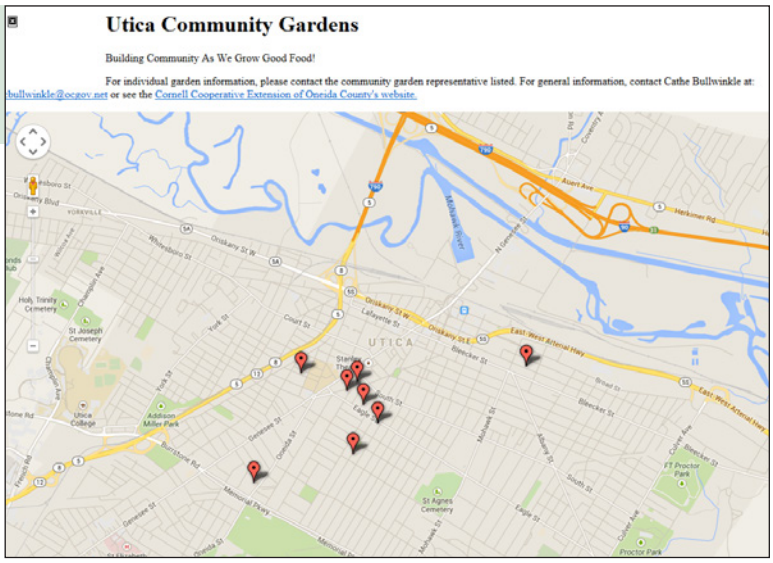
INTERACTIVE MAPPING

Interactive mapping technology allows for easier public access to spatial data that allows the user to sort, filter, and visualize the data. Interactive mapping systems often use multiple layers of health, environmental, geographic, and commercial data to provide communities easy-to-access information. Data access is an important issue for some communities. The maps give users a comprehensive snapshot of their community and allow them to collect data for reports, grants, public use, and other activities.

The New York State Department of Health (NYSDOH) worked with community stakeholders to develop interactive mapping for Buffalo's Perry Choice neighborhood, the city of Kingston,

and a Utica community working with the Oneida County Health Department. The Perry Choice neighborhood asked for a map of community services such as medical care, grocery stores, churches, and other places of interest to residents. NYSDOH helped Kingston stakeholders develop a map of cultural assets to encourage residents to use a new bike path and patronize local businesses. Utica asked for assistance mapping their existing community gardens, shown in the figure below. Perry Choice, Kingston, and Utica worked with NYSDOH to create interactive Google Fusion maps that are now maintained and updated by those communities. NYSDOH developed training for communities to create their own free, interactive mapping technologies, which will build a more sustainable skill within the community using the "train-the-trainer" approach.

An example of an interactive map developed by the Utica Community. Source: NYSDOH, undated.



SIDEWALK ASSESSMENT

Often sidewalk assessments are conducted in communities to assess the conditions of sidewalks and the walkability of the general community. Sidewalk assessments are ideal for grassroots community groups who live in that community and walk those streets every day. Sidewalk assessments are done on foot by volunteers to ensure that more ground is covered and more sidewalks are assessed. Sidewalk assessments are conducted using either a paper questionnaire or mobile technology using specific and uniform measures. The assessments detail cracked pavement, missing pavement, or other obstructions, and overall walkability issues such as traffic, safety, crosswalks, and handicap access. NYSDOH conducted a sidewalk assessment in Rome's South End neighborhood with community volunteers and a city council member. Subsequently, the city of Rome adopted this pilot assessment for a larger, city-wide sidewalk assessment in the summer of 2014.

A sidewalk in Rome, NY. Source: NYSDOH, 2014.

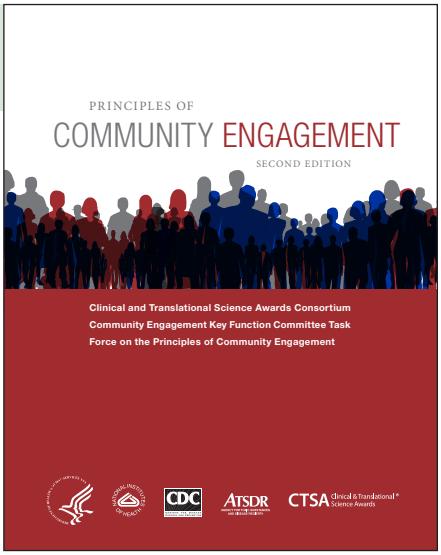
AMERICAN COMMUNITY SURVEY

The **American Community Survey** is available at **http://www.census.gov/acs/www/**. The American Community Survey is an annual effort of the U.S. Census to collect data on a sample of the population to help communities in planning efforts. The Census collects and presents data for communities with populations of 65,000 or more. Data include information about age, sex, race, families, income, health insurance, and many other aspects. Communities can use the data to help allocate resources for planning and resource distribution. The data are less useful for smaller communities with populations of 65,000 or less.

PRINCIPLES FOR COMMUNITY ENGAGEMENT

CDC/ATSDR led a consortium of federal agency representatives that developed the **Principles of Community Engagement**. The Principles of Community Engagement provides public health professionals, health care providers, and community-based leaders and other stakeholders with both a science base and practical guidance for engaging partners in projects such as land reuse efforts. The Principles of Community Engagement can provide guidance to people in a variety of roles, from a program funder who needs to know how to support community engagement to the community leader who needs hands-on, practical information on how to mobilize the members of a community. The primer also provides tools for people who are leading efforts to improve population health through community engagement.

Available at: https://www.atsdr.cdc.gov/communityengagement/pdf/PCE_Report_508_FINAL.pdf



CONCLUSION

The resources presented in this chapter may be useful for community engagement and assessment activities. These are some of the most used community engagement resources in many land reuse projects. In some cases, these tools can be used together. For example, communities may wish to conduct some HIAs to determine if proposed redevelopment projects will have health impacts, which may influence planning to maximize health benefits. Once plans are in place, the Action Model can then be used to ensure that redevelopment project outcomes can be tracked over time, enhancing the sustainability of the project. BROWN members Candace Rutt and Laurel Berman have demonstrated in training sessions how these two models can be used simultaneously to encourage a health-based focus for land reuse and redevelopment. BROWN member Mary Dereski has engaged the Southwest Detroit community in CBPR projects such as the WSU HELP clinic and health fair highlighted above. The Detroit community also used the Action Model framework over a period of several years, and the WSU events were part of the indicators of this framework.

Regardless of the framework, model, or strategy used, the ultimate goal of community engagement in redevelopment is to create community-driven visions that improve the overall health of the affected community.

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CHAPTER 4

Using Media to Engage Communities and Generate Change

ATSDR Office of Communications, Robert Safay, and Art Jones

As highlighted throughout this book, engaging communities to generate change is a critical component of healthy land-reuse practices. In today's society, technology has taken a lead in community engagement. Through **social media,** videos, and outreach tools and resources, communities can learn about and get involved in redevelopment plans. This chapter includes a series of essays by community engagement experts.

USING SOCIAL MEDIA TO ENGAGE COMMUNITIES

This essay has been provided by the ATSDR Office of Communications.

You can use social media tools such as Facebook, Twitter, Pinterest, YouTube, Flickr, Instagram, blogs, online images, and video sharing to engage and encourage communities in conversations about land reuse and redevelopment.

For social media to be most effective, you need a plan that identifies your goals and objectives to help you successfully connect with the community. A well-developed social media strategy can help you increase awareness, visibility, and the reach of your content, and identify the channels you want to use to communicate information to your community. For in-depth guidance on integrating social media into health communication campaigns and activities, visit the **CDC Social Media Tools, Guidelines and Best Practices** websites: **https://www.cdc.gov/socialmedia/tools/guidelines/socialmediatoolkit.html**.

TIPS FOR DEVELOPING CONTENT FOR A SOCIAL MEDIA CALENDAR

1. **Determine who you are trying to reach and why.**

   Whom are you trying to reach in your community? What do you know about them? What kind of information do they want?

2. **Determine which social media platforms you will use to reach your audience.**

   What social media platforms does your audience use? Where are the conversations in which you want to be involved taking place?

3. **Identify goals for each platform.**

   What are you trying to accomplish by posting to Twitter, Facebook, etc.? For example, do you want to inform people about development progress, increase participation at public meetings, or seek community input?

4. **Develop your voice and tone.**

   Consider the tone of your content. What is your organization's social media personality—light and friendly or serious and informative? Decide how you will refer to your organization. Will you use the pronouns "we" or "I"?

5. **Create a content strategy and calendar.**

   Identify three to four themes on which you want to focus. Ensure that these themes resonate with your community and align with your development goals. To avoid repeating content, it may be helpful to build a three-month calendar of content and proactive messages, including posts, imagery, and publish dates.

6. **Engage with your community.**

   Social media isn't just about broadcasting messages; it's also about conversation and engagement. Think about how you will use social media to engage partners and respond to questions or comments from your community. Monitor social media to see questions or comments you receive and determine the conversations in which you can participate.

COMMUNITY TOOLS AND RESOURCES

You can use social media and other forms of media to engage communities to form partnerships and gather community input. Other resources to help communities learn about contamination and engage them in land-reuse plans include applications for portable devices such as cell phones and iPads, photo mapping, Geographic Information Systems (GIS) mapping, and websites.

ENGAGING COMMUNITIES THROUGH FILM

Videos such as documentaries are popular tools you can use for health education. People may absorb messages in a video more effectively than they do messages in print media. Videos can create powerful and effective messages that can reach many people. To protect public health, ATSDR has used videos such as **Don't Mess with Mercury** to educate people about specific dangers.

Robert Safay and Art Jones wrote the following essays. Robert (Bob) Safay worked for ATSDR for many years. During his years with ATSDR, he discovered that he could combine his passion to document life events through video with his duties at ATSDR. He produced many documentary films for ATSDR and the U.S. Environmental Protection Agency (EPA). The **ATSDR Brownfields/ Land Reuse Health Program website** features his films.

Art Jones heads Great Jones Productions in New York and has directed and produced films that move people and make change for more than 20 years. For corporate clients, Jones' story-driven films spur innovation, employee action, transformation, and business growth. Art and his team also make independent films and documentaries that propel collaborative change and social action. His films, many of which HBO and PBS have featured, advance causes at the grass-roots level.

Together, Bob and Art have created information on how you can use videos to educate the public and create change.

USING VIDEOS TO DISSEMINATE THE PUBLIC HEALTH MESSAGE

Special contribution by retired ATSDR and BROWN member Robert Safay.

For many years, the media has relied on videos to deliver news to the public. People have migrated from the written media to the visual media. Instead of reading the news, people now watch the news. Organizations can benefit greatly by producing videos to deliver public health messages to communities near hazardous waste sites. Videos have several advantages over conventional written documents; for example, they are easier to understand. Community members are able to understand an animated graphic better than they can a diagram—they are able to "see" what is going on at a particular project. Videos can be less expensive to produce than written material (This chapter gives tips on creating a video on a shoestring budget). Site-specific videos have the advantage of including interviews with a variety of people, including federal and state employees, who are involved with the site as well as community residents, local activists, physicians, the clergy, and local political figures such as the mayor or city council members. By posting updates on site-specific web pages, videos give community members an opportunity to actually "see the site" and follow its progress.

Videos allow one community to teach other communities how to move forward with a project. In ATSDR's ***The Dream is Possible*** video, communities in Tampa and Mulberry, Florida, show other communities how to work with local governments, the Health Resources and Services Administration, and local activists to develop community health centers on brownfield properties.

You also can use videos to deliver important health information to families. In ATSDR's ***The Upper Explorerland Regional Planning Commission Lead Outreach*** video, local health officials and school nurses teach families the importance of having their children tested for lead poisoning. Producing short, topic-specific videos is the most effective and affordable means to convey important public health information to the general population.

A video production goes through several stages of development, including concept, storyboarding, videoing, editing, and distribution.

Key Steps

1. **Concept.** This is where it all begins. Here is where you answer the questions: What information am I trying to convey to the public? What is the story I want to tell? This step includes meeting with the community members and project managers to understand their concerns and the issues they want to address in the video. You also might talk with local health officials, teachers at the school, or even members of the local government such as the mayor. Issues to be addressed in the video could include concerns about dust control, noise abatement, wastewater treatment, or community health and safety issues.
2. **Storyboarding.** A storyboard is a road map for organizing your story in a sequence using drawings, descriptions, or images of the scenes planned for actual videoing in the field. The storyboards will guide the videographer through the story-telling process and lay out the scenes and locations to be filmed; it gives an illustration or description of the scene. An example would be a scene in which a school nurse is taking a blood sample from a child in an examination room. In the next scene, the nurse turns to the camera and describes the importance of having your child tested for lead. In the next scene, the nurse hands the child over to the mother. Those three scenes told a short story.

   Storyboards also help in the editing process because the editor has a sense of the flow of the video. Composing a good storyboard is often the hardest part of a project; however, a good storyboard will save you hours of time in the field. The storyboard will also help you schedule your actual filming schedule in the field. By knowing the scene location and description, you can schedule photographing or videoing your actors to minimize travel and set-up time. Remember, your actual filming time in the field may be limited to just a few days, so time is very precious, and you cannot waste it. You can distribute storyboards in advance so that you can prepare for filming, identify locations, and get a feel for what the scene will encompass. You can use the storyboard or script for the internal and external review to ensure that you present all aspects of your story. This circumstance will ensure that you address all community or partners' issues before going into the field to film.

Story Board Narrative – Blue Island Community Health Video

Narrative	Text	Accompanying Visuals	Directions
WELCOME-MAYOR Tuesday, 7/16/13 2:30 p.m., City Hall. **NARRATOR – Bob Safay**	Welcome to Blue Island. I am Mayor **Domingo F. Vargas.** I hope you enjoy learning about our Green Blue Island. History – why it is called Blue Island. Introductory Information and demographics about Cook County and Blue Island, IL.	Mayor in front of city hall. Pictures of Blue Island.	This will be delivered bilingually. Jason B, City of Blue Island will provide photos.
Bob Safay **Jodi Prout** **Tuesday July 16, afternoon (after mayor?)**	Blue Island has been declared an Enterprise Zone (define). The City estimates 400 potential brownfields/land reuse sites throughout the community. These are sites with real or perceived contamination issues. We incorporated community health in our brownfields redevelopment plans by using the ATSDR Action Model. The Action Model encourages a diverse partnership of people called the Development Community who are interested in healthy	Filming outside of an older home in Blue Island, with stills of industrial areas in Blue Island. Stills of food desert area: 141st and Francisco	ATSDR will shoot stills.

3. **Editing.** This is where it all comes together—this is where you create the magic.[2] The editing process allows you, the filmmaker, to combine all of the video scenes and still photographs taken in the field and put them together into a final production. Here again, the importance of a good storyboard becomes evident. In the field (or studio), you may have to take several views of the same scene. These views may be from a different position or include a small change in dialogue. The editing room allows you to select the views you want and insert those views into your video using the storyboard. The editing room also is where you can include narration, graphics, titles, sound effects, and even a little music to improve your production. Do not worry about including still photographs in your video. This is a common practice and, if done correctly, can enhance your final product. The editing process usually takes the most time but can be the most rewarding because you see how your video has

developed from an idea to the final product. For every minute of completed video, expect to spend several hours editing.

The time needed to produce a final product will vary with the complexity of the issue. A general rule of thumb is that a 5-minute video will require one day of filming in the field. A 10-minute video will require about two days of filming and approximately 15–20 hours of editing and narration. Before you release the final product, you can send drafts to stakeholders as an FTP (file transfer protocol) file, or through a social media website such as Vimeo for public review and comment. We are not implying that videos can replace **Public Health Assessments or Consultations**, or other forms of documentation or reports, but they are an alternate means of disseminating pertinent information to the public.

4. **Distribution.** Once the video is developed, the reproduction costs are minimal; you can purchase blank DVDs in bulk and replicate in house. You also can post the video on websites for public viewing. Once the video is completed, you can change it into different formats that allow reproduction to DVDs or uploading onto social media websites such as YouTube, Facebook, or Vimeo for broadcasting on the Internet. Once your video is on the Internet, it becomes available to thousands of interested people throughout the country.

   In addition to videos, communities can produce and distribute radio and television Public Service Announcements (PSAs) to local television and radio stations to inform their communities about public health issues. Examples of community public issues are preventing exposures to hazardous material, establishing a community garden, providing information about the hazards of mercury poisoning, or illustrating a successful brownfields redevelopment project. Check with your local radio and television stations for their PSA broadcast requirements.

5. **Basic Video Equipment.** You do not have to have a state-of-the-art video production unit to produce good, high-quality videos. All you need is four basic pieces of equipment: a camcorder, a tripod, wireless microphones, and a computer.

   The camcorder does not have to be the most advanced or an expensive, high-definition model. Any reasonably good digital camcorder will do, as long as it has either a Firewire® or USB port so you can connect the camcorder to a computer. Many people think that in today's world they have to film in high definition (higher resolution) because most of our TVs are high definition. In truth, every video posted on the ATSDR Brownfields/Land Reuse webpage was filmed in standard definition. Most of the videos produced for communities either will be posted on the Internet or reproduced on DVDs. Both of these methods work well in standard definition. Camcorders range in price from several hundred dollars to thousands of dollars, depending on the features included. If you can connect the camcorder to your computer, any digital or solid-state camcorder will work. Before buying a new camcorder, ask members of your community or friends if they have a camcorder that they would lend to your organization. You may even find a member of your community that would volunteer to film for you.

   A sturdy tripod is a must—nobody wants to look at shaky videos filmed using the hand-held method. A good tripod not only will give you smooth, steady shots but will also reduce arm

stress caused by trying to hold a camcorder during an interview. Make sure that you buy a tripod designed for a camcorder; these tripods have special fluid heads to ensure smooth movement while filming. Tripods are rated based on the amount of weight they are designed to support. Make sure you buy a tripod that is rated for the camcorder you will be using.

A pair of wireless microphones is a must-have item. Standard rule—video is 80% audio. A production with bad video and good audio is less offensive than a production with good video and bad audio. Using a good set of wireless microphones will guarantee good, clean audio and help reduce unwanted background noise such as street traffic or random conversation. Another good feature of wireless microphones is they allow your speaker to move around while talking. As with all equipment, wireless microphone systems vary greatly in price.

You will need a basic computer system to edit and post your videos. You will need a proper port to connect your camcorder to the computer and download the video into your editing program. Your needs will determine the cost of your editing program. Most desktop and laptop computers have a factory-installed basic editing program. If you use Microsoft Windows, you probably have a version of Movie Maker included with your software. Otherwise, you can purchase from numerous editing programs; ensure that the program you buy is compatible with your computer. Programs such as Sony Vegas, Premier, or Pinnacle will allow you to download the program for a free 30-day trial. This will allow you to try different programs and help you decide which one works best for you. Most video editing programs come in at least two versions and range from the basic edition for home use to the professional edition. Everything that you need as a community videographer will be included in the basic edition. You can also use software that may be included in your operating system, such as iMovie. Editing your videos can be simple with basic cuts and fades with good audio, or as fancy as you want with graphics, narration, music, and sound effects. Remember, your job as a filmmaker is to get the message to the community.

When you are satisfied with your edited video, the final step before distribution is rendering. Rendering is a computer's way of collating all of the work you have completed and formatting it for distribution. Simply put, to burn your video to a DVD you would render it to an MPEG-2 format. You may want to render your video to an MPEG-4 format to post it on a website. Major social media webpages such as YouTube, Facebook, or Vimeo will have specific guidelines on how to render your video to post it on their web site. Once your video is posted, it is available for the entire world to view. You have created the magic!

To be proactive in an ever-changing world of information dissemination, agencies and communities may explore producing videos as an additional means of delivering information to the public.

WANT TO MAKE CHANGE? BRING WORK GLOVES, SHOVELS, AND A VIDEO CAMERA

Special contribution by BROWN member Art Jones.

Today's truly great stories of innovation and re-invention do not occur in Silicon Valley, New York, or white-coat research and development labs. They are occurring in America's small towns and rust-belt cities. They are taking shape on the streets and empty spaces of "forgotten" communities on the so-called margins of the country. These great stories may be emerging right where you live.

In ailing towns and cities of the United States, many communities are tackling innovative projects and bold initiatives to revitalize themselves and build a better, healthier, sustainable future. These pockets of revitalization offer great news for communities that are at economic and social crossroads and searching for a new way forward. People at the grass-roots level are doing the heavy lifting of national revival, and these stories must be told in the aftermath of our recent Great Recession. People across the country (and just down the block) are hungry for good news that they can apply in their communities.

You may be an agent of change working to transform an abandoned factory. You may be remediating polluted wetlands or helping site a local elementary school on property ripe for reuse. You may bring expert help, volunteers, work gloves, and your high spirits; just as importantly, bring a video camera. Bring strong intent to document the hard work, the daunting history, the challenges, and the breakthroughs of your project. Bring a passion to tell a compelling story infused with the spirit and inspiration that has made your project succeed. Help engage your community and spur your larger revitalization goals by spreading a sense of mission, achievement, and new possibilities through video.

Making Videos that Help Make Change

The stories we tell about ourselves truly shape our present and our future. When headlines tell us of small towns facing bankruptcy and large cities on the verge of collapse—and we know that vitality still resides in these places—we need to change the story. When we take part in remarkable change, in healthy land reuse and revitalization efforts that are not getting media coverage, we need to reclaim the narrative. We can intervene by sharing dynamic, story-driven videos and engaging citizens through local community outreach events. We can use social media to reach wider audiences and link with support networks and active communities far beyond our immediate area.

I have been a filmmaker for more than 25 years and have seen the power of film to open people's eyes and spur them to action. Film can take viewers inside new worlds that they would never experience otherwise. It can make essential emotional connections like no other media. At my firm, Great Jones Productions, we have made films for small and large for-profit companies, helping drive culture change and revive troubled businesses. Using profits from this work as a funding source, we have in turn kick-started our own independent feature films and documentaries to tell original stories and advance causes.

My deep awakening to the real power of film came in 2009, a full two decades into my filmmaking career. In the midst of the America's Great Recession, my team and I sensed the depths of national confusion and despair. With millions of people losing their jobs, their homes, and their most basic sense of identity, I went looking for a story of resilience and hope, some kind of bright light on a darkened national landscape.

Rutland, Vermont, and the Making of *The Blood in this Town*

I found that story of resilience and hope in the least likely place. It emerged from an area that had been left behind by economic booms and globalization. A series of phone calls from a friend propelled me to Rutland, Vermont, a gritty, blue-collar city of 16,000 people wrestling with hard times and high unemployment. The people of Rutland had challenged themselves to take on an enormous, near-impossible "crazy" goal–to give more blood in one day per person than any other town or city in the United States. Their annual "Gift-of-Life Marathon" event was not about "taking blood" from donors, but about giving life-blood back to the community. In pursuing its record-breaking goal, Rutland would rediscover itself and learn what it was capable of accomplishing.

The resulting film, *The Blood in this Town,* is a feature-length documentary chronicling the city's efforts to rebuild community and revitalize itself from the grassroots. Following the through-line of the blood drive, we explored many of Rutland's bold initiatives that were creating sustainable new businesses; excellent, natural recreation assets; farm-to-table networks; entrepreneurial start-ups; and the revival of a historic downtown. Through interviews with residents who were leading the charge, and with in-action footage of work in progress from a host of projects, we endeavored to connect the dots of a larger revival movement. Rutland, a former boomtown built on railroads, quarries, and manufacturing, achieved inspiring, hard-won progress by building on local strengths and assets to chart a new way forward.

The Blood in this Town has helped the Rutland community revision itself, emphasizing real achievement and "can-do spirit" in the face of formidable odds and a chorus of naysayers. It serves as a wide-angle mirror, allowing citizens to see themselves and their city as part of something larger and pioneering in a bold, authentic new way. As a unifying force, the film has brought together and galvanized the active members of the community, many of whom had been working on their own community-building efforts in relative isolation. These leaders and activists now communicate, plan, and work in concert with a vision for a revitalized Rutland that had not been articulated before. Just as valuable, the film has helped create the necessary momentum that attracts new believers, new volunteers, and new investments to power the next stages of transformation in the city.

On a broader scale, the film re-introduces Rutland as a bona fide source of innovative ideas and models for grassroots-led revival for thousands of struggling towns and across America. Learning to save itself, this rough-and-tumble city possesses the tools and know-how to save others. It has something vital to give.

See our movie trailer for *The Blood in this Town* at **http://vimeo.com/16096789**.

For further information on *The Blood in this Town* and Rutland's community outreach program, visit: **http://bloodinthistown.com**.

Communicating Works-in-Progress and Building Support to Reach the Goal

Revitalization is always a work in progress. Whenever possible, it is important to follow the action and create "progress updates" for both existing and new projects. As soon as we completed *The Blood in this Town,* Rutland citizens were already tackling new initiatives and wider-ranging, community-building plans. These update videos let everyone know that hard-won achievements are not one-time efforts but are part of a larger movement toward real change. These progress updates can convey stages of dramatic progress and expanded scope; systematically, they enlist a wider circle of citizens and partners to believe and join in. In short, stories of ongoing achievement build momentum and turn around power.

Many people in Rutland have realized that the old models of economic development are broken, that there is no returning to the glory days of manufacturing. Many people share the goal of creating new engines of economic growth, building upon local strengths and sustainable assets. In this spirit, farmers and community members have come together to transform an abandoned factory into a dynamic new agricultural center. When we got word of it, my team and I knew we had to capture this new development in action as it rose in stages, so that each milestone achieved at the site could generate greater interest and support to accomplish the next stages in the master plan.

Against great odds, the new Vermont Farmers Food Center is rising on the site of an old ironworks, one of the most blighted and visible properties in Rutland. Step-by-step, volunteers throughout the community are creating a regional distribution and education center—a driver of better health, new businesses, and expanding markets all built around locally grown food. We endeavored to do more than merely document a series of before and after moments as transformation progressed. We aimed to get right into the thick of the work, capturing teams energized by a pioneering vision in action. We worked to reveal the kind of mission-driven collaboration that definitely exists and mobilizes thousands of other struggling towns across the country.

Our five-minute, Part I video, *Feeding a New Economy,* introduces the early stages of work at the Vermont Farmers Food Center and can be seen by clicking on **http:/youtu.be/D0Ic2iMzesg**.

Our five-minute, Part II video, *To Market: Growing an Economy around Food,* features the opening of the new Winter Farmers Market, the largest in Vermont, and can be seen by clicking on **http://youtu.be/fdh_wcCX0W0**.

Video's Power to Engage People and Advance Change

Following are some of the basic field-tested and successful ways to use video.

1. To inform people and build awareness about a specific community challenge, opportunity, reuse project, or revival initiative.
2. To open people's eyes by allowing them to "visit" a site, witness progress in motion, and hear from the inspirational people driving the change.
3. To herald good news and examples of real, positive change in an embattled town, and counter naysayers, negative perceptions, and one-sided narratives of decline.

4. To unite local community members in a shared sense of mission that engenders support and participation to see goals to fruition.
5. To make vital emotional connections between viewers and the people doing the hands-on, revival work on screen. Video is especially potent when you communicate a very human sense of common challenges, struggles, and shared goals, and when viewers are able to see something of themselves and their own communities in the stories.
6. To create a community-building tool for screening at local events to rally support, financial contributions, and volunteer help.
7. To create a "big-picture overview" that is often absent in many grass-root–level projects, connecting the dots for a broader-based vision of a community's turnaround. That compelling unified vision presents a town that, as a whole, is forward looking and forward acting, and worthy of attention, investment, and a new future.
8. To provide needed models of reuse and revitalization that can be shared with, and transferred to, other communities seeking revival.

How to Make Videos that Help Make Change

There is no shortage of "Video 101" guides, and no scarcity of recommendations about cameras and editing software. You can make video production as complex or as simple as you choose. The tools of video making have never been more accessible or inexpensive; you can film, edit, score, and share a video all with your iPhone. Whatever protocols you follow, consider these suggestions when telling the story of reuse and revitalization in your area.

1. A good video requires preparation and story structure before you begin filming.
   - Research all aspects of a project's story—historical background, inception and goals, organizers and partners, challenges, opportunities, and benefits to the community.
   - Identify key players and potential interviewees who have shaped and advanced the project. Conduct pre-interviews with grassroots leaders, volunteers, concerned residents, and local officials to get a full sense of what the video can and should include.
   - Prepare a preliminary story outline with a compelling beginning, middle, and end. Identify key content points, strategic messages, dramatic turns, and any "calls to action" you wish to include.
   - Prepare interview questions designed to elicit key points from interviewees in their own candid, memorable words.
2. Aim for five minutes or less for videos you will share on a website. Do not worry about covering every aspect of a story in this short span; leaving viewers curious and wanting more can lead to further interest, inquiries, and involvement. Be open to creating a longer piece (7–15 minutes) for local screenings for people, groups, and audiences who have an appetite for more in-depth exploration.

3. Film dynamic footage of people, teamwork, and progress on your project **in action**. When possible, bring the story to life by getting the camera off the tripod, moving in close to the action, and taking viewers inside work in motion to create a sense of intimacy and forward movement.
4. Film interviews with the people who are leading and doing the work, and allow them to tell the story. Let their own plainspoken and passionate words (instead of stiff, scripted sound bites) bring key moments and accomplishments to life. Real people speaking with conviction—guided by informal questions you have prepared based on your story outline—will help build essential credibility and emotional connection with viewers.
5. Set your interviews against meaningful project-related backgrounds, out in the field whenever possible. Get interviewees from behind desks, out of offices, and away from conference rooms.
6. Review your final interview lineup and be sure you have included a lion's share of grassroots leaders and volunteers who truly have been involved in bringing the project to fruition. While leaders in local government or people with civic titles may expect to be interviewed as authorities, use your judgment as to whether they have been prime movers of the effort.
7. Be open to on-camera action and interview moments that you did not anticipate in your story outline. Filming on site with a project in progress can elicit surprise visuals, dramatic moments, and insightful remarks that you could not have scripted; these incidents will lend your film extra spark, freshness, and character. Conducting interviews as a guided but informal conversation between you and your interviewee will increase the opportunity for fresh, compelling insights and turns of phrase that will engage viewers and remain memorable.
8. Never underestimate the importance of good sound. Whenever possible, work with a trained sound person to record interviews and all live sound at work sites, events, and meetings that are central to your story. At the very least, try to become familiar with good microphone-use techniques and appropriate recording levels so that your audio is as strong and vibrant as your visuals.
9. Engage the young people in your community to make some or all of the videos. Many small towns suffer from a "brain drain" as young people leave the area after high school. Truthfully, many of these places do not give their young people a voice or a sense of investment in the town and its future. Young people tend to be very technology and social-media oriented—they are natural storytellers who can reconnect with the community and its revival. While they are still available to you, invite them and their unique perspectives into the process; let them create and share videos about key challenges and opportunities around town, or about a specific project.
10. Watch and study notable documentaries from PBS and Netflix to identity techniques and video-making approaches that you feel capture action and interviews effectively. Test-drive these techniques in your own work.

Making the Video is Only Half the Job

Now that you have edited your video, you have to get active with it. You'll need to muster the same passion you put into making the piece and channel it to connect energetically with residents in town and outside its borders. The difficult truth is that no one is on edge, waiting for the story to be released. Let that story sit on your hard drive or park it on a rarely used Web site, and it is sure to catch digital dust. You have to take it to people, in person and on the Web.

Great storytelling has the power to stimulate social change, especially when you combine video making with community engagement, strategic partnerships, social media campaigns, and on-the-ground action. It means starting with the most basic step of uploading your video to YouTube and Vimeo, then accelerating to a whole new level of sharing, promotion, and exchange. You do not need to create a full-blown outreach operation (though it is not a bad idea). But you do need to think strategically about harnessing the many channels available to reach local residents of various interests and ages, partner organizations, media (local and national), businesspeople, policymakers, and government leaders.

VIDEO + COMMUNITY OUTREACH + SOCIAL MEDIA = **CHANGE**

To share Rutland's revitalization know-how with a wide audience, my team and I at Great Jones Productions launched a strategic outreach program, taking *The Blood in this Town* on the road to some of the nation's hard-hit small towns and cities. Partnering with local community leaders, we held forums and screenings with residents to help spark the exchange of ideas sharing of resources, and community-building activities. We have taken the film to towns in Vermont, Pennsylvania, Michigan, Florida, Ohio, and California, with major stops in New York and on Capitol Hill. Alternatively, our outreach program's website provides the film, a discussion, and an action guide, giving local advocates and leaders a dynamic tool to inspire, engage, and enlist local residents in vital community initiatives.

Social media has allowed us to discover and build a much larger community of people and organizations unified by common interests and revitalization goals. Tapping the usual (and mighty) suspects, including Facebook, Twitter, Instagram, and LinkedIn, we have worked across platforms to link Rutland and its reuse models with communities across the country, while bringing interest and resources from outside organizations back to Rutland. We created a website for *The Blood in this Town* to accelerate DVD distribution and establish a resource for revival news and know how. We have engaged blogs, online media, and virtual town hall meetings to increase the film's reach and impact. Much of this outreach has led to collaboration with partners such as the United States Environmental Protection Agency (EPA), the Centers for Disease Control and Prevention (CDC), the Ben and Jerry's Foundation, the Pratt Institute, the Rockefeller Foundation, the Northeast-Midwest Institute, and the Vermont Council on Rural Development.

Making changes means advocacy. Advocacy for your video and revitalization project now represents 50% of the video-making process, yet you may find it be the richest part of the process. By actively

connecting your film with other people, you will be discovering new friends, audiences, supporters, and unseen opportunities for your community, all of which extend far beyond your city's limits and your own expectations.

Reach for the Record Button

In the most audacious ways, things are truly looking up in post-recession America, thanks to our small towns and cities. In these overlooked spots, remarkable innovation is rising out of community resilience and native ingenuity. Fresh ideas and small successes are being battle-tested and readied for expansion and transfer in small towns and cities. But, as major media outlets chronicle the stories of "Broke Town, USA" and the growing ranks of near-death towns, we, as video makers, must act. We need to communicate the successes and viscerally, humanly, and compellingly build awareness, fuel the transfers, and speed renewal in communities seeking to forge new paths of their own.

Local acts of revival—and the stories we tell about them—remind people of their capabilities. They reconnect us to our strengths, our talents for reinvention, and our heritage as pioneers—their energy is contagious. And, for people who can't visit and experience our local project sites first-hand, we have a solution: the energy is best unleashed through video.

Summary of Links:

- Web site for *The Blood in this Town*—**http://bloodinthistown.com**
- Trailer for *The Blood in this Town*—**http://vimeo.com/16096789**
- Short Video, *Feeding a New Economy*—**http://youtu.be/D0Ic2iMzesg**
- Short video, To Market: Growing an Economy Around Food—**http://youtu.be/fdh_wcCX0W0**

Suggestions for Documentaries to Watch:

- *Bully*
- *Food, Inc.*
- *Gasland* and *Gasland Part II*
- *Detropia*
- *The Waiting Room*

CHAPTER 5

Environmental Health and Land Reuse

Suzi Ruhl

Case Study provided by Monica Robison

Very often communities with land reuse sites like brownfields share a disproportionate environmental burden. In recent years, federal agencies have adopted **environmental health** policies to ensure that environmental pollution does not affect disadvantaged or minority communities disproportionately. Engaging with and supporting the Development Community as they recognize and take action on environmental health concerns can be key drivers for community revitalization visions and to address health imbalances in land reuse areas.

ENVIRONMENTAL BURDENS AND COMMUNITY HEALTH

Numerous empirical studies conducted since the 1980s have shown environmental burdens are located in minority, low-income, and tribal communities disproportionately. This means that these populations also share a disproportionate share of risks, such as contamination from industrial plants or landfills and indoor air pollution from poor housing conditions. The physical elements of spoiled and hazardous physical environments in these communities have contributed to human disease and illness, negative psychosocial effects, economic disincentive, infrastructure decay, and overall community disintegration.[2]

The ultimate goals of environmental health are to foster healthy, sustainable, equitable, and resilient communities, especially for disadvantaged and overburdened populations. Planners must give priority to areas with a long history of noxious land uses, illegal dumping, and lack of health and safety enforcement to ensure that they are safe for redevelopment as the first step in urban revitalization and land reuse efforts.

The basis of environmental health is that the health of the community members, both individually and collectively, is a result of physical, social, cultural, and spiritual factors. Land-reuse sites are merely one aspect of this phenomenon. Environmental health plays a key role in integrating efforts to address housing, environment, transportation, and health issues. Approaches that integrate environmental health, and community design offer ways to arrange land uses, address pollution, develop sites, and construct buildings to help protect overburdened populations from environmental and health hazards. These approaches can help create safe places to live, learn, work, play, and pray.

The concept of environmental health celebrated its 20th anniversary in 2014, but the concept of environmental health has been adapting over the years. It is important to understand both the history of environmental health as well as its changing trends to fully leverage brownfields redevelopment and advance healthy, sustainable, equitable, and resilient communities. This essay provides an overview of environmental health and its relationship to land reuse and redevelopment. It offers insight on the important approaches for community engagement and illustrates how to integrate environmental health and brownfields redevelopment.

Image of community members meeting. Source: CDC Stock Image, undated.

2 For a compilation of scientific information on environmentantal health disparities, see "Environm Disparities in Environmental Health" in the *American Journal of Public Health,* December 2011, Volume 101, S1.

EARLY HISTORY: ENVIRONMENTAL HEALTH

The environmental health movement emerged in the 1980s when minority, low-income, and tribal communities began to organize in response to disproportionate environmental and health impacts in their neighborhoods such as hazardous facility sites, industrial contamination, air pollution, and lead poisoning. One of the earliest recognized environmental health events occurred in 1982 when poor, predominantly African American residents of Warren County, North Carolina, protested the creation of a polychlorinated biphenyl (PCB) landfill. This protest helped focus national attention on the burden of pollution on minority and low-income communities and sparked action at local, state, and national levels.

In the 1990s, environmental health leaders made substantial progress in bringing attention to the environmental and public health needs of minority and low-income populations, including tribal groups, by securing systemic changes to federal government. A key change in occurred in 1992, when the U.S. Environmental Protection Agency (EPA) established the Office of Environmental Health and President Clinton signed Executive Order 12898, "Federal Actions to Address Environmental Health in Minority Populations and Low-Income Populations" (E.O. 12898).

E.O. 12898 created the **Federal Interagency Working Group on Environmental Health** to reduce disparities between minority and non-minority communities for hazardous exposures including lead, toxic waste, air pollution, and pesticides (United States Environmental Protection Agency, 2018).

E.O. 12898 coalesced the broad range of community actions to address pollution in minority and low-income communities under the umbrella of environmental health. Each federal agency has to "make achieving environmental health part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations."

KEY TERMS

Initially, EPA defined environmental health as "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies." Since its inception, environmental health has continued to evolve.

EPA and environmental-health organizations have expanded the concept of fair treatment to consider not only how burdens, but also environmental and health benefits, are distributed. In other words, everyone should enjoy equally the positive outcomes of environmentally related decisions and actions such as cleaner air and water, improved health, and economic vitality. Individual federal agencies may use different terms and phrases to define environmental health in accordance with their core missions. For example, Team-EJ, a working group of the **Partnership for Sustainable**

Communities (PSC), an initiative created by the Centers for Disease Control and Prevention (CDC), the U.S. Department of Housing and Urban Development (HUD), EPA, and the U.S. Department of Transportation (DOT), identified a range of terms related to environmental health, sustainability, and health, and assessed how each of the three PSC agencies defines and understands these terms: environmental health, sustainability, affordable housing, smart growth, green jobs, goods movement, health, cumulative impact (cumulative environmental exposure), and built environment. These definitions are available here: **http://www3.epa.gov/environmentaljustice/resources/publications/sustainability/team-ej-lexicon.pdf**.

"Fair treatment" means that no group of people should bear a disproportionate share of negative environmental consequences caused by industrial, government, or commercial operations or policies. "Meaningful involvement" means that the public should have opportunities to participate in decisions that could affect their environment and their health, regulatory agencies should take into account the public's contributions, and decision-makers should seek and facilitate the engagement of persons or populations potentially affected by their decisions.

ENVIRONMENTAL HEALTH AND BROWNFIELDS

Environmental health first merged with brownfields redevelopment in the early 1990s at both the national and local levels. A series of public meetings proposed by EPA and the National Environmental Health Advisory Council were hosted by the cities of Boston, Massachusetts; Philadelphia, Pennsylvania; Detroit, Michigan; Oakland, California; and Atlanta, Georgia. This public policy discourse elevated brownfields redevelopment from a real estate transaction to a community-focused plan. The results let to the 1996 NEJAC publication, "Environmental Health, Urban Revitalization, and Brownfields: The Search for Authentic Signs of Hope" (U.S. Environmental Protection Agency, 1996).

Community leaders and advocates in Florida were at the core of this awareness of brownfields as a community-focused plan and took concrete action to produce exemplary results. The Legal Environmental Assistance Foundation (LEAF), a nonprofit advocacy group, helped advance legislation that integrated environmental health into brownfields redevelopment (National Academy of Public Administration for U.S. Environmental Protection Agency, 2002). The legislation focused attention on the public health implications of environmental health and brownfields redevelopment. In collaboration with community environmental health advocates, LEAF authored a series of model bills that the Florida legislature adopted. These bills include:

- The "Community Environmental Health Program" established by the state legislation in 1999 in the Florida Department of Health. Its purpose was to "ensure the availability of public health services to members of low-income communities that may be adversely affected by contaminated sites located in or near the community." The legislation also required the Department of Health to establish a Community Environmental Health Advisory Board with a majority of low-income members to identify community health needs and the types of services to be provided.

The funding of the first free health clinic on a brownfield site in Clearwater, Florida (now named the Willa Carson Community Health Resource Center) in 2000. The legislature also funded six other health clinics to provide basic health services for communities located near contaminated sites.

A 50% tax credit allocated for clean-up and other eligible environmental costs (such as additional 25% bonuses upon the completion of the clean-ups if the project was the site of an affordable housing development or health care facility or provider) in 2006. The intent of this legislation was to generate the development of health care facilities, which could advance environmental health by increasing access to health care for environmentally overburdened and medically underserved populations.

FEDERAL AGENCY ACTION ON ENVIRONMENTAL HEALTH

The entire federal family is implementing environmental health now through a variety of approaches that address health and environmental challenges of minority, low-income, tribal, other vulnerable populations. These measures extend from statutory authorizations to executive action. For example, relevant examples from the **2010 Affordable Care Act** (ACA) suggest positive implications for community health and land reuse, including populations with environmental health concerns. The ACA included a new requirement that all 501(c)(3) non-profit hospitals provide community benefit by conducting Community Health Needs Assessments (CHNA) every 3 years. Based on the gaps, threats, and opportunities identified by the CHNA, the non-profit hospitals must develop an Implementation Plan detailing how the hospital intends to help fill the gaps and address the threats. Health or safety threats posed by brownfields, for example, could be identified and addressed by the hospital as a part of a community coalition.

In 2010, the EPA and the White House Council on Environmental Quality reconvened the Federal Interagency Working Group on Environmental health and re-invigorated cross-agency efforts on environmental health. Seventeen federal agencies are collaborating with community stakeholders to develop and implement environmental health strategies, strengthen community access to federal resources, and integrate environmental health into programs, policies, and activities across the federal government. For more information, see: **EPA Website on Federal Interagency Working Group.**

In 2012, the HHS Environmental Health Planning Committee released the 2012 **HHS Environmental Health Strategy** to provide direction for HHS efforts to achieve environmental health as part of its mission.

Within HHS, other agencies, including CDC's National Center for Environmental Health (NCEH), the Agency for Toxic Substances and Disease Registry (ATSDR), and the National Institute of Environmental Health Sciences (NIEHS), have active roles in promoting environmental health. ATSDR's Brownfields/Land Reuse Health Program has funded over 40 communities to address community health concerns and contaminated sites. NIEHS's Minority Worker Training Program has awarded grants in more than 30 communities across the United States to recruit and train people

who live in vulnerable communities at risk of exposure to contaminants for employment in the environmental field. NIEHS also promotes Community Based Participatory Research (CPBR) as a valuable research approach to help us further understand the complexities of environmental health. For more information about CBPR, see Chapter 3.

US EPA's Plan EJ 2014

A key driver for EPA is **Plan EJ 2014**, the Agency's overarching strategy for advancing environmental health. The plan seeks to empower communities to improve their health and environment and establish partnerships between government agencies and other stakeholder groups. Plan EJ 2014 is **not a rule or regulation;** it is a *strategy* to help integrate environmental health into EPA's day-to-day activities. In implementing the Plan, EPA seeks to engage meaningfully with communities and stakeholders. The goals of the plan are to:

- Protect residents' health in communities overburdened by pollution
- Empower communities to take action to improve their health and environment
- Establish partnerships with local, state, tribal, and federal organizations to achieve healthy and sustainable communities

The goals of Plan EJ 2014 demonstrate the connections between environmental health and public health and complement efforts of many federal, state, and local agencies to address environmental contamination and improve community health. Moreover, these goals show how environmental health is woven into the fabric of safely reusing land to reduce environmental exposures and the associated health disparities we often find disproportionately in land reuse areas.

CASE STUDY: ENVIRONMENTAL HEALTH AND REDEVELOPMENT IN PRACTICE

Monica Robinson describes how residents in Fulton County, Georgia, addressed environmental health and land-use issues by strengthening an Environmental Health Initiative.

The interests of communities living near brownfield sites extend from concern with proper remediation of contamination to enthusiasm for healthy, sustainable end uses of the brownfield properties. Local governments play a key role in achieving both of these interests. The following discussion relates actions by the Board of Commissioners of Fulton County, Georgia, and illustrates the type of action that local governments can take to promote healthy reuse of brownfield sites.

Catalyst for Action

Citizens in particular areas of Fulton County, Georgia, have voiced their concerns about their years of exposure to pollution and unhealthy environments. Balancing the needs of the communities adjacent to and surrounding Fulton Industrial Boulevard, a major industrial transportation corridor in Fulton County, against economic development has challenged the Fulton County Government for decades. Although the ultimate decision for approval or denial of all zoning cases has rested with the Fulton County Board of Commissioners, the zoning laws that stipulate the formal regulatory review processes conducted by non-elected government officials did not provide any explicit protections for environmentally stressed communities.

On March 26, 2012, a report entitled "The Patterns of Pollution: A Report on Demographics and Pollution in Metro Atlanta" (GreenLaw, 2012) was released by GreenLaw, a Georgia-based, non-profit law firm serving environmental and community organizations that have been adversely affected by pollution. Using publicly available data, the report evaluated eight types of air, water, and land pollution within a 14-county area to identify "hotspots." Hotspots are "the blocks that contain the most pollution points, poorest economic conditions, highest linguistic isolation rates, and/or the largest minority populations in the metro Atlanta region." Thirteen of the 52 hotspots identified by the analysis were located in Fulton County. According to the report, two of the 13 hotspots in Fulton County were among the five highest ranked environmental health hotspots in the study area due to a high number of pollution points, high minority rates, language isolation, or depressed economic conditions. Since the release of the report, various zoning hearings and environmental discussions have referenced these hotspots.

Since Fulton County government has a mission "to cultivate safe, healthy, livable communities through the delivery of quality services" and a goal to "enact policies that promote environmental health," the report prompted the Fulton County Board of Commissioners to strengthen the Environmental Health Initiative. In particular instances of rezoning applications, citizens were very vocal about concerns for their health and the safety of proposed land uses. Neither the staff nor the Board of Commissioners had the legal authority to determine the existing conditions of an environmentally stressed community and the appropriate distance the pollution point should be from that community.

Local Government Action

On October 3, 2012, the Fulton County Board of Commissioners approved a resolution that directed county staff to prepare and process a text amendment to the Fulton County zoning resolution that promoted environmental health by establishing distance requirements between certain land uses that could have adverse environmental effects. Staff of the Planning and Community Services, the Health and Wellness Departments, and the County Attorney collaborated to draft the language. On July 17, 2013, the Board of Commissioners of Fulton County approved amendments to the Fulton County Zoning Resolution intended to protect environmentally stressed communities in unincorporated Fulton County.

Amendment Summary:

The Board of Commissioners made the amendments to the definitions of "Environmentally Adverse Use" and "Environmentally Stressed Communities."

Furthermore, the amendment addresses minimum separation distances from properties requiring rezoning, ranging from a minimum of 300 feet to a maximum of a half mile. The amendment to the General Provisions also sets the process for development of future uses not specifically identified.

BROWNFIELD AND LAND REUSE CONNECTION

The amendments to the Fulton County Zoning Resolution demonstrate how a zoning ordinance can contribute significantly to addressing brownfields and land reuse. Cleaning up brownfields and redeveloping them also protects public health and the environment. Cleaning up a brownfield benefits human and environmental health in that it removes the immediate threat, although it does not prevent future threats that could cause similar or worse exposures. Decisions or actions taken to redevelop brownfields and land-reuse properties in unincorporated Fulton County provide criteria to evaluate future uses. These decisions or actions protect communities that have inequitable toxic exposures and provide separation if attempts are made to locate potentially harmful exposures near residential communities. The revised definition of "Environmentally Stressed Community" also will help protect newer and future communities from the level of exposure experienced by existing low-income and minority communities. This is a positive local step for environmental health in that the voices of the community were sought, heard, and included during the drafting and decision-making processes. In addition, while brownfields and land-reuse properties potentially may harm surrounding residential communities, the amendment to the Fulton County Zoning Resolution demonstrates how zoning ordinances can help address brownfields and land reuse while mitigating disproportionate negative environmental consequences.

IMPLEMENTATION

Since the Environmental Health Zoning Amendment has been in place, Fulton County citizens have contacted planning and zoning staff to verify that their property meets the conditions of the amendment before submitting a zoning application. The Department of Economic Development also has aided the process by seeking input from the Planning and Community Services and Health and Wellness Departments on the applicability of the ordinance when conversing with future business seeking to locate in unincorporated Fulton County. Staff continues to educate the public. Since the adoption of the amendment, zoning applications and land disturbance permits have complied with the standards and there have been no requests for an appeal of the requirements. Thus far, the EJ Amendment process is working well and benefiting the community.

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SECTION II OVERVIEW:

Evaluating and Communicating Environmental and Health Risks

We still live with mistakes from our past that have caused air and soil to be polluted with harmful chemicals, water that is unsafe to drink, and fish that have accumulated harmful levels of mercury and other chemicals. Linked to many of these challenges are the hundreds of thousands of potentially contaminated sites that can expose people to harm. Through assessment, planning, and policy, we are creating programs that aim to turn potentially contaminated sites into opportunities to improve the social and environmental conditions in which residents live, learn, work, and play. Sites such as former gas stations, dry cleaners, auto shops, and industrial-employment hubs provide real and tangible opportunities for environmental and health agencies to consider health.

Environmental health examines how the environment can affect peoples' health. We often refer to outcomes from environmental contamination as "risks" or threats to public health. Sometimes environmental health is called environmental public health to emphasize the connection between the environment and effects on community health outcomes. When we evaluate the environment for harmful chemical exposures, we are evaluating it to determine adverse health outcomes to people who may live, work, or play nearby.

Once we have identified and evaluated risks of environmental exposures to people's health, it is very important that we communicate these risks, if any, back to the Development Community who may be affected. This practice is often referred to as health communication or risk communication.

Public health professionals in environmental health, particularly those who work in local or state health agencies, are uniquely qualified to evaluate whether or not exposures to chemicals associated with brownfield sites may harm health. They typically have special training in fields such as toxicology, risk assessment, risk communication, and epidemiology and can draw on this expertise to evaluate exposures and potential health effects of these exposures.

Environmental health professionals evaluate environment and health risks and communicate what these risks may be to the Development Community. This section describes **Steps 2 and 3** of the Agency for Toxic Substances and Disease Registry's (ATSDR's) 5-step Land Reuse Model to Safely Reuse Land to Improve Health (5-step Land Reuse Model): **Evaluate Environmental and Health Risk** and **Communicate Risks,** respectively. Topics in this section include environmental health basics; environment and health risk evaluation tools; and risk communication basics.

CHAPTER 6

Environmental Health and Land Reuse

Michelle Watters

Public health practitioners can evaluate environmental and health risks posed by land reuse sites to ensure community health is protected. Integrating public health into redevelopment plans can ensure that the community protects and improves its health through "healthy" reuse strategies. Some of our past land-reuse practices have not always considered the health of people living on or adjacent to sites that may have posed dangerous exposures to chemical contamination. Some pivotal events have occurred with some unfortunate results and lessons learned retrospectively; Love Canal is one such example.

The evacuation and relocation of residents living in the Love Canal neighborhood in Niagara Falls, New York drew national attention. Love Canal prompted the federal government to pass the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, commonly known as "**Superfund**." Superfund is the federal government's program to clean up abandoned or uncontrolled hazardous waste sites. Love Canal, once a symbol of environmental disaster, became a symbol of success when in 2004 the site was removed from the Superfund National Priorities List. For more information about land reuse sites like Superfund sites, see the Introduction to this book.

1950s—Homes and elementary schools are built on a former municipal and chemical land disposal site in the Love Canal neighborhood of Niagara Falls, New York.

1978—The New York State Department of Health declares a health emergency in Love Canal after their health study showed an excess number of women with reproductive problems and environmental data demonstrated contaminants in the water, soil, and air. President Jimmy Carter issued the first of two environmental emergency declarations for Love Canal resulting in the relocation of residents from 239 homes and closure of one elementary school.

1990s—The Love Canal Area Revitalization Agency, which was in charge of the maintenance and rehabilitation of homes in the emergency declaration area, began the sale of homes in portions of the area that had been deemed habitable. Zoning and deed restrictions allowed for some non-habitable areas to be used for light manufacturing, office park, and other uses. The neighborhood was renamed Black Creek Village.

Love Canal provides an example of the consequences of not considering environmental contamination in residential planning. Love Canal also demonstrates the results of "healthy" planning in the redevelopment of a neighborhood. The Love Canal story illustrates why **environmental health,** the aspect of public health that examines environmental impacts on human populations, should be considered in land reuse and revitalization.

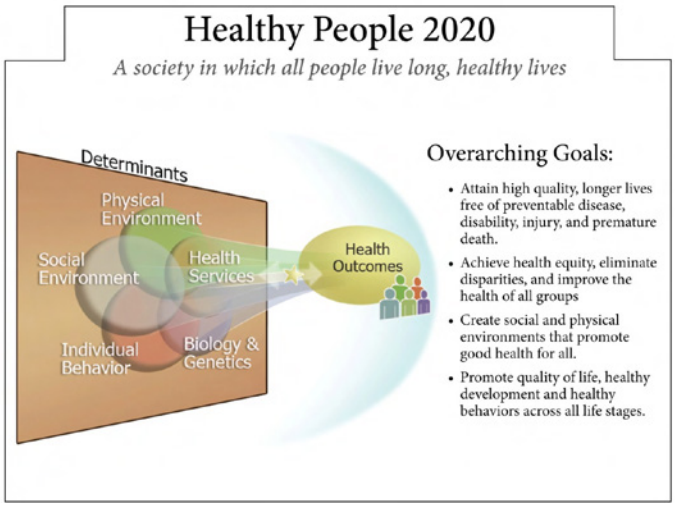
According to the World Health Organization, environmental health "comprises those aspects of human health, including quality of life, that are determined by the physical, biological, social, and psychosocial factors in the environment. It also refers to the theory and practice of assessing, correcting, controlling, and preventing those factors in the environment that can potentially adversely affect the health of present and future generations." Simply put, environmental health looks at the impact of our surroundings on human health. This definition of environmental health is well-suited to brownfields and land revitalization efforts since a holistic approach to improving the health of communities is taken.

DETERMINANTS OF HEALTH

The U.S. Department of Health and Human Service's (HHS) national initiative, ***Healthy People***, captures the importance of the physical and social environment in influencing health. For three decades, *Healthy People* has provided 10-year national objectives and goals for improving the health of all Americans. The *Healthy People 2020 and Healthy People 2030* goals include creating social and physical environments that promote good health and eliminating health disparities (U.S. Department of Health and Human Services (HHS), 2014 and 2020). *Healthy People 2020* looked

at **determinants of health** that influence health outcomes in its approach to achieving the national objectives (Figure 6.1). These determinants of health include the social and **physical environment, individual behavior,** biology and genetics, and **health services.**

Figure 6.1. Determinants of Health (U.S. Department of Health and Human Services, 2014).



When people inquire about the causes of a cancer or disease, the causes are often split into two categories: genetic or environmental. However, there are not many diseases that are solely genetic or environmental. Most of the time, interactions between genes and the environment determine who acquires a disease. The determinants of health that are depicted in Figure 6.2 do not equally contribute to health. Individual behaviors and biology and genetics contribute a relatively small fraction to population health as compared to the remaining determinants that are related to environmental causes.

External factors such as unhealthy living and working conditions, lower education levels, and issues related to poverty will influence the overall health of an individual. The environment may influence the severity of the disease or lead to periodic aggravations of a medical condition. Exposure to traffic air pollutants, tobacco smoke, and cockroach droppings can all result in more frequent and in some cases more severe asthma attacks. Stress related to living in areas with a high degree of crime or that are less desirable has been associated with increased susceptibility to illnesses. In these areas, there may be limited access to primary care, despite the reality that access to healthcare for medical management and early preventive services leads to better health outcomes.

Areas with land reuse sites tend to have more physical and social disparities. Communities with multiple sites, like brownfields, tend to have higher crime rates, higher rates of unemployment and poverty, higher rates of disease, and lowered access to amenities. These disparities lead to not only poor health outcomes but also an economic burden in terms of healthcare costs. A study looked at a brownfield neighborhood in southeast Baltimore, which had a history of heavy industrial use. It found that this population had **excess mortality rates** due to respiratory disease, heart disease, and cancer (Litt, 2002). The cost of environmental disease in U.S. children was estimated to be $76.6 billion dollars in 2008; about $50.9 billion was attributed to lead poisoning (Trasande, 2011).

Although the health impact of the physical and **social determinants of health** are experienced on an individual level, the interventions for these determinants occur at the population or community

level. Individual health involves evaluation of **personal risk factors,** medical diagnosis, treatment, and management of illness. On the other hand, public health professionals look at risk factor prevalence and disease rates in the population, provide low cost clinics as part of the healthcare system, and offer screening, vaccines, and environmental testing. These activities may be considered as redevelopment goals. As an example, the state of Florida is a leader in the reuse of brownfields as health clinics in medically underserved areas.

Public health focuses on prevention: preventing an **adverse outcome** from happening or minimizing the impact if it has occurred. Public health is typically practiced on a federal, state, or local government level. Each level has a role in health promotion and some degree of regulation enforcement. For brownfield sites, local agencies may have a lead role in responding to nuisance issues such as noise or odors, public safety (building condemnation) concerns, or sanitation efforts. Local public health agencies may be involved with blood lead screening programs, vaccination programs, and other health promotion or health education tasks. For environmental contamination investigations or clean-up, local government may be supported by state or federal partners. While these activities may not initially seem to be related to redevelopment, the results of brownfields and associated potential contamination issues may broadly affect communities. As an example, the city of Blue Island, Illinois holds annual health fairs as part of its brownfields community health monitoring effort. ATSDR and EPA routinely participate in these events, frequently addressing lead contamination associated with older **housing stock,** brownfields, and metal industries.

Improving community health status matters not only for the individual but for societal and economic reasons. An overarching goal is to provide opportunities for individuals to reach their fullest potential and increase their years of healthy life expectancy. Creating environments that promote good health by encouraging physical activity, improving mental health, and decreasing air and water pollution can help diminish health disparities.

HAZARDOUS CHEMICAL CONTAMINATION

The remainder of this chapter will introduce the reader to one subject that is commonly associated with environmental health at brownfield sites: hazardous chemical contamination. Other environmentally related health determinants for the community, such as access to health care, crime, the **built environment,** and **food deserts,** are covered in other chapters.

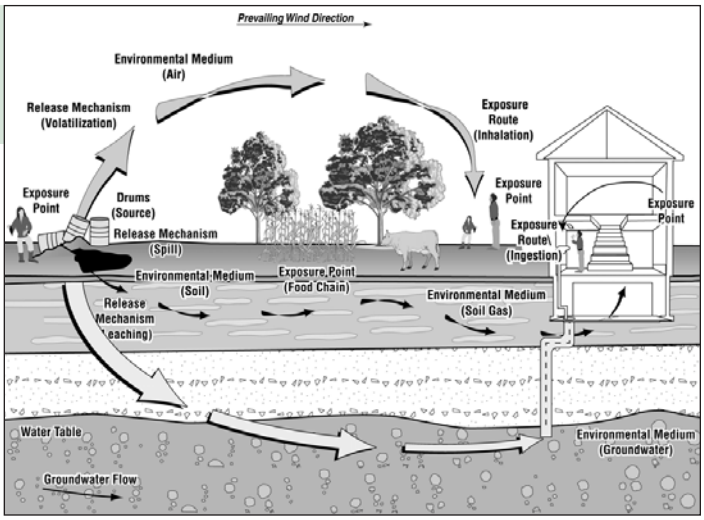
In evaluating exposures to the public from chemical contaminants at a site, ATSDR and other public health and environmental agencies use the concept of an **exposure pathway** (Agency for Toxic Substances and Disease Registry, 2005). An exposure pathway is the link between the chemical released and the potentially exposed population. Environmental sampling data is commonly used to evaluate the exposure pathway.

In order for an exposure to occur, a completed exposure pathway must exist. A completed exposure pathway consists of five main components (Figure 6.2):

- Source of the hazardous chemicals—the site that is contaminated with a specific compound, such as an industrial solvent

- Fate and transport— the method that allows the chemicals to move from the source and bring it into contact with the community (e.g., surface water, groundwater, soil, dust, vapors, and soil gas);
- Point of exposure—the location where the person comes into physical contact with the chemical.
- Route of exposure—the route through which the person comes into contact with the chemical (e.g., inhalation, ingestion, or direct contact).
- Exposed population—the people who live near the chemical contamination and come into contact with the chemicals from the site.

Figure 6.2. Components of an Exposure Pathway (Agency for Toxic Substances and Disease Registry, 2005).



Having a completed exposure pathway does not mean that a health effect will occur. The concentration of the chemical and the frequency and duration of the exposure will influence whether or not there is a public health hazard. If there is a specific health concern, one also needs to look at whether attributing the disease to the chemical makes sense from a scientific standpoint.

For example, simply attributing lung cancer to living in an industrial area may not be a strong case for causation. On the other hand, if there are an excess number of cases of a specific type of cancer, like liver cancer, and the individuals affected all worked in the same plastics facility, there may be a stronger association.

Completed exposure pathways are further characterized by whether the exposure occurred in the past, is occurring in the present, or will occur in the future. Public health professionals try to interrupt an existing completed exposure pathway or prevent the pathway from becoming complete.

For brownfield redevelopment sites, interrupting the completed exposure pathway involves a range of interventions. For chemical hazards from past industrial activities or found in junkyards or garbage dumps, involving environmental agencies may be needed to assist in removing drums and contaminated soil or sediment. To protect public health, mitigation might be needed to prevent unwanted vapors from contaminated groundwater plumes from entering homes through basement cracks. Safety issues may be dealt with by removal of the hazard or fencing the site. Some sites may need to have deed restrictions to prevent residential housing from being built on the site.

There are many potential health hazards on properties that are being redeveloped. There are categories of hazards that are common to certain industries. For example, solvent contamination can be found at some former metal finishing/plating shops, machine shops, and dry cleaners. Categories of commonly found contaminants are discussed below. More information on these chemicals can be found on the **ATSDR Toxic Substances Portal**.

HEAVY METALS

Lead, arsenic, cadmium, chromium, and mercury are considered heavy metals. All are ranked among the top hazardous substances on the **National Priorities List**. (This list contains the national priority sites known to have releases of hazardous substances, pollutants, or contaminants throughout the U.S. and its territories.) Metals are naturally occurring in the earth's crust. Since the metals are elements, they do not degrade into other compounds. They may be found in dust or bound to soil or sediment. In places where these metals are used, workers may inadvertently bring contaminated dust home on their clothing or shoes. These metals are usually found in higher amounts at metal finishing/plating shops, foundries, and smelters.

Lead is a common environmental contaminant (see Box 6.1). Some areas around mines, smelters, and other industries have higher soil lead concentrations. Lead used in plumbing fixtures or solders and lead found in paints are sources of lead in homes. Most significant childhood exposures occur from ingestion (e.g., eating paint chips, hand-to-mouth behavior in areas with contaminated soil and dust)). Lead is not a required nutrient in the body and there is no known benefit from ingesting lead. Lead toxicity can affect every organ system in the body. The nervous system, kidneys, and blood are primary target organs. Even fairly low blood lead levels are associated with subtler health effects including childhood learning disabilities and behavioral problems.

Arsenic is a metalloid, which has properties of both metals and nonmetals. Arsenic can occur as a contaminant in drinking water wells or soils from past industrial or agricultural use. Inorganic arsenic was used as a wood preservative in chromated copper arsenic (CCA) treated wood and in some herbicides. Elemental arsenic is used as an alloy in solders. Arsenic is readily absorbed from drinking water or eating foods containing arsenic. Organic arsenic, a less toxic form of arsenic, is found in seafood; inorganic arsenic can be found in rice, especially brown rice. Exposure to arsenic can lead to skin disease, peripheral neuropathy, and kidney dysfunction; it also increases the risk for skin, bladder, and lung cancers.

Cadmium is used in the alloy, battery, pigment, and plastic industries. Areas around waste incinerators and smelters may also have higher concentrations of cadmium in the soil from airborne deposition. People who smoke get exposed to most of their cadmium from tobacco products, while non-smokers are primarily exposed to cadmium from their diet. Leafy vegetables, potatoes, grains, and organ meats typically contain higher concentrations of cadmium than other foods. Breathing high levels of cadmium can severely damage the lungs. Consuming high levels of cadmium in food or water can severely irritate the stomach and lead to vomiting and diarrhea. The kidney is the most sensitive target organ for cadmium exposure. Long term exposure can lead to kidney disease.

Chromium is found in several forms. Chromium has different elemental states. Chromium (0) is used for making steel, and is used in electroplating, leather tanning, wood treatment, and textile manufacturing. People are commonly exposed to chromium from the air and their diet. Chromium (III) is an essential micronutrient. Dietary sources of chromium include meat, fish, fruits, and vegetables. Chromium (VI) is more toxic than chromium (III). Chromium (VI) is a known human **carcinogen.**

Mercury is the only metal that is a liquid at room temperature. Elemental mercury is found in medical equipment and in electrical switches. Mercury is also used in smelting. Elemental mercury evaporates into a colorless odorless vapor. Adverse health effects result from inhaling mercury vapors. Mercury is toxic to the brain, kidneys, and lungs and is more toxic to children than adults. (See Box 6.1, below) Methylmercury is an organic form of mercury. People usually get exposed to methylmercury by eating fish that may have been caught in water that had mercury-contaminated sediments. Fetuses, infants, and children may have developmental impacts from exposure to mercury during pregnancy or from their diet.

POLYCHLORINATED BIPHENYLS (PCB)

Polychlorinated biphenyls (PCBs) refer to a mixture of 209 different man-made chemicals with a similar structure consisting of two bonded benzene (phenyl) rings surrounded by at least one and up to 10 chlorine atoms. PCBs are extremely stable, heat resistant, and soluble in oil. They were used as coolants and lubricants in transformers and other electrical equipment. Although their manufacture was banned in the United States in 1977, they are still found in these products. In the environment, PCBs are found mostly adsorbed to sediments or soil rather than in water. They are very persistent and degrade very slowly.

At successive levels of the food chain, PCBs accumulate and become more highly concentrated in the organism. In higher organisms, such as fish and humans, PCBs concentrate in the fatty tissue. The major dietary source of PCBs for humans is through the consumption of PCB-contaminated fish. Fetuses, infants, and children are **potentially vulnerable populations** and may be especially sensitive to PCB exposures. Developmental effects are associated with pre- and post-natal PCB exposure. Reproductive, immunologic, and endocrine effects are related to PCB exposure in adults and children. PCBs are considered a human carcinogen.

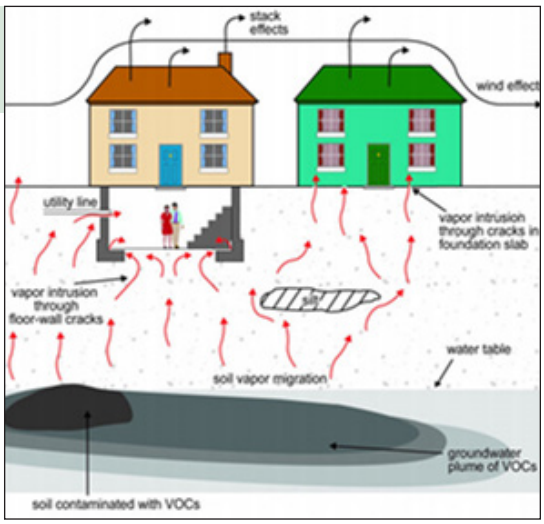
CHLORINATED SOLVENTS

Chlorinated solvents refer to a group of chemical compounds that tend to be small in size and contain chlorine molecules; they are used to dissolve or disperse materials that are insoluble in water. **Trichloroethylene (TCE)** and **tetrachloroethylene (PCE or PERC)** are two examples of chlorinated solvents. Chlorinated solvents are extensively used in manufacturing as a chemical intermediate or as a metal degreaser. PCE is commonly used for dry cleaning and TCE can be found in paint and spot removers.

When solvents are spilled on the ground, they can contaminate the soil and leak down and contaminate the groundwater. The chlorinated solvents tend to be very volatile (meaning, they

easily evaporate). Solvent vapors from groundwater plumes or soil contamination can make their way through soil air spaces and enter homes through cracks in the foundation, utility lines, and drains. This process is termed **vapor intrusion** (Figure 6.3). Residents can be exposed to solvents by breathing indoor air contaminated with vapors.

Figure 6.3. Vapor Intrusion (source: https://www.epa.gov/vaporintrusion/what-vapor-intrusion)



Thus, people are primarily exposed to chlorinated solvents by inhalation or by drinking contaminated well water. Exposure to high concentrations of chlorinated solvents can impact the nervous system and cause headache, dizziness, difficulty concentrating, and loss of coordination. The liver and kidney are also target organs for chlorinated solvent exposure. Some solvents, such as TCE, are cancer-causing agents. Exposure to TCE during fetal development is associated with an increased risk of some cardiac birth defects.

BENZENE, TOLUENE, ETHYLBENZENE, AND XYLENE (BTEX)

Benzene, toluene, ethylbenzene, and **xylene (BTEX)** are **volatile organic compounds** found in gasoline and fuel oil. BTEX and other gasoline products can be found at Brownfield sites with above and below ground storage tanks such as gas stations and tank farms or in pipelines. Like the chlorinated solvents, the components of BTEX are used as chemical intermediates and as solvents. Spills of BTEX can contaminate soil or leak into groundwater. Vapor intrusion into homes can also result from these spills (Figure 6.3).

For most people, inhaling vapors or drinking contaminated water is the primary source of exposure to BTEX. Inhalation exposure to high concentrations can cause light headedness, headaches, and difficulty with coordination. Prolonged or high exposures can cause negative blood, liver, and kidney changes. Exposure to benzene, in particular, increases the risk of leukemia.

POLYCYCLIC AROMATIC HYDROCARBONS (PAHS)

Polycyclic aromatic hydrocarbons (PAHs) refer to a group of chemicals that are made of two or more benzene rings. PAHs are byproducts of incomplete combustion of coal, gas, oil, wood, charcoal,

tobacco, or other carbon-containing organic material. Some PAHs are used in roofing tar and shingles, road asphalt, and wood preservatives. PAHs can be found at coal tar production plants, coking plants, and waste incinerators. Heavier PAHs break down slowly and can be found in soil and sediment at former production sites.

Exposure to PAHs typically occur from inhaling compounds in tobacco and wood smoke. Absorbing PAHs into the body may be caused by skin contact with heavily contaminated soils. Most short-term inhalation exposures do not cause health effects. However, both long- and short-term skin exposures may result in rash, irritation, or increased skin sensitivity. Some PAHs can cause cancers in humans.

ASBESTOS

Asbestos refers to a group of naturally occurring mineral fibers. These fibers are very resistant to heat, fire, many chemicals, and degradation. Once called the "miracle mineral" for such properties, asbestos was used in a slew of everyday products, from building materials (e.g., insulating pipes and walls and in shingles and tiles) to fireproof protective gear. All new uses of asbestos have been banned in the United States since 1989. However, renovation of older buildings containing asbestos or disturbance of deteriorated asbestos-containing material increases exposure to asbestos fibers. Asbestos is a common concern for redevelopment sites.

There are several diseases related to inhaling asbestos fibers; however, not everyone exposed to asbestos has health problems. Risk of disease would increase with the frequency and length of exposure, tobacco smoking, and pre-existing lung conditions. Asbestos is associated with mesothelioma, a fatal cancer that affects the lining of the lungs, as well as other cancers and lung-related illnesses.

HEALTHY LAND REUSE TO IMPROVE COMMUNITY HEALTH

While Love Canal made headlines across the country, there are thousands of neighborhoods that could benefit from brownfields revitalization. The land reuse movement has been gaining momentum for more than a decade. Across the United States, brownfield areas are benefitting from redevelopment plans that reuse former industrial, manufacturing, and blighted areas and include plans to improve community health, such as adding parks, grocery stores, and health facilities.

While we are making progress in the creation of healthier communities through redevelopment, our landscapes continue to be littered with blighted and vacant properties, some of which may pose harmful exposures to populations. By considering environmental health outcomes through frameworks such as *Healthy People 2030*, properties can be reused and redeveloped in ways to improve overall health status of communities. Partnerships with local, state, and federal health agencies may additionally ensure "healthy redevelopment" – redevelopment to protect and improve community health.

BOX 6.1 CASE STUDY 30TH STREET CORRIDOR

The 30th Street Corridor in Milwaukee, Wisconsin was once a thriving industrial area located along a rail corridor that transported raw materials to and finished products from the site. Foundries, tanneries, breweries, and automobile part manufacturers were surrounded by homes, many of which provided the workforce for these industries. Years of economic decline left the neighborhood with deserted buildings, abandoned properties, and underutilized land. The area remains densely populated, although now about 38% of the population lives below the poverty level.

The Wisconsin Department of Natural Resources (WDNR) partnered with the City of Milwaukee, ATSDR, the EPA, and other agencies to focus on an area-wide approach to revitalizing the area. Many economic and social challenges needed to be addressed in the community including recruitment of new businesses to the area, high unemployment rates, limited access to health care, a small number of grocery stores, and extensive environmental contamination. ATSDR's baseline characterization of the site [ATSDR 2008] looked at multiple indicators of community health. Given that over 75% of the homes were built before 1960, one baseline measurement used to characterize community health was blood lead levels in children.

Living in older housing (especially pre-1950s) is a major risk factor for childhood exposure to lead because of deteriorated lead-based paint. In this neighborhood, lead contamination of soil from the over 200 brownfield properties can be an additional source of lead exposure. There is no safe level of lead exposure. Blood lead levels below 5 micrograms per deciliter (µg/dL) are associated with decreased academic achievement and increased behavior problems in children. Hand-to-mouth behaviors of children increase their likelihood of lead exposure.

Blood lead level data from 2005 for children less than six years of age that was used in ATSDR's baseline characterization found that 15.7% of the children tested who were living in the 30th Street Corridor had blood lead levels at 10 µg/dL or higher. This percentage was almost double that of children in Milwaukee and over five times that of those in Wisconsin. The 30th Street Corridor revitalization efforts will return properties back to productive uses for residents and businesses. Environmental clean-up of contaminated property, lead abatement in buildings, and construction of lead-free housing will reduce sources of exposure and help lower blood lead levels.

[ATSDR 2008] Building Healthy Communities: A Baseline Characterization of Milwaukee's 30th Street Corridor, June 2008. http://www.atsdr.cdc.gov/sites/brownfields/docs/30THStreetCorridorReportAUG2008.pdf

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Image of a brownfield site in Milwaukee's 30th Street Corridor. Source: Wisconsin Department of Natural Resources, 2012.

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CHAPTER 7

The Role of Public Health Agencies in Land Reuse

ATSDR Land Reuse Team (Laurel Berman, Leann Bing, and Gary Perlman), Kari Christensen, Jessica Solomon Fisher, Martha Halko, Domenica McClintock, and Tina Yuen

Kari Christensen provided the following essay about the role of health agencies in land reuse.

Health professionals have long understood that infectious diseases, food toxins, and toxic air, water, and soil are harmful to human health. It is only within the past few decades that we've begun to realize that the physical makeup of neighborhoods, town centers, and communities, and the types and distribution of resources within them, can dramatically affect the **chronic diseases** that are today's most pressing health problems—heart attack, stroke, cancer, obesity, diabetes, and respiratory ailments.

Community-design decisions can help create healthy communities and achieve health —the "attainment of the highest level of health for all people" (U.S. Department of Health and Human Services Office of Minority Health, 2016). Too often, though, community-design decisions negatively affect low income and working-class communities and communities of color disproportionately (Zenzola, 2003). For example, in her New York Times Magazine article, Helen Epstein (2003), cited RAND Corporation research findings that neighborhoods with many boarded up or abandoned buildings had higher rates of early death from cancer and diabetes than did neighborhoods with intact housing, even though the neighborhoods had similar rates of poverty and insurance coverage (Epstein, 2003).

Economic and environmental considerations largely drive land reuse efforts; however, public health agencies need to be involved strongly to ensure that plans proactively identify and address potential effects on human health and quality of life. This chapter describes how uniquely positioned public health agencies can ensure that health risks are mitigated and health benefits are maximized. Partner stakeholders and agencies appreciate the expertise and resources that public health agencies bring to the table. Skilled public health professionals offer expertise in **health risk assessment, toxicology, epidemiology, health education, risk communication,** relationship building, community engagement, health data, and health indicators and metrics. Public health professionals also can help map local health indicators and integrate **Community Health Needs** and **Community Health Improvement Plans** into land reuse plans and funding proposals that seek brownfield or other land reuse assistance.

THE ROLES OF PUBLIC HEALTH AGENCIES

Social, economic, and environmental factors that shape our built environment greatly influence our health. Health agencies with the capacity to assist communities in linking brownfield and land reuse efforts to address community health needs help make changes in the built environment—our community infrastructure and spaces where we live, work, and play--that lead to improvements in health and quality of life in time.

Public health agencies include:

- Local health departments (LHDs)
- State health agencies, such as a state department of public health
- Tribal public health authorities

- Federal health agencies, such as the Agency for Toxic Substances and Disease Registry (ATSDR)

State and local laws bestow authority and responsibility to LHDs. All LHDs exist for the common good and are responsible for demonstrating strong leadership in:

- Promoting physical, behavioural, environmental, social, and economic conditions that improve health and well-being
- Preventing illness, disease, injury, and premature death
- Eliminating health disparities and inequities

A local health department (LHD) is part of a local or state government and is responsible for the health of an area smaller than the state.

Public health agencies are central to protecting and promoting the health of communities at state and local levels. **The Ten Essential Public Health Services** (Figure 7.1) guide many state health agencies and LHDs that serve as the backbone of the larger public health system (Figure 7.2). The public health system plays a unique and critical role in shaping the decisions that affect health through brownfield and land reuse planning, projects, and policies. Communities often see health departments as local or state authorities on health and may rely on their expertise for information and resources. Public health agencies should be included early in the process and take an active role in community health education regarding decisions that influence remediation and land reuse.

Figure 7.1. The Ten Essential Public Health Services (CDC, 2018, https://www.cdc.gov/publichealthgateway/publichealthservices/essentialhealthservices.html)

The approaches that health agencies take to achieve health goals vary widely, ranging from engaging local residents in the planning and assessment phases to ensuring a mix of quality housing types across a range of incomes. Health agencies can draw upon and apply expertise gained from efforts in Health in all Policies (HiaP), Health Impact Assessments (HIA), social determinants of health, the National Prevention Strategy, environmental health.

Health in All Policies (HiAP) helps leaders and policymakers integrate considerations of health, well-being, and fairness when developing, implementing, and evaluating policies and services. In terms of land reuse, HiAP emphasizes the need to integrate health across sectors of redevelopment, including master planning, economic development, and transit-oriented development.

Health Impact Assessments can help determine whether a single proposed project can affect health potentially. The following East Cleveland example and Chapter 3 discuss HIAs.

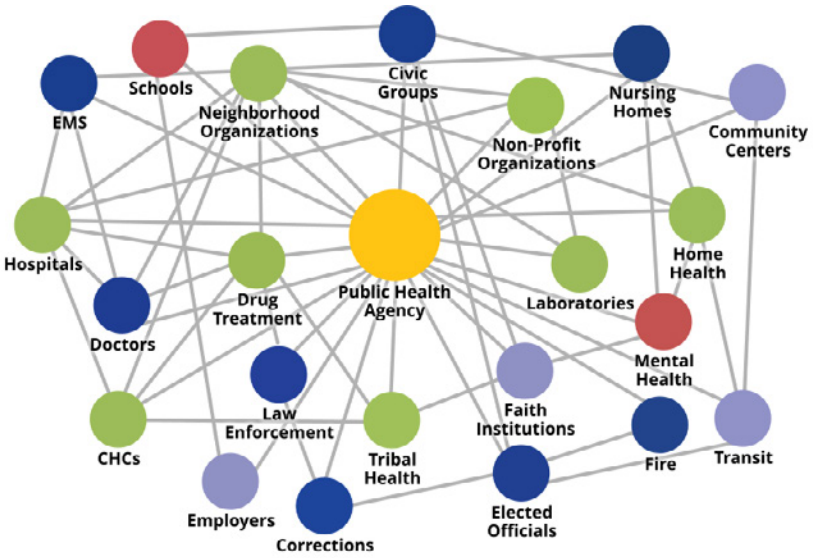
Social Determinants of Health are not only the circumstances in which people are born or grow up, live, work, and age, but also the systems put in place to deal with illness. Economics, social policies, and politics influence these circumstances.

The **National Prevention Strategy** is a national movement focused on the most effective and achievable means for improving the health and well-being of the public.

Environmental Health is a movement spearheaded by the U.S. Environmental Protection Agency (EPA) that advocates the fair treatment and meaningful involvement of all people regardless of color, national origin, or income with respect to developing, implementing, and enforcing environmental laws, regulations, and policies. Chapter 5 fully describes Environmental Health.

Health: means that every person has the opportunity to "attain his or her full health potential" and no one is "disadvantaged from achieving this potential because of social position or other socially defined circumstances." Differences in length of life; quality of life; rates of disease, disability, and death; severity of disease; and access to treatment reflect health inconsistencies.

Figure 7.2. The Public Health System (CDC, 2018, https://www.cdc.gov/publichealthgateway/publichealthservices/essentialhealthservices.html



THE CASE FOR LHDS IN LAND REUSE

A growing body of literature draws strong connections between the built environment and public health (Jackson, Dannenberg, and Frumkin, 2013). Many public health agencies recognize this relationship; these agencies are aligning their goals and objectives with health concerns by intervening in advance of decisions concerning land use and community design. Additionally, many public health agencies are building their capacity to collaborate with other agencies and community stakeholders to bring health to the table in land reuse decisions. Forward-thinking health professionals can envision how an old gas station could become a new community center and how the community center could help with pressing community health needs, such as teen pregnancy

rates or gang-related issues. Health partners see how a former mill site, with existing roads, water, and electricity infrastructure connecting it to the rest of the town, aligns with smart growth principles. This alignment also could provide a much-needed, safe, outdoor space for children to play and for adults to be active physically while helping address obesity and diabetes rates in the community. Health agencies' involvement in the redevelopment process is essential to ensuring that the community's health is at the forefront of decisions.

HOW LHD EXPERTISE HELPS IN LAND REUSE

Depending on state or local capacity, some health agencies also rely on the technical expertise of environmental health staff. When this capacity does not exist in the state agency or LHD, health agencies rely on environmental professionals and environmental regulatory agencies to evaluate hazards, chemical contamination, and exposures to contaminants.

This technical expertise incorporates unique skills in several areas, including:

- assessing land reuse sites and potential contamination by drawing on expertise in health risk assessment, risk communication, toxicology, epidemiology, and geographic information systems (GIS) mapping
- analyzing public health data to advocate land reuse funding and resources
- engaging and organizing communities for positive change
- partnering with all members of the Development Community to encourage including health in land reuse efforts

Expertise

Health departments can rely on expertise in toxicology, epidemiology, and Geographic Information System (GIS) mapping to characterize contamination and potential exposures to community members from land reuse sites they may live, work, or play near. They can rely on these skills to communicate any issues, concerns, or risks to community members.

Data Analysis

Health departments can use public health data and analytical tools to help develop and submit applications to secure resources and funding, as criteria in land reuse and brownfield inventory projects, and to support health-promoting redevelopment plans. Public health departments access, gather, and use health data to define population health status at varying levels (neighborhood, city, county, state, or regional). Data include information about everything from obesity and asthma rates to sidewalk connectivity, availability of public spaces, and transportation options. Data help characterize health needs in communities and inform strategies for redevelopment plans, projects, or policies. Public health data are critical to raising awareness of the close connection between the built environment and public health, and to providing a quantifiable method to monitor and assess the redevelopment goals, objectives, and effects over time. Health departments often engage

in community health-improvement planning, a process that involves an ongoing collaborative, community-wide effort to:

- identify, analyze, and address health problems;
- assess applicable data;
- develop measurable health objectives and indicators;
- inventory community assets and resources;
- identify community perceptions;
- develop and implement coordinated strategies and identify accountable entities; and
- cultivate community ownership of the process.

Community Engagement

Public health agencies can help facilitate community engagement in redevelopment plans. (See Chapters 1 and 2 for more information about community engagement.) Staff may have health education or environmental health training and may specialize in communicating risks of chemical exposures and ways to avoid exposures.

One tool LHDs use to engage communities is the community health-improvement planning process that initiates a community health assessment (CHA) and community health improvement plan (CHIP). CHAs provide information for problem and asset identification and policy formulation, implementation, and evaluation. CHAs also help measure how well a public health system is fulfilling an essential service related to assuring the public's health (National Association of County and City Health Officials, Undated). A CHA should be part of an ongoing, broader community health-improvement process. A community health-improvement process uses CHA data to:

- identify priority issues;
- develop and implement strategies for action; and
- establish accountability to ensure measurable health improvements, which are often outlined in a CHIP.

A community health-improvement process considers how the activities of many organizations contribute to overall community health improvement as opposed to the performance of an individual organization serving a specific segment of a community (Durch, Bailey, and Soto, 1997).

Many public health agencies follow specific principles and outline their community engagement plan similar to the following example.

1. Engage local residents.

    a. Prioritize efforts for involving vulnerable populations. Identify local organizations that serve the interests of certain populations (e.g., children, the elderly, groups with low income, or racially and ethnically diverse groups).

b. Seek out local leaders and community-serving organizations that are well-suited to work with health agencies and are gatekeepers to communities. Local leaders and community organizations can help shape culturally sensitive engagement strategies that are relevant to identifying health concerns related to a land reuse planning process or project.

c. Allocate resources to build capacity at the local level to represent health interests in land reuse processes.

d. Train residents living near brownfield and land reuse sites to become community liaisons or work with existing capacities within the community to lead efforts that affect health.

2. Involve underrepresented populations through culturally specific and competent approaches. Practice cultural humility approaches when cultural competency is not achievable or realistic (Tervalon and Murray-Garcia, 1998).

a. Consider the receptivity of the facilitating person and select a facilitator to whom populations traditionally underrepresented in land reuse and redevelopment decisions will be receptive.

b. Facilitate the process of community engagement to discuss and honor differences in cultural beliefs, worldviews, and health beliefs through the process.

c. Set ground rules that respect and allow equal time for the contributions of all people or organizations.

d. Integrate measures of success that help the brownfield or land reuse project, plan, or policy gauge improvements in social and environmental health, and community-defined goals and interests.

CROSS-SECTOR PARTNERSHIPS AND COLLECTIVE IMPACT

Successful land reuse projects that focus on health as an outcome need diverse partnerships. Public health agencies have experience navigating across a variety of disciplines. These agencies are typically non-regulatory bodies that foster collaboration across government agencies, sectors, and disciplines. Public health agencies can facilitate partnerships with traditional redevelopment agencies and stakeholders (e.g., city officials, community and economic developers, planners, environmental agencies, local businesses, or any stakeholders in the redevelopment effort) to plan for collective impact and strategies that provide health benefits to the community. In particular, they may include those partners who have decision-making influence over the brownfield project, or who have the ability to facilitate consideration of public health recommendations in the planning process.

Vulnerable populations are groups of people at higher risks of illness and death due to a range of social, environmental, or biological factors. These populations usually include low-income communities, communities of color, infants and children, pregnant or nursing mothers, and people who are disabled, immuno-compromised, obese, or living with chronic disease.

Achieve public health goals in collaboration with revitalization partners. Local health agencies can provide health-based education and recommendations to residents, partners, and decision makers. They can use input from residents and stakeholders as well as existing health data to develop recommendations that address public health concerns and maximize the health benefits that result from redevelopment. Local health agencies can incorporate health metrics and track outcomes relevant to public health recommendations and actions. They can use resources such as the ATSDR Brownfields/Land Reuse Action Model, HIA, and Protocol for Assessing Excellence in Environmental Health. Chapter 3 discusses these resources.

HOW PUBLIC HEALTH AGENCIES CAN GET INVOLVED

The first step for public health agencies involvement in land reuse discussions and decisions is identifying the relevant state and local agencies and organizations that are involved in land reuse efforts. The next step is for public health agencies to become versed in land reuse terminology and processes. Different agencies and partners accomplish land reuse processes in different phases. For example, the planning phase typically involves city planners and redevelopment agencies; the assessment and cleanup phases typically involve environmental consultants and regulatory agencies; and the redevelopment phase typically involves local businesses, developers, housing authorities, and other partners that might use the site in the future. In general, early and consistent public health contributions to these projects will more effectively address health-related concerns, engage communities, assist with timely site cleanup and redevelopment, maximize health benefits, and increase support for, and use of, the site after it is redeveloped. Ideally, health agencies are involved every step of the way. Realistically, often health agency staff and resources are stretched to the point that involvement throughout the entire timeline may not be practical. In these instances, it is important to consider how public health involvement will create the most positive benefits for the community and the project and determine the decisions that are most critical to influence.

POINTS OF INVOLVEMENT

Health-agency involvement in land reuse and redevelopment may be most effective at the beginning stages of land reuse planning. This early involvement can enhance projects through planning, addressing site-specific or area-wide concerns, inventorying and assessing sites, and engaging the community in redevelopment plans.

Planning—comprehensive planning and polices could include plans for zoning, transportation, housing, basic infrastructure, and how land reuse sites are incorporated. In land reuse plans, discussions and projects, health agencies can help educate the community about the overall redevelopment, engage the community, and address redevelopment concerns in general.

Site-specific—when a land reuse project pertains to a specific site, site-specific assistance of health agencies could include environmental assessment and communication of risks or health education about contamination.

Area-wide—when a land reuse project pertains to an area rather than a specific site, efforts often include creating an inventory at the city level (sometimes county or regional). Efforts also include

setting the criteria for prioritizing sites to pursue first (in which areas of the community, for what purposes, and with what measures of success).

Inventory—a city, county, or region can create a list/inventory of potential brownfield or land reuse sites. Public health agencies can play a role on the committee established to create the inventory, the criteria used to place sites on the list, and the integration of health considerations as inventories are created.

Assessment—once a site is identified, the next step is the **Phase I Environmental Site Assessment.** This is the initial look into the history of the site to understand more about potential contamination that may have occurred on the site. If more assessment is needed, next is the **Phase II Environmental Site Assessment.** This includes plans and actions for environmental sampling. Findings from the Phase I assessment inform the Phase II assessment. Health agencies can coordinate community involvement in this step may help to incorporate community concerns, build trust, promote use of the site once it is developed, and integrate plans for health benefits. In addition, health agencies can help communicate the results of the assessments to the community. More information about environmental site assessments is provided in Chapter 8.

SUPPORTING LHDS IN LAND REUSE AND REDEVELOPMENT

Jessica Solomon Fisher and Tina Yuen contributed the following essay about supporting LHDs in land reuse and redevelopment activities

Including health agencies in the land reuse process during the early stages can help ensure the success of site redevelopment. At the same time, increasing the capacity of health agencies, particularly LHDs, which are often overburdened and under-funded, will help address effectively the public health issues associated with brownfields redevelopment and land reuse. Tools, resources, and funding are available to health agencies to increase their capacity.

Two particularly strong supports for LHDs are the National Association of County and City Health Officials (NACCHO) resources and the HIA process.

NACCHO Overview

NACCHO is the voice of approximately 2,800 LHDs across the country. City, county, metropolitan, district, and tribal health departments work every day to protect and promote health and well-being for everyone in their communities. NACCHO's vision is health and security for everyone through public health policies and services. NACCHO's mission is to be a leader, partner, catalyst, and voice for LHDs to safeguard conditions that promote health, combat disease, and improve and lengthen all lives.

How NACCHO Supports LHDs

NACCHO supports and works with LHDs to:

- Develop a permanent process for integrating public health and environmental protection into planning, zoning, land-use, and other redevelopment activities
- Take an active role in local, state, regional, and national decision-making regarding pollution allowances, land-use planning, and pollution prevention
- Create policies and programs, such as identifying and mitigating disproportionate exposures to environmental health hazards, to promote environmental health
- Encourage the inclusion of brownfields redevelopment in community land-trust strategies
- Incorporate NACCHO's Public Health Principles and Guidance for Brownfields Policies and Practices into their everyday work

NACCHO works with federal, state, and local governments to:

- Enact land-use and development policies that support healthy, stable communities
- Encourage early, sustained, and effective participation by community residents in all stages of brownfields decision making
- Require the use of HIAs for brownfields redevelopment

- Ensure that future uses of a property do not include facilities or activities that will cause new health problems

LHDs and HIA: Advancing Healthy Public Policies

An HIA is a structured process that brings together scientific data, public health expertise, and stakeholders; Chapter 3 describes HIAs. Decision makers use the information the HIA collects to assess potential health consequences and make health-based recommendations before implementing a policy, project, plan, or program.

An HIA is one component of an overall **Health in All Policies (HiAP)** approach toward decision making that emphasizes collaborations and partnerships across sectors. HIAs are used often to expand public participation by emphasizing everyday experiences, and to help build consensus among different stakeholders.

HIAs provide LHDs with a structured approach and innovative opportunity to collaboratively create healthier and more equitable communities. NACCHO has supported LHDs using HIAs through the **HIA Mentorship Project** and policy statements on **HIA**, **healthy community design**, and **HiAP**. The Centers for Disease Control and Prevention's **Healthy Community Design Initiative** was a major source of funding for HIA capacity-building grants to local, county, and state health departments. Some of the grantees' success stories are available at **http://www.cdc.gov/healthyplaces/stories/default.htm**.

Through various technical assistance and funding opportunities as well as trial and error, LHDs have increased their capacity to conduct HIAs and extend their role in public policies. For example:

- Cuyahoga County Board of Health (CCBH) started their first HIA in 2011, and their program has been steadily expanding ever since, with two new HIAs completed in 2014. Please see the CCBH case study in this chapter.
- Crook County Health Department in Oregon won NACCHO's 2013 LHD of the Year Award in the small LHD category for their work on an HIA related to bicycle and pedestrian safety in Prineville, Oregon.
- San Francisco Department of Public Health in California adopted HIAs in the early 2000s and led one of the first HIA projects in the United States. With more than 10 years of HIA experience, they now have a robust program partnering with residents, public agencies, and private organizations to advance healthy environments and social health.

NACCHO provides a number of helpful resources, including:

- HIA Resources: **https://www.naccho.org/programs/community-health/healthy-community-design/health-impact-assessment**
- NACCHO Toolbox (Public Health Tools): **https://toolbox.naccho.org/pages/index.html**
- NACCHO HiAP Resources: **https://www.naccho.org/programs/community-health/healthy-community-design/health-in-all-policies**

CUYAHOGA COUNTY BOARD OF HEALTH: LAND REUSE WORK IN PRACTICE

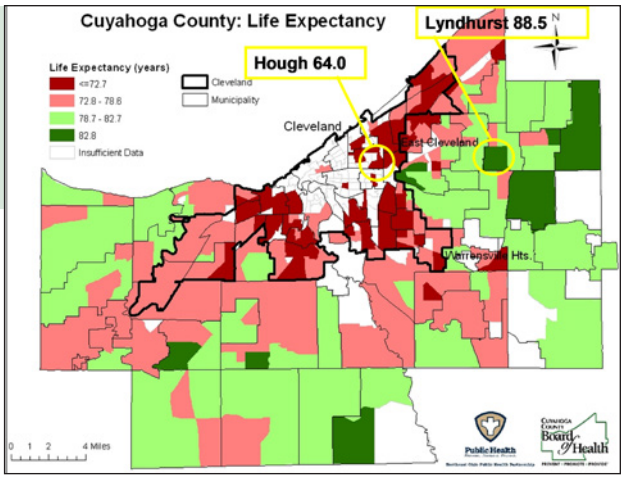
Martha Halko and Domenica McClintock

The Cuyahoga County Board of Health (CCBH) in Cleveland, Ohio has a strong program in land reuse and community involvement. The CCBH story exemplifies the beneficial role of engaging health agencies in land reuse efforts.

Summary

Poverty, racism, lack of education, lack of transportation, vacant property, and the built environment have prevented public health strategies from being successful in Cuyahoga County. Cuyahoga County's inequities are concentrated geographically in the urban core (Cleveland and Inner Ring Suburbs) of the county. We see the highest concentration of African American and Hispanic populations, as well as the highest concentrations of poverty, in these low-income communities. Local data clearly indicates that Cleveland and the inner ring suburbs have a higher poverty rate and greater burden of health disparities as compared with Cuyahoga County overall. Among the African American population, cardiovascular disease and cancer deaths are higher than for Caucasian populations.

Vital Statistics data obtained from:
Ohio Department of Health—Life Expectancy data calculated by Cuyahoga County Board of Health and Alameda County Public Health Department (California)



Efforts to address the leading causes of death in vulnerable communities such as East Cleveland (an inner-ring suburb of Cleveland) served as the foundation for the CCBH to shift its focus to one that addresses health through the social, environmental, and economic issues at the root of poor health outcomes. CCBH's involvement in PLACEMATTERS provided learning opportunities that supported these efforts. The Cuyahoga County PLACEMATTERS team strives to inform and engage policy makers and community members to use an overarching health lens to develop policies that create conditions for optimal health, such as safe housing, adequate green space, clean air and water, access to healthy foods, access to quality health care, and quality education. The team is guided by its shared vision for a Cuyahoga County where people can thrive because of equitable access to resources and opportunities—economic, social, or environmental—that are necessary to attain the highest quality of life.

Before getting involved with PLACEMATTERS in 2006, CCBH addressed disease prevention and health promotion through more traditional public health interventions. The focus was on behavior modification with an emphasis on personal responsibility, risk limitation, and expanding access to health care. These behavior changes routinely involved adopting healthy eating habits, engaging in daily exercise and other lifestyle changes, and discontinuing tobacco use in all forms. However, CCBH has come to recognize that where a person lives, learns, works, and plays affects their health and life expectancy in fundamental ways. CCBH and PLACEMATTERS partners are collaborating with decision makers, organizational partners, and community members to implement evidence-based and "place-based" solutions that improve access to healthy food, provide safe and accessible opportunities to be physically active, reduce pollution, and improve water quality.

CCBH and PLACEMATTERS partners began to use tools such as Health Impact Assessments (HIAs) to inform and integrate health considerations into land-use planning, neighborhood revitalization, redevelopment, and community design decision- and policy-making processes. The goal was to improve health outcomes, decrease premature death, and reduce inequities in the region.

PLACEMATTERS

Eliminating Health Disparities by Addressing the Social Determinants of Health

PLACE MATTERS is a nationwide initiative of the Health Policy Institute in the Joint Center for Political and Economic Studies, (**www.jointcenter.org**). The initiative is intended to improve the health of participating communities by addressing social conditions that lead to poor health.

"An HIA is a Rosetta Stone. It's a translator. When HIA is a part of all our lives, we're asking what people think, we're saying we care what they have to say, and we're making the effort to do it."

—Joe Cimperman, City Ward 3, Cleveland City Councilman

Solution

To build capacity for HIAs within CCBH and develop a comprehensive HIA program in Cuyahoga County, CCBH and the Cleveland City Planning Commission convened the Northeast Ohio Health Impact Assessment Partnership (NEO HIA-P) in January 2012 (**https://www.pewtrusts.org/-/media/assets/external-sites/health-impact-project/ccbh-2015-cle-esg-rename.pdf**). This partnership brought together representatives from diverse sectors of the community who share a commitment to use HIAs to advance "Health in All Policies"—a coordinated policy

response focused on addressing the social, environmental, and economic determinants of health, such as land use, education, housing, agriculture, transportation, and urban development. NEO HIA-P is shaping a three-pronged approach to advance HIA capacity in the region. This response includes:

- Building capacity for HIAs through training and education
- Using HIAs to assess and address the health effects of land use and other key decision-making processes
- Collaborating and coordinating to incorporate HIAs

Results

Through this three-pronged approach, CCBH and project partners formed a multi-sector HIA team, completed two HIA trainings, developed resource toolkits, and completed four pilot HIAs. CCBH continues to carry out this approach in planning and land use projects. Public health, urban planning, and other multi-sector partners continue to work together to enhance and sustain efforts to create healthier communities and achieve optimal community health for all residents of Cuyahoga County. To achieve agency-wide integration and system changes, CCBH is actively integrating principles and practices associated with environmental health into their community health-improvement planning process (**www.hipcuyahoga.org**) and its chronic-disease prevention, tobacco control, maternal and child health, and environmental health programs.

CCBH has established a standard of a non-traditional partnership by working with members of the Northcoast Brownfield Coalition (NBC), which includes but is not limited to the County Department of Development, Cleveland Port Authority, Northeast Ohio Regional Sewer District, and the City of Cleveland Department of Development. CCBH is working actively with these partners to integrate health considerations and livability principles into redevelopment policies to transform brownfields into productive mixed-land uses. CCBH also supports health monitoring for the NBC coalition. CCBH has integrated specific health considerations into the brownfield-assessment application process, allowing for better environmental controls for land-use conditions and mitigation of potential health effects.

HIA AND EAST CLEVELAND

HIA methods provided avenues for East Cleveland residents and city leaders to engage actively in considering the health impacts of land use and brownfield-redevelopment policy initiatives. East Cleveland used the HIA process to help the community identify high-priority social determinants of health, such as food access, physical activity opportunities, safety, land use, water quality, and access to services, and determinants of public health. By facilitating three community events, the Health and Development Committee increased the knowledge and awareness of community members about the links between land use and health, received input on the community's concerns, and identified the community's vision for a healthier East Cleveland.

AGENCY-WIDE HIA USE

CCBH has completed two HIAs:

The Euclid Transportation for Livable Communities Initiative HIA (Euclid TLCI)

With the City of Euclid, Cuyahoga County Planning Commission, and Human Impact Partners, the Cuyahoga County Board of Health completed an HIA that examined the potential health effects of the TLCI planning project for key intersections of a four-mile stretch of Euclid Avenue in Euclid.

The Eastside Greenway HIA (Eastside of Cuyahoga County)

The Cuyahoga County Board of Health, in partnership with LAND studio, Cuyahoga County Planning Commission, Human Impact Partners, and many other organizations conducted an HIA to inform and influence planning and implementation decisions for establishing a trail and greenway network traversing diverse communities on Cuyahoga County's eastside. The HIA provided recommendations on plan development, design, and implementation.

FUTURE DIRECTIONS

The next steps for NEO HIA-P include:

- Educating partners on "Health in All Policies"
- Continuing to build non-traditional partnerships
- Continuing to educate partners on the HIA practice
- Continuing to seek resources to support HIA practice

The CCBH experience with HIA indicates that partnerships and consideration of health in planning can help collaborations form around health improvement. The support of a collaboration can help share the message about HIA as a means to advance "Health in All Policies." In addition, the consideration of health educates policy and decision makers on incorporating health considerations into an existing decision-making process.

FUNDING HEALTH AGENCIES FOR LAND REUSE WORK

ATSDR Land Reuse Team: Laurel Berman, Leann Bing, and Gary Perlman

Health agencies, particularly those at the local level and in small or rural municipalities, may not have the time and financial resources to engage fully in land reuse consultation activities. In many areas, LHDs become involved when developers have questions about possible previous assessments of the sites because the LHD often maintains these records and provides expertise about potential contamination. In smaller communities, the LHD may be working on issues concerning well water used for human consumption, swimming pool inspections, and restaurant inspections, among other activities. Dealing with land reuse issues can add to an already overburdened workload.

Cities, municipalities, and counties can provide funds for health agencies to assist with land reuse work. In many cases, this is efficient and economical because the overhead of hiring a consultant may be costly. For example, Baraboo, Wisconsin, allocated a small portion ($2,500) of their EPA Brownfields Assessment grant to the Sauk County Health Department through a Memorandum of Understanding. In turn, the health department was a key stakeholder in Baraboo's use of the ATSDR Action Model, particular in the area of health education. In addition, the health department characterized lead paint and asbestos risks of hundreds of properties in the redevelopment area. Subsequent to their involvement, staff from Sauk County Health Department felt competent enough to consider applying for brownfields funding on their own, with the goal of integrating a public health aspect into brownfields assessment.

ATSDR provided funding for several years to state-affiliated agencies, including city governments and local and state health departments, for community health projects related to land reuse. Cuyahoga County Board of Health was one of the grantees and serves as an example of how funding can help LHDs leverage resources and partnerships to address land reuse and impacts on community health.

Additional sources of funding for LHDs can come from state and federal agencies, such as state environmental agencies, state health agencies, EPA, and HUD. This funding is awarded typically through a competitive process, such as grant announcements on government Web sites. For more information about government funding, visit **https://www.grants.gov/**.

RESOURCES FOR LHDS

NACCHO and agencies such as the, National Environmental Health Association (**NEHA**), American Public Health Association (**APHA**), Association of State and Territorial Solid Waste Management Officials (**ASTSWMO**), Association of State and Territorial Health Officials (**ASTHO**), and Indian Health Service (**IHS**), often have programs that can benefit or are specific to land reuse.

INTEGRATING A PUBLIC HEALTH APPROACH TO REDEVELOPMENT: CHALLENGES AND SUCCESSES

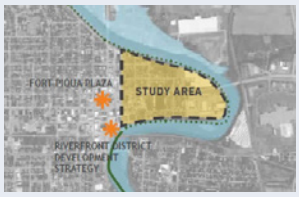
Land reuse and redevelopment is typically the economic development domain of developers and consultants. Engaging health agencies and integrating a public health focus in redevelopment is only recently a consideration. A key challenge is motivating developers and private consultants to recognize economic development as part of public health. With programs such as Health in All Policies and the National Prevention Strategy in place, and the sustainability movement in federal agency funding programs, now is the critical time to help developers and consultants understand the benefits of including health in redevelopment and encourage them to integrate it early in planning.

One example of engaging health at the front end of redevelopment plans is a project in Piqua, Ohio. By engaging their local health agency early in redevelopment plans, public health was a driver for redevelopment, resulting in increased access to recreation, medical services, and childcare.

Case Study: Riverfront STAMP Project — Piqua, OH

Image of a former field house ATSDR Case Study, 2017.

Rendering of redeveloped site. ATSDR Case Study, 2017.



Map of Piqua site. ATSDR Case Study, 2017.

Piqua, Ohio, is a small Midwestern city with a population of 21,000 people in Western Ohio, about 25 miles north of Dayton.

What were the contaminants and risks?

From the late 1800s through the 1900s, Piqua was a booming industrial town, flush with apparel and textile manufacturers, aviation equipment manufactures, and several other industries. Many of these manufacturers are no longer in existence, leaving vacant, underused and potentially contaminated properties in or near residential neighborhoods. Many properties were deteriorated and presented health and safety risks. They were also associated with increased crime. The City was concerned about potential exposure to numerous chemical contaminants that were left behind in some of these properties, including particulates, chlorinated compounds, lead-based paint, asbestos, metals, petroleum products, and volatile compounds.

What did the Development Community do?

The City was awarded $300,000 from ATSDR and leveraged part of those funds to partner with the National Brownfields Association (NBA) and an engineering and architectural firm to work with a team of experts to create a redevelopment Master Plan for East Piqua. The team was a "STAMP" Team: Site Technical Assistance for a Municipal Project. This team was comprised of private-sector Developers, Environmental or Health Professionals, and community residents. ATSDR and the local health agency provided free environmental and public health expertise throughout the two-year project.

Residents of Piqua had specifically asked for increased access to recreation, medical services, and childcare. The STAMP Team created the redevelopment Master Plan based on community input and identified needs, highlighting economic development potential and the creation of a recreation center that would serve the city and surrounding communities. The City moved forward on the vision of the Master Plan, sharing it with the Development Community to launch redevelopment. The City used ATSDR funding to finalize the Master Plan and to identify sites for reuse and redevelopment. The City used EPA funding to complete lead-based paint and asbestos assessments in older commercial structures, and to conduct environmental site assessments on a former meat packing plant in the redevelopment area.

The City used $420,000 in federal funding for these activities, and they expect a return of $50 million in private investment. By the spring of 2017, the first three redevelopments were launched or scheduled. These include a senior housing facility on the site of a former field house, an early childhood learning center, and a medical office building. Each of these projects is a $10 million private investment.

Chapters 15 and 20 provide examples of how developers and consultants create Healthfields—community redevelopment projects that focus on healthier communities through access to healthcare, food, and other amenities. These projects demonstrate the connection between redevelopment and health and emphasize successful redevelopments that can serve as models for communities everywhere.

LHDs can play a key role in land reuse projects. Many community members may feel more comfortable working with government or development entities when LHD staff are part of the process. LHD staff are often experts in health education, community engagement, and environmental health disciplines, which can be large components of redevelopment projects. In addition, LHDs are uniquely skilled to navigate issues of distrust, concerns about contamination, and concerns about exposures to chemicals and hazards during redevelopment projects. Throughout the redevelopment process, LHDs can assist Development Communities in planning for healthier communities.

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CHAPTER 8

Environmental and Health Risk Evaluation

Laurel Berman, Sabine Martin, Eric Neagu, and Gary Perlman

There are many resources available that are used by Development Community members to evaluate environmental and health risks. Such tools are typically used by environmental regulators, environmental consultants, and state and local health personnel to address public health and community development concerns, particularly those around underperforming real estate assets. This chapter highlights these resources, beginning with an environmental and health risk overview and followed by evaluation tools and example case studies.

ENVIRONMENTAL AND HEALTH RISK EVALUATION

Environmental evaluation of a property, whether occupied or abandoned, is typically based on a risk-based approach to assessment of contamination and potential associated adverse health effects. The U.S. Environmental Protection Agency (EPA) describes risk as the chance that harmful effects to human health or ecological systems may result from an environmental stressor (US Environmental Protection Agency, 2016a), such as chemical contamination leading to an adverse health outcome. The EPA risk assessment process looks at how much of a chemical contaminant is present in an environmental medium (e.g., soil, water, air), how much contact (exposure) a person or ecological receptor has with the contaminated medium, and the inherent toxicity of the chemical. More information about the EPA Risk Assessment process is available on this website: **https://www.epa.gov/risk**. Evaluating such risks is a critical initial step in developing a strategy for addressing public health risks associated with a specific property.

Like the EPA, the Agency for Toxic Substances and Disease Registry (ATSDR) incorporates and enhances risk assessment techniques in evaluating environmental and health risks in their **public health assessment** process. Since 1986, ATSDR has been required under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to conduct a **public health assessment** (PHA) at each of the sites on the EPA National Priorities List (NPL). The aim of these health assessments is to find out if people are being exposed to hazardous substances and, if so, whether that exposure is harmful and should be stopped or reduced. ATSDR also may conduct PHAs when petitioned by concerned individuals or requested by a federal, state, or local entity for assistance. Public health assessments are carried out by environmental and health scientists from ATSDR and from the states with which ATSDR has **cooperative agreements** (Agency for Toxic Substances and Disease Registry, 2011).

In the PHA process, scientists review environmental data to determine the extent and location of contamination at a site, and how people may come into contact with it. If the review indicates that people have or could come into contact with hazardous substances, ATSDR scientists evaluate whether or not there will be any harmful (adverse) effects from these exposures. ATSDR uses **Minimal Risk Levels** (MRLs). ATSDR Minimal Risk Levels (MRLs) are screening levels. ATSDR uses them to identify environmental exposures that might harm people's health. If an exposure is below an MRL, it is not expected to result in adverse health effects. If an exposure is above an MRL, ATSDR conducts further evaluation to determine if the exposure might harm human health. For more information, see: **https://www.atsdr.cdc.gov/mrls/index.asp**. In addition, MRLs are described in more detail in Chapter 9 in the section about Redevelopment and Protecting Children's Health.

Similarly, the U.S. Environmental Protection Agency (EPA) has tools to determine the possible impacts of a contaminant. One tool used by both ATSDR and EPA is benchmark dose modeling, deriving dose levels that correspond to specific response levels (i.e., benchmark responses). The EPA's Reference Dose (RfD) is based on a No Observed Adverse Effect Level (NOAEL) or equivalent estimate, which is the highest exposure level at which no statistically or biologically significant increases are seen in the frequency or severity of adverse effect between the exposed population and its appropriate control population. One simple definition of the RfD is the NOAEL divided by an Uncertainty Factor (UF). Uncertainty factors account for variability and uncertainty in differences

between test animals and humans and variability among humans. The UFs are typically a factor of 10, so the division is by at least 10 for one UF, 100 (10 times 10) for UFs, and so forth. The RfD is typically for oral exposure (ingestion). To assess inhalation risks, the EPA uses a similar term called the Reference Concentration (RfC) (US Environmental Protection Agency, 2016b).

The RfDs, and RfCs are used to protect people from environmental exposures and help establish risk based cleanup guidelines in cases of environmental releases, such as spills or historical contamination. Land reuse sites, like NPL sites or Brownfields, often have unknown or historic contamination. These sites are assessed using a risk-based approach to protect the health of the public and the environment.

SITE EVALUATION AND CLEANUP: PHASE 1 AND PHASE 2 ENVIRONMENTAL SITE ASSESSMENTS

As the impacts to health and safety due to environmental contamination became evident during the 1960s and 1970s, various agencies, states, and consultants worked to develop a process that led to the *2002 Small Business Liability Relief and Brownfields Revitalization Act* (United States Environmental Protection Agency, 2002). This Act provided funds to assess and clean up brownfields; clarified liability protections under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); and provided funds to enhance state and tribal response programs.

The assessment of brownfield properties includes Phase I and Phase II environmental site assessments.

Phase I Environmental Site Assessment (ESA), identifies potential environmental concerns. It establishes historical and current uses of the site and surrounding area. Recognized Environmental Conditions (RECs) are documented, if present. These may or may not prove to be actual contamination but are typically identified to determine if further assessment work is required. The Phase I ESA typically includes:

- Historic Records searches
- Interviews with property owners
- Interviews with past and present site operators/users
- Local, State, and Federal database reviews
- Site visit


Environmental Science and Technology Briefs for Citizens

Center for Hazardous Substance Research

Brownfields Resources

Phase I Environmental Site Assessments

What are Phase I Environmental Site Assessments?

Who conducts Phase I ESAs?

What is included in a Phase I ESA?

What is not included in a Phase I ESA?

What does a Phase I ESA report look like?

Are there standards for Phase I ESAs?

Many banks will not lend on a mortgage for a commercial or industrial property without a Phase I ESA. The Phase I is not part of the lending transaction. However, the Phase I may be required by a lender for liability protection. A useful overview of Phase I ESAs is available at the Kansas State University's Technical Assistance to Brownfields Program website, at: **https://www.ksutab.org/?ResponseView=TABResourceDownloadView&id=10**.

A Phase I ESA allows a purchaser to have an understanding of potential environmental impacts associated with the property to be acquired and make a more informed decision about the acquisition. Further, a Phase I ESA, under certain circumstances (e.g., innocent landowner or bona fide purchaser), provides some level of liability protection should environmental contamination be identified after acquisition.

In some cases, the results of the Phase I ESA may merit additional assessment of site conditions, i.e. obtaining samples from appropriate media (air, soil, water, or building materials), which results in the **Phase II Environmental Site Assessment** (or Phase II ESA). The goal of the Phase II ESA is to address the RECs that were noted in the Phase I ESA. This may include:

- Soil Samples
- Groundwater Samples
- Ambient Air Samples
- Asbestos Testing
- Lead Based Paint Testing

The Environmental Protection Agency requires Phase I and Phase II ESAs to be conducted by environmental professionals following ASTM International Standards ASTM E1527-13 and ASTM 1903-11, respectively. These standards are available for purchase from **ASTM International**. Because ASTM E1527-13 does not address asbestos, lead paint or controlled substances, assessment of these additional contaminants needs to be identified in the initial scope of work.

RISK-BASED CLEANUP

Assessment and cleanup of a contaminated property is not limited to certain types of property, such as brownfields. However, due to the large number of brownfields across the U.S. there are local, state, and federal programs that specifically address the cleanup of these land reuse properties. With support from CERCLA 128 (a) funding, state brownfield programs oversee assessment and cleanup activities at the majority of brownfield properties across the country. State programs rely on a risk-based approach to cleanup. The risk-based approach to cleanup may be described as a "tiered" approach, with more detailed assessment and data required in subsequent tiers. The Michigan Department of Environmental Quality provides a useful example of the tiered approach to corrective action (e.g., cleanup) here: **http://www.michigan.gov/deq/0,1607,7-135-3311_4109_4215-17592--,00.html.**

Tier 1 consists of a qualitative risk-assessment based on general site assessment information. At this stage, data identifies obvious environmental impacts:

- Sensitive receptors (e.g., schools, homes, water bodies)
- Significant exposure pathways (drinking water wells, vapor transport, other)

Tier 2 consists of obtaining more site-specific data to determine the appropriate risk-based actions, including:

- Characterization and monitoring
- Projects of expected levels of contamination after treatment
- Potential plume migration
- Reasonable maximum exposure scenarios

Tier 3 focuses completely on the site-specific conditions. For example:

- Fate and transport phenomena
- Descriptions of the range of possible exposures/risks
- Site specific risk assessment models may be developed.

Due to the costs involved, this analysis is suited to only large sites.

The activities in the tiered approach described above are typical of risk assessments and actions implemented in the cleanup of most types of environmentally contaminated sites.

HEALTH RISK EVALUATION: HEALTH DATA

Often communities with multiple land reuse sites such as old gas stations, old factories, and deteriorated apartment buildings, demonstrate conditions of health inequity and health disparities as compared to communities with fewer environmentally impacted sites. In addition to risk-based evaluations of environment and health, health data are valuable resources to look at the overall health conditions within communities. These data can provide the bigger picture of community health, beyond just contamination on a site-by-site basis.

The Centers for Disease Control and Prevention (CDC) is a good starting point to obtain health data for a given area. For example, the CDC **National Center for Health Statistics** (NCHS) collaborates with public and private health partners to collect health data from multiple sources. This process provides a broad perspective to help NCHS understand the population's health, influences on its health, and health outcomes. NCHS collects data from birth and death records (i.e., vital statistics), medical records, interview surveys, and through direct physical examinations and laboratory testing. The health statistics enable NCHS to:

- Document the health status of the population and of important population subgroups.
- Identify disparities in health status and the use of health care by race or ethnicity, socioeconomic status, region, and other population characteristics.
- Describe experiences with the health care system.
- Monitor trends in health status and health care delivery.
- Identify health problems.
- Support biomedical and health services research.
- Provide information for changing public policies and programs.
- Evaluate the impact of health policies and programs.

For more information about NCHS data collecting programs, visit: **http://www.cdc.gov/nchs/about/50th_anniversary.htm**.

In addition to the NCHS, states and often counties and cities maintain vital statistics and other health data, such as cancer and chronic disease rates. To find health data in your state, county, or cities, search the Internet using the name of your state, county, or city plus keywords such as "vital statistics," "county health data," "blood lead data," and "cancer data."

ENVIRONMENTAL AND HEALTH RISK EVALUATION TOOLS

ATSDR Land Reuse Site Screening Tool. When engaging communities in land reuse, common concerns are the number of potentially contaminated sites, and how these sites may affect the surrounding community. The ATSDR Land Reuse Site Screening Tool (Site Tool) is one resource that can be used to create a customizable, searchable, inventory to characterize land reuse sites and determine potential threats to public health. The Site Tool allows rapid site screening and assessment according to past or future intended use, site use restrictions (i.e., institutional controls such as a ban on using groundwater), sensitive populations, and suspected or confirmed contamination. Within the Site Tool, there is also a Site Visit component to aid the evaluator in noting potential contamination and hazards at sites. If environmental sampling data such as soil-contaminant concentrations are available, Site Tool users can screen a site for potential exposure concerns. The site tool will process those data by comparing the maximum value to ATSDR health comparison values (CV). A visual representation of the data is provided that plots the CV, minimum, quartiles, and maximum for each chemical. A companion tool, the ATSDR Comparison Value Viewer, is available for users to quickly look up a chemical and determine the associated ATSDR Health Comparison Value for air, soil, and water pathways of exposure. Both tools have a built-in update checker and will download updates when available.

ATSDR Toxic Substances Portal. ATSDR's Toxic Substances Portal contains toxicological resources for the community members, emergency responders, toxicological and health professionals, and healthcare provider education. For example, Toxicological Profiles contain information about contaminants found at hazardous waste sites. There are Toxicological Profiles for 275 substances, available through the Toxic Substances Portal at: **https://www.atsdr.cdc.gov/substances/index.asp**. Each Toxicological Profile contains health and toxicologic information. Each profile begins with a **Public Health Statement** that summarizes in nontechnical language, a substance's relevant properties. A useful two-page information sheet, the **ToxFAQs,™** is also available.

Community Mapping Tools. Land-reuse communities can benefit from several available community mapping tools to help them identify potential sites of concern, such as hazardous waste generators or landfills. One example of these mapping tools is EPA's **EnviroMapper**. This website provides access to several EPA databases with information about environmental activities that may affect air, water, and land anywhere in the United States. Some communities have developed their own tools. For example, the **Data Driven Detroit** website provides access to health and environmental data for Detroit communities. **Grounded in Philly** is an online mapping tool that

identifies and characterizes vacant lots in Philadelphia, including information about the size of the lot and how a user may gain potential ownership of the lot.

EJSCREEN. **EJSCREEN** is EPA's environmental health screening and mapping tool. The tool integrates national data, such as air quality, census/demographics, and health data in maps and reports. Users of the tool can enter their community name (city, state) or a census block group, and a variety of environmental, census, and health reports will be listed and available for viewing or printing. Reports are organized by environmental indicators, such as air quality, water quality, Superfund site proximity to the area, and other factors; demographic indicators such as minority population, income, and age; and EJ Indexes, which compare the selected area to the state, region, and country.

EnviroAtlas: **EnviroAtlas** is a collection of interactive tools and resources that allows users to explore the many benefits people receive from nature, often referred to as ecosystem services. Key components of EnviroAtlas include: (1) A multi-scaled **Interactive Map** with broad-scale data for the lower 48 states and fine-scale data for selected communities; (2) **The Eco-Health Relationship Browser**, which shows the links between ecosystems, the services they provide, and human health; and (3) **Ecosystem services** information, GIS and analysis **tools**, and written **resources**. EnviroAtlas seeks to measure and communicate the type, quality, and extent of the goods and services that humans receive from nature so that decision makers can consider their connection to human health. EnviroAtlas is a collaborative project developed by EPA, in cooperation with the U.S. Geological Survey (USGS), the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) and Forest Service, and **LandScope America**.

Envirofacts: **Envirofacts** is a data warehouse that integrates information from several EPA environmental databases. Each of these databases contains information about EPA-regulated facilities, such as those required to report activity to a state or federal system. Users can retrieve information about environmental activities that may affect air, water, and land anywhere in the United States. Searchable topics include air, land, water, waste, toxins, radiation, facility, compliance, grants awarded within the search area, and ultraviolet index for the area of interest. In addition, Envirofacts provides access to EPA's Substance Registry Services, a database of information regarding substances that EPA or other sources track or regulate. It is possible to search Envirofacts by address, city, state, county, zip code, or place name. Envirofacts is available at **http://www.epa.gov/enviro/**.

Clean-up Sites in My Community: The **Cleanups in my Community** EPA tool will map and list geographic areas where hazardous waste was or is in the process of being cleaned up. Included are NPL Superfund sites, brownfields, Resource Conservation and Recovery Act corrective action sites, and federal facilities under EPA's cleanup programs. The Introduction to this book describes these types of sites. For a complete list of sites included in Cleanups in My Community, go to **http://ofmpub.epa.gov/apex/cimc/f?p=cimc:63**. Areas of interests may be searched by a variety of geographic units (e.g., city, zip code, street) or by state. Tribal lands are included in this database.

Environmental Public Health Tracking: The CDC created the **Environmental Public Health Tracking Network (the Tracking Network)**, available at **http://www.cdc.gov/nceh/tracking/**. The Tracking Network conducts the ongoing collection, integration, analysis, interpretation, and dissemination of data about environmental hazards, exposure to environmental hazards, and health

effects potentially related to environmental hazards. Users of the Tracking Network tool can access county-level data in these categories: Environment, Environmental Exposures, Health Effects, and Population Characteristics. Environmental data include categories of air quality, temperature distribution, and community design. Environmental exposures include pesticide exposures, toxic substances releases, and other environmental chemicals. Health effects data include categories such as asthma, cancer, and childhood lead poisoning. Population characteristic data include lifestyle risk factors, socioeconomics, demographics, and vulnerabilities.

Selected Metropolitan or Micropolitan Area Risk Trends: The **Selected Metropolitan/ Micropolitan Area Risk Trends (SMART)** project uses the **Behavioral Risk Factor Surveillance System** (BRFSS) to analyze the data of selected metropolitan and micropolitan statistical areas (MMSAs) with 500 or more respondents. CDC has collected BRFSS data since the early 1980s to determine the prevalence of many health risk behaviors among populations. BRFSS data can be used to identify emerging health problems, establish and track health objectives, and develop and evaluate public health policies and programs.

County Health Ranking: **County health rankings** and roadmaps are available at **http://www.countyhealthrankings.org**. Health outcomes (mortality and morbidity), health factors (health behaviors, clinical care, social and economic factors, and physical environment), and additional measures (e.g., demographics, additional health outcomes) can be viewed at the county level; data across counties can be compared as well. The Web site also provides tools and resources to improve county health.

Community Health Status Indicators: **Community Health Status Indicators** is an interactive web application that produces health profiles for all 3,143 counties in the United States. Each profile includes key indicators of health outcomes, which describe the population health status of a county and factors that have the potential to influence health outcomes, such as health care access and quality, health behaviors, social factors and the physical environment. The social factors and the physical environment are especially important because they represent the conditions in which people are born, grow up, work, and play. Neighborhoods with affordable healthy food, safe and accessible housing, and quality employment opportunities can positively influence behaviors and help create healthy lifestyles.

EXAMPLES: REDEVELOPMENT AND PUBLIC HEALTH INVOLVEMENT

Environmental and environmental health professionals can ensure that redevelopment plans integrate strategies that promote health and prevent illnesses. However, the process is not always straightforward, and site environmental knowledge is often variable depending on the sophistication of the developer or the community around land acquisition. Early public health involvement in land-reuse and redevelopment may be seen as optimum for land reuse. However, public health concerns may be considered late in the process. In some cases, significant contamination that was not cleaned up causes health-related problems after a site has been developed.

When health is considered early on in land reuse, such as through health agency engagement, better outcomes may result for the community. How do health agencies help? Consider the following three examples.

EARLY CONSIDERATION OF HEALTH IN REDEVELOPMENT PLANS

Hazardous industrial, commercial, and residential waste (e.g. household waste that may contain toxic materials) and wastewater discharges have severely affected Nassau County, New York. The county has 15 federal Superfund Sites, 122 State Superfund Sites, hundreds of contaminated EPA Underground Injection Control Sites, and numerous potential sources of contamination at sites proposed for residential development. In addition, tens of thousands of petroleum and chemical spills have contaminated the county's soil and groundwater.

The Nassau County Department of Health (NCDH) responded to this situation with an innovative program—the 2009 Residential Development Protection Program. The program's goal is to ensure that all the county's residential developments have an approved water supply, approved sewage collection or on-site sewage disposal facilities, and an environment free of public health hazards.

How does it work? The program allows the NCDH to provide advance comments and recommendations to developers and project consultants. This gives the county greater local oversight and input into siting and developing residential projects to protect the community's health. In addition, the program assures that potential environmental contamination problems are investigated and corrected before development is approved. The program ensures that NCHD can be proactive in systematically addressing potential environmental health issues instead of reacting piecemeal to contamination effects. Over the past 10 years, the program has evaluated more than 100 projects and almost 5,000 housing units. In 2014, NACCHO awarded the program the Model Practice award for their innovative work in protecting the health of their community.

Author note: We would like to acknowledge Thomas S. Dunlop, MPH, REHS, Pitkin County Environmental Public Health Advocate, for his contributions to this example.

LATE CONSIDERATION OF HEALTH IN REDEVELOPMENT PLANS

In 2001, in Detroit, Michigan, the Detroit Public Schools system planned to locate a new elementary school, New Beard Elementary, on a 6.45-acre property with a long history of industrial use that left contaminants, including arsenic, lead, polychlorinated biphenyls (PCBs), and volatile and semi-volatile organic compounds, in the soil. Site remediation and construction activities removed much of the contamination. Some contaminants, primarily arsenic, remained in the soil at the property but were contained under an extensive site cap, such as in paved areas, and under the school building itself. The Michigan Department of Environmental Quality requested that the Michigan Department of Community Health (MDCH) conduct a health consultation of the property. MDCH used existing soil-sampling data to evaluate the site for risks to public health. MDCH found that the property posed an indeterminate public health hazard and recommended collection of additional samples to determine if contaminant levels in surface soils could pose a public health risk. Developers followed this recommendation. By 2009, after reviewing all new sampling data, MDCH found that the New Beard Elementary School property posed no public health hazard either then or in foreseeable future site conditions.

The school was completed; however, despite the best efforts of developers, parents initially did not want their children to attend the newly constructed school. Eventually, enough risk communication and "damage control" was instituted and children attended the school. The lesson learned: early involvement of parents and other stakeholders, including health agencies and community members, is necessary for successful redevelopment.

ATSDR contributed the publicly available information for this example.

NO CONSIDERATION OF HEALTH IN REDEVELOPMENT PLANS

The Waterbury Radium Dial Clock Factory in Waterbury, Connecticut, manufactured clocks from 1857 through 1944. In 1919, the factory began using glow-in-the-dark paint with Radium-226, which creates a light that emanates in the darkness when combined with zinc sulfide. Radium-226 has a half-life of 1,600 years. The watch and clock industry used this paint from the early 1900s through the 1940s on watch dials, airplane equipment, and clocks.

After this factory closed (unknown date), the building complex was retrofitted for use as a leather clothing company, an apartment complex, and a human-services center. None of these post-closure uses engaged public health involvement. A subsequent investigation using radiation survey instrumentation of the building complex identified areas with radiation at levels (measured at about 3 feet above the ground) that posed a public health hazard to occupants of the buildings. The complex relocated the occupants of twelve apartments to avoid potential adverse health effects.

The developers of the mixed-use complex learned an unfortunate lesson with the Waterbury facility. Had health agencies been involved in any of the planned reuses, a conversation about the past uses of the facility could have revealed the potential for radiation exposures. Ultimately, many people could have avoided harmful exposures to radiation while working or living in the building.

ATSDR contributed the publicly available information for this example.

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CHAPTER 9

Redevelopment and Protecting Children's Health

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When contaminated sites are redeveloped, it is especially important to ensure full protection from potential exposures for people who will be using the new sites for work, school, or residences. This means that developers should clean up land reuse sites to levels that protect the health of the community. Children are a sensitive population, and planners must consider their health for redevelopment end uses. When we evaluate environment and health risks, we consider some of our most sensitive populations, including children, the elderly, women of childbearing age, and others. The essays in this chapter introduce the concept of children's environmental health and discuss how redevelopment may or may not protect children from harmful exposures.

OVERVIEW: CHILDREN'S HEALTH AND REDEVELOPMENT

Michelle Watters introduces below the topic of children's health and its relationship to land reuse and redevelopment.

Historically, children have been the focus of many public health interventions. Vaccination campaigns to eliminate childhood infectious diseases are classic examples of organized and systematic attempts to eliminate or mitigate these health effects. Similarly, children's health has taken a prominent position on the environmental health front, including land reuse and redevelopment. Lead-poisoning prevention remains a key undertaking for children's environmental health. Recognizing that former industrial activities in a neighborhood may have caused soil and groundwater contamination has increased public health efforts to evaluate sites for potentially hazardous exposures to children both on and off site. Safety hazards from decaying buildings and unmaintained premises also pose a threat to children's well-being and call for public health interventions. In some unfortunate instances, land reuse sites have been redeveloped into daycare centers and schools without proper oversight or investigation of potential contamination. These circumstances have resulted in children's exposure to residual contamination left on site during redevelopment (see the Kiddie Kollege case example mentioned below).

Children are particularly vulnerable to potential adverse effects from chemical exposures. Anatomical, physiological, and behavioral differences may increase the chemical dose they receive and influence their body's ability to metabolize toxic compounds. During fetal development, *in utero* exposures can occur. During breastfeeding, infants may be exposed to chemicals, such as polychlorinated biphenyls (PCBs) that are stored in maternal adipose (fat) tissue. Young children have a higher respiratory rate and drink more water per kilogram of body weight. Detoxification mechanisms (elimination or break down of toxins) in fetuses, infants, and young children are immature and may limit their ability to break down chemicals to less harmful **metabolites.** Because of these physical circumstances, children may be exposed to chemicals at critical points in their development.

Because they are shorter than adults, children's breathing zones are closer to the ground, so they may breathe in higher amounts of air contaminants that are heavier than air. For example, air monitoring at a flea market that was previously a fertilizer warehouse in Puerto Rico found levels of ammonia, a strong irritant, greater than the Agency for Toxic Substances and Disease Registry (ATSDR) health guidance values. Small children walking or in strollers were particularly at risk of exposure to the ammonia vapors, which are heavier than air, because of their proximity to the ground and their limited ability to voluntarily remove themselves from the source of exposure. Mercury vapor, another example of a toxic substance that is heavier than air, is of particular concern for children (see Box 9.1).

Children are more likely to sit on the ground while playing outside and on the floor inside their homes, thereby increasing their likelihood of picking up soil and dust that may contain metals, fibers, or chemicals. Children exhibit greater hand-to-mouth behavior regardless of their environment, increasing the likelihood of ingesting soil and dust. Concern about this ingestion pathway includes not only children with soil pica (the recurrent ingestion of unusually high amounts of soil) but also all young children. Young active children without soil pica typically ingest less than

200 milligrams of soil daily (about 1/16th of a teaspoon); we typically use this level (default value) to evaluate toxic contamination from soil ingestion. Metals at concentrations of concern for young children have been found in areas with soil contaminated with arsenic and lead from mine tailings and waste.

While some childhood exposures lead to acute and observable health effects during childhood, other adverse health outcomes only become apparent after long latency periods. As life expectancy has increased, so has the likelihood of the occurrence of several diseases in adulthood related to environmental toxicants, including some types of cancer. Some **epidemiologic** and animal-model research suggests an environmental origin caused by fetal or childhood chemical exposures results in some adult chronic diseases. Research has linked chronic, low-level lead exposure early in life to the development of hypertension and other cardiovascular changes. Research has also theoretically linked early childhood exposure to some pesticides to the development of **neurodegenerative** disease in adults. One theory is that early life environmental exposures may modify tissue development that may increase susceptibility later in life.

Given children's vulnerabilities of exposure to environmental toxicants, it is imperative to consider children's health in land-use redevelopment. It is also apparent that protecting children's health from environmental toxicants not only protects less sensitive populations but fosters future healthier adults. With their role in **primary** and **secondary prevention,** public health agencies can play an important part in advocating for children's health at land reuse sites.

ATSDR and Children's Health

ATSDR has served the public since its inception as a federal public health agency in 1980, accomplishing its mission of promoting healthy and safe environments and preventing harmful exposures. Recognizing that children may be more vulnerable than adults are to environmental exposures, ATSDR launched a Child Health Initiative in 1996 to include children's health systematically in all Agency activities. ATSDR created a multi-disciplinary Child Health Workgroup to recommend actions and directions the Agency could comprehensively take to promote child health (Agency for Toxic Substances and Disease Registry, 1997). President Bill Clinton's 1997 Executive Order 13.045, "Protection of Children from Environmental Health and Safety Risks," further encouraged the Agency's emphasis on children. ATSDR's response included incorporating children's health considerations into several key documents that the Agency regularly publishes.

ATSDR's **Toxicological Profiles**, documents that summarize key epidemiologic, health, and toxicologic information available about a specific hazardous substance, include a section on children's susceptibility. The toxicological profiles include minimal risk levels (MRLs) which are screening levels. ATSDR uses them to identify environmental exposures that might harm people's health. If an exposure is below an MRL, it is not expected to result in adverse health effects. If an exposure is above an MRL, ATSDR conducts further evaluation to determine if the exposure might harm human health.

ATSDR develops MRLs using data from the epidemiologic and toxicologic literature. When the scientific data on a hazardous substance is incomplete, ATSDR applies uncertainty factors as part of the MRL calculation. These uncertainty factors help ensure that MRLs are at a level where health

effects in people are not expected by accounting for differences between health effects in humans and animals; when information about how a chemical may affect a sensitive population (for example, the very young, or people who may have other health problems) is incomplete; or when information about the chemical levels that may be associated with health effects is incomplete.

ATSDR sets each MRL well below a value that is likely to cause a health effect.

ATSDR's **Public Health Assessments and Health Consultations** also include a section on children's health considerations. Toxicological Profiles, MRLs, and Public Health Assessments and Health Consultations are discussed in more detail in Chapter 8.

Since its inception, ATSDR has convened workgroups and supported health studies to address specific questions related to children's environmental health. As early as 1988, ATSDR provided Congress with a report related specifically to children, *The Nature and Extent of Lead Poisoning of Children in the United States* (Agency for Toxic Substances and Disease Registry, 1988). In specific cases, Congress has directed ATSDR to conduct exposure investigations. For example, in 2006, children were exposed to **elemental mercury** vapors in a New Jersey daycare center (Kiddie Kollege) that was housed in a former thermometer factory. Congress directed ATSDR to further investigate and characterize these mercury exposures to children. In 2009, ATSDR summarized numerous mercury spill exposures and other sources of mercury exposure to children across the United States in its report, *Children's Exposure to Elemental Mercury* (Agency for Toxic Substances and Disease Registry, 2009).

At the community level, ATSDR has shown its commitment to protecting children's health. ATSDR has supported local community groups that performed **surveillance** for childhood lead exposure. Health education outreach has included children as a primary target audience. The "Don't Mess with Mercury" elemental mercury spill prevention initiative (see Box 9.1) and the "Recognize, Retreat, Report" public health outreach to prevent injuries from unexploded ordnance (military supplies and weapons) in Saipan (see Box 9.2) are prime examples of education outreach. ATSDR has produced educational material for children, including an activity book that teaches children how to be safe after flooding events in their communities.

To support ATSDR's efforts in promoting children's environmental health, ATSDR and the Association of Occupational and Environmental Clinics (AOEC) formed three Pediatric Environmental Health Specialty Units (PEHSUs) in 1998. Today, the U.S. Environmental Protection Agency (EPA) and ATSDR fund management of the PEHSU network. The PEHSU network has expanded to include at least one PEHSU in each of the 10 ATSDR regions, one in Canada, and one in Mexico; the units are located at leading academic medical centers. PEHSUs provide consultation to health care professionals, community groups, and parents on prevention, diagnosis, treatment, and management of environmentally related health concerns that affect children and families. The units focus on medical education and training of pediatric residents and other medical specialties. PEHSUs have hosted regional training sessions and prepared fact sheets that address specific environmental topics.

ATSDR reached out to other health care providers about pediatric environmental health through on-line trainings. ATSDR developed the **Pediatric Environmental Health Toolkit**, a training module on pediatric environmental health, in partnership with the University of California-San Francisco

PEHSU and Physicians for Social Responsibility. ATSDR also provides two continuing education primers that are part of a series, "**Case Studies in Environmental Medicine**," that specifically focus on children. The continuing education primers are *Principles of Pediatric Environmental Health* and *Taking a Pediatric Exposure History*.

After working to address harmful exposures to children at sites such as Kiddie Kollege (discussed below), ATSDR recognized the need to prevent those exposures in the first place. In 2017, ATSDR released the **Choose Safe Places for Early Care and Education Guidance Manual**. The manual is available on the ATSDR **Choose Safe Places for Early Care and Education website** along with other useful resources. ATSDR is working with a broad range of partners and providing resources to state health departments, to ensure that early care and education facilities are placed on safe locations. This effort, coupled with the "Don't Mess with Mercury" initiative and other efforts, form one of ATSDR's recent priorities: Protect Children from Harmful Exposures and Conditions.

BOX 9.1 DON'T MESS WITH MERCURY

California, 2007—Half a teaspoon of mercury was spilled from a high school science room barometer and the mercury was not cleaned up properly. Professionals were called in to assist. The clean-up cost of the mercury spill was about $20,000.

Kansas, 2008–A skate park was evacuated after police were notified of a large mercury spill. Three teenagers had taken elemental mercury from broken mechanical equipment at a former diesel shop and spread it around the park. Officials screened numerous people, 31 homes, and multiple vehicles, businesses, and schools for mercury.

Wyoming, 2013–A high school was closed for several days to allow cleanup of mercury that had been tracked throughout the school. One cup of mercury (about 7 pounds) was spilled from a broken bottle in a science classroom storage closet. Microscopes and other scientific equipment were discarded because they could not be decontaminated adequately.

Elemental mercury spills are common. Regardless of the size of the spill, and whether proper clean-up methods are used, the spills cause either minor inconveniences or major, expensive, and potentially harmful exposures. Recognizing that many of the elemental mercury spills had either occurred in schools or resulted from students handling mercury at the school, EPA requested ATSDR's assistance for health education outreach that targeted the middle school-age audience.

Elemental mercury is a heavy metal that is liquid at room temperature. The liquid properties of mercury entice students to play with it; unfortunately, mercury is toxic. It evaporates into an odorless, colorless vapor that people can inhale. Mercury has no known benefit in the body, and it is harmful to the brain, kidneys, and other organs. Children are more sensitive to health effects from mercury than adults.

The "Don't Mess with Mercury" outreach's initial goals were to create awareness about the dangers of mercury and reduce mercury exposure incidents among children. ATSDR produced a 30-second public service announcement. ATSDR also developed a Web-based game in which students had to prevent their belongings from coming into contact with mercury and correctly answer questions about mercury to win the game.

ATSDR outreach has broadened to include a mercury spill-prevention initiative that targets not only students but also teachers, administrators, and other school staff. The "Don't Mess with Mercury" Web site includes interactive educational material for students such as the Web-based game mentioned earlier, a health effects body graphic, a timeline, and a fact sheet. For adults, the Web site provides instruction on responding to mercury spills, disposing of products containing mercury, identifying and finding alternatives to products containing mercury, and developing a school policy to ensure mercury safety. Ultimately, the reduction in the number and the extent of damage of mercury-spill incidents in schools will reflect a successful public health outreach.

If you see mercury, do not mess with it—Do not touch it. Find an adult.

www.atsdr.cdc.gov/dontmesswithmercury/

BOX 9.2 RECOGNIZE, RETREAT, REPORT

Unexploded ordnance (UXO) refers to explosive bombs, grenades, mines, shells, and other military materiel that was deployed but did not detonate. Millions of pounds of UXO remained in the Pacific Islands after their occupation during World War II. During the war, Saipan, now part of the Commonwealth of Northern Mariana Islands (CNMI), was a strategic and major battleground for both Japanese and United States forces.

UXO presents a danger to the public because they are capable of detonation if disturbed. Leakage from some UXO poses risks for burns and other injuries from contact with hazardous chemicals.

In 2006, the EPA Brownfield Assessment Program awarded a grant to the CNMI Department of Public Lands (DPL) to assess the Marpi Point Village Homestead area of Saipan for the presence of UXO and contamination from munitions. DPL is in the process of clearing the UXO and safely storing and disposing of this hazardous military materiel.

DPL used part of the brownfield funding for health monitoring. DPL partnered with ATSDR, EPA, other CNMI departments, and the Northern Marianas College to document the impact of UXO on public health. Additionally, the partnership raised public awareness about the dangers of UXO and the actions that should be taken when UXO are encountered. Public health and outreach included posters, a 5-minute video, and a 30-second public service announcement. All outreach material had the same theme: "Recognize, Retreat, Report." The posters and public service announcement targeted children particularly to prevent injuries from UXO.

Medical record reviews, claims reviews, and interviews with citizens revealed that hundreds of islanders have encountered UXO. Many citizens handled the ordnance and removed the explosive compounds to make fish bombs and sell the scrap metal. Children have burned the gunpowder for fun and used UXO for decoration. Handling the UXO has contributed to at least two dozen deaths and many other injuries that included burns, eye damage, and extremity injuries (especially finger amputations).

Public health outreach has informed the community about the dangers of UXO and the actions they should take when they discover UXO. Brownfield assessment and clean-up has remediated many properties contaminated with UXO, providing more than 500 new housing opportunities for local residents.

Reference:
https://archive.epa.gov/region9/brownfields/archive/web/html/cnmi.html

CONCLUSION

Land reuse sites often are redeveloped into childcare or other facilities where children and other sensitive populations will spend large amounts of time. Knowing the history of these sites and ensuring that any contamination issues have been addressed is important. Children and their caregivers should be safe and protected from harmful exposures. Sites that are used before they are assessed, or that are improperly assessed, may have unknown contamination. If a land reuse site is available for redevelopment into a childcare facility, asking key questions can ensure that redevelopment will protect future occupants of the site. What was the site used for previously? Are potential contaminants on the site? What businesses are adjacent to the site, and what potential contamination issues exist? In addition, learning about sites in the area that may pose environmental hazards, such as gas stations or active or former dry cleaning plants, can further clarify any risks to children and help us protect children and their caregivers from environmental hazards.

CASE STUDIES: PROTECTING CHILDREN'S HEALTH IN PRACTICE

Tarah S. Somers, Margaret L. Harvey, Sharee Major Rusnak, and Kenny Foscue present examples that have led to approaches to protect children's health in land reuse areas.

CHOOSE SAFE PLACES FOR EARLY CARE AND EDUCATION

ATSDR developed the Choose Safe Places for Early Care and Education (CSPECE) because protecting children's health is an important part of good planning when developing land reuse sites. This issue is especially relevant when reusing potentially contaminated land to create a child care or early learning facility.

Child playing outside of daycare center.
Source: CDC Image Library, 2011.

The term early care and education (ECE) can include many different places where children are cared for outside of their homes. ECEs can include child care centers, family child care homes, Head Start, day-care, preschool, and pre-K. The children in these programs are very young—about five years old or younger. According to the National Association for Regulatory Administration, approximately 9.8 million children younger than five years are cared for on a regular basis outside the home by non-relatives. Of these, about 86% or 8.3 million children are in licensed child care facilities (Administration for Children and Families Office of Child Care, 2015). Additionally, an estimated one million children are enrolled in Head Start programs (Administration for Children and Families, U.S. Department of Health and Human Services, 2017). Poor siting decisions can result in children and staff being exposed to indoor or outdoor chemical contaminants in soil, water, and air. These chemical contaminants can come from sources on the ECE program property or nearby sites. It is important to protect children from a wide variety of environmental contaminants, including lead, arsenic, asbestos, polychlorinated biphenyls (PCBs), pesticides, perfluoroalkyl substances (PFAS), volatile organic compounds (VOCs), mercury, and radon.

Although school and ECE programs have many similarities, some important differences create siting considerations and challenges that are unique to ECE settings. The first key difference is that children are voluntarily enrolled in ECE, whereas attending school is mandatory. This voluntary enrollment makes it harder to track and determine the number of children in ECE programs and the number of ECE programs.

Second, many ECE programs are privately owned and operated as businesses. As such, ECE programs can be placed in buildings that are zoned for businesses, such as office buildings, strip malls, or mixed development facilities. Unlike schools, ECE programs do not generally go through a public input process. Without much public input, an ECE program might be placed inappropriately, without parents or the center operator realizing it.

Finally, most ECE programs must meet specific licensing requirements within their state to be allowed to provide care for children. These licenses require inspections and renewals that provide opportunities to catch potential problems. Schools are not licensed in this manner. In 2015, the Environmental Law Institute reviewed the child care licensing requirements of all 50 states. It found that some states have requirements for inspections for specific chemical contaminants such as lead-based paint, radon, and asbestos. However, across the country, most ECE programs were not required to conduct a site history, environmental audit, or any other type of environmental assessment to obtain a license (Environmental Law Institute, 2017).

ECE program providers follow licensing requirements and frequently go beyond those requirements to keep children safe. However, many environmental issues are not under the direct control of the ECE program provider, and providers might not be aware of past or nearby sources of contamination. When ECE programs are placed in, on, or near hazardous sites, the cause is usually a lack of awareness about the past use and nearby uses of ECE program locations, or the hazards caused by such past or nearby uses.

Whenever an ECE program is being sited, it is important to determine whether the location is affected by past activities or hazardous substances from nearby sources or land uses. The following four key considerations come from ATSDR's experiences working on ECE siting issues. A thorough consideration of these four key elements can help ensure that exposures do not reach unsafe levels.

Key Considerations for ECE Safe Siting:

- Former uses of the site that might have left harmful substances
- Migration of harmful substances onto the site from other sites, nearby infrastructure or activities
- Presence of naturally occurring harmful substances
- Access to safe drinking water

More information on Choose Safe Places for Early Care and Education can be found at the ATSDR website: **https://www.atsdr.cdc.gov/safeplacesforece/index.html**.

In 2017, ATSDR expanded the ATSDR Partnership to Promote Local Efforts to Reduce Environmental Exposure (APPLETREE) Program to include CSPECE. Currently, 25 state health agency partners will spend three years to achieve CSPECE program goals that include: defining how locations for ECE programs are selected, developing methods to help ensure ECE programs are placed on safe sites, and implementing a pilot Choose Safe Places program. ATSDR is providing technical support and guidance to the APPLETREE states to help them start their own Choose Safe Places programs.

THE KIDDIE KOLLEGE DAYCARE CENTER EXPERIENCE AND NEW JERSEY'S RESPONSE

In 2006, officials discovered that a child care center in New Jersey was located in a building that once manufactured mercury-filled thermometers. The company that made the thermometers closed operations in 1994, and the building remained vacant until 2001 when a local realtor purchased it. In 2004, a child care provider rented the facility and opened the Kiddie Kollege Day Care Center. Environmental testing sanctioned by New Jersey daycare licensing regulations at the time indicated the site was free from lead, asbestos, and radon contamination, and in compliance with licensing requirements. Despite this compliance acknowledgement, officials found elevated levels of mercury in indoor air and surface wipe samples in the center, prompting immediate closure. Officials monitored the children and staff for urine-mercury levels. At the time of the incident, New Jersey had no site history requirement for a property proposed for a childcare center. Prompted by this incident, the New Jersey legislature passed legislation requiring that a licensed indoor environmental consultant conduct an Indoor Environmental Health Assessment (IEHA) for childcare centers located on or in specific prior-use sites.

CASE STUDY: THE CONNECTICUT DEPARTMENT OF PUBLIC HEALTH AND THE SAFER PROGRAM

The Connecticut Department of Public Health (CTDPH) was an early proponent of choosing safe sites for ECE. They recognized the potential for harm if childcare centers were located on sites where environmental contamination existed. The CTDPH Environmental and Occupational Health Assessment Program (EOHA), one of ATSDR's cooperative agreement state programs, partnered with its Child Daycare Licensing Program in 2007 to create the Child Day Care Screening Assessment for Environmental Risk (SAFER) Program.

The SAFER Program is a proactive, non-regulatory approach to finding childcare centers on or near hazardous sites and raising awareness about safe childcare center siting. EOHA chose to pursue a non-regulatory approach because it was quicker and easier to implement than getting new regulations passed. It also required less resource investment than a regulatory approach. Additionally, EOHA had evidence that the regulated community (i.e., child daycare centers) would be more likely to embrace the SAFER Program if it did not involve onerous regulatory requirements that might make it costlier to open or operate a daycare. For example, requiring costly environmental site assessments before opening a daycare might prevent providers from opening a new center. Also, a non-regulatory approach afforded EOHA greater flexibility with its guidelines. After initial implementation of the SAFER Program, EOHA made (and continues to make) modifications to the program in response to suggestions from the child daycare regulators.

The SAFER Approaches

The SAFER Program was designed using three approaches to find childcare centers with potential environmental concerns. The first approach is **a crosscheck of the address** of a licensed childcare

center when the center is licensed initially that compares the address with the Connecticut Department of Energy and Environmental Protection's (CT DEEP) known hazardous waste-sites list. Currently, this crosscheck procedure is performed manually. In the near future, the manual crosscheck approach will be replaced by geographic information system (GIS) technology to search for both new and existing childcare centers within one-eighth of a mile of known hazardous sites. The second approach uses a **property history questionnaire** developed for childcare centers applying for new or renewed licenses. The questionnaire was designed to gather information that helps EOHA, in consultation with daycare licensing staff, identify childcare centers that may be located on sites with past environmental contamination. The questionnaire asks people seeking a license to provide information about the past use of the property and buildings. Questions include whether the site was used in the past as a dry cleaner, gas station, landfill or dump, funeral home, or shooting range. Also included are guidance and resources that assist applicants with the property history questionnaire. Although the questionnaire is voluntary, applicants appear to be giving the questionnaire greater attention than if it was distributed separately from the application forms because it is part of the package for a child daycare application. The third approach consists of an **inspection referral form.** New childcare centers in Connecticut are inspected by CT DPH staff and the local health department before they begin operations. Once a daycare center is in operation, it is inspected on a regular basis by state and local staff. The referral form helps inspectors identify property or building attributes that could signal the presence of hazardous contamination. The referral form also helps inspectors identify businesses that could affect the environmental quality of a location adversely, such as a dry cleaner or nail salon, that are operating near a childcare center. During regularly scheduled inspections, a child daycare inspector only needs to devote a small amount of additional time to look for building and property attributes included in the referral form. EOHA provides yearly training for its daycare inspectors on how to use the new form. The form also is provided to local health departments to use when conducting daycare inspections. Though the inspection referral form is voluntary, it appears to be used widely. Inspectors view the form as an important tool to help them ensure that daycare centers are operating in buildings and on land that is as safe as possible. The following Figure 9.1 provides a logic model of the SAFER program's protocol.

Follow-up Protocol

When the CT DPH Daycare Licensing Program refers a daycare center to EOHA, EOHA gathers and reviews all information available for the property. Coordination with the local health departments, the CT DEEP, EPA, the childcare-center provider, the property owner, and the state's Child Daycare Licensing Program is also a large part of follow-up activities. If additional action is needed, such as collecting environmental data, EOHA coordinates with all appropriate parties. For problem sites, EOHA provides recommendations to reduce exposure from environmental contaminants, and helps families and daycare workers understand the risk for potential exposures and the dangers those exposures might pose. The SAFER Program has not identified any regulations that specifically require follow-up activities at child daycare centers. Despite this lack of regulations, EOHA has not yet encountered difficulties in securing compliance with its recommendations to daycare centers. Recommendations have included soil, indoor and ambient air, and tap-water sampling and soil remediation.

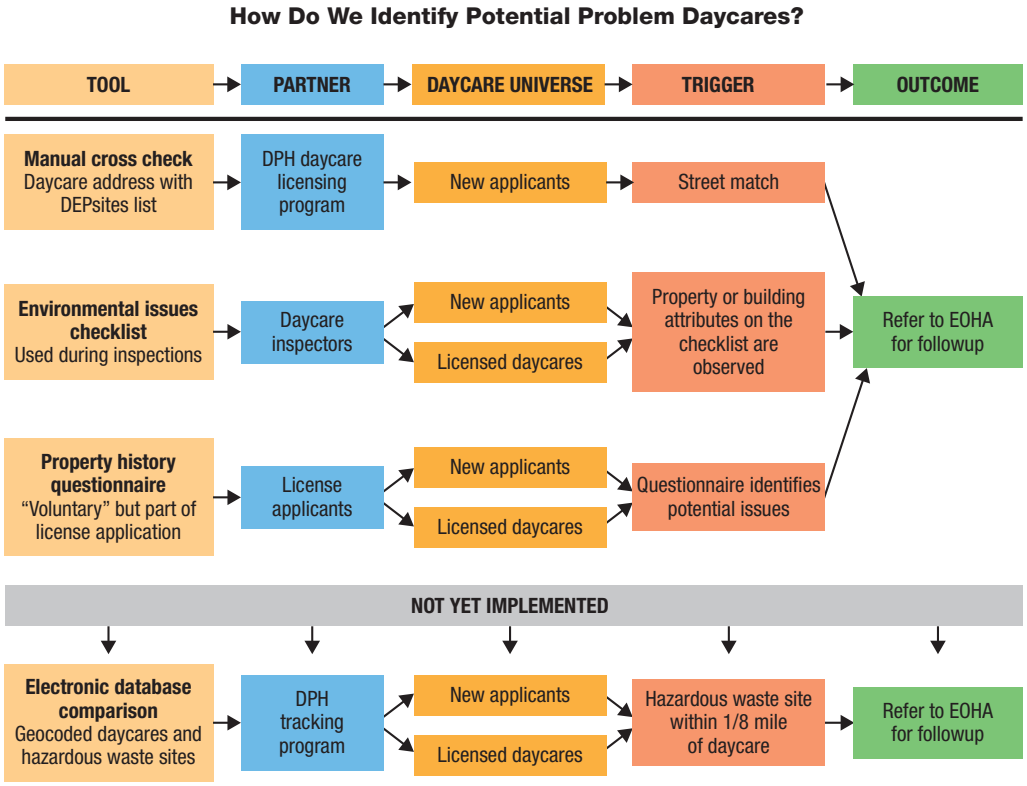
A SAFER Example

A recent case provides a good example of how the proactive, non-regulatory approach of the SAFER program works. CT DPH's Daycare Licensing Program referred a daycare center for assessment. The daycare center, located on a former herbicide and pesticide manufacturing and storage facility, was applying for a license to expand their programs. The referral was triggered by a property history questionnaire submitted as part of an application. Soil-arsenic levels were as high as 270 parts per million (ppm), greatly exceeding Connecticut's arsenic clean-up standard of 10 ppm. The assessment determined that these arsenic levels presented a potential public health risk to children who would be attending the programs there. Additional sampling was performed to better delineate the soil contamination, and interim remedial measures were put into place. EOHA facilitated the implementation of remedial actions for the soil that included excavating contaminated soil and covering with clean soil. In addition, EOHA recommended health and safety measures to prevent exposures while the interim remediation was in process, and communication with families using the daycare center to keep them apprised of activities. The site was in CT DEEP's **voluntary cleanup program,** which had no regulatory timeframe to mandate a cleanup. Without the SAFER program involvement, the new license allowing the daycare center to expand and enroll more children would have been granted. Without benefit of the additional assessment and cleanup of contaminated soil, children attending the expanded daycare center could have been exposed to the contaminated soil.

The SAFER program has assessed more than 35 referred daycare centers since it was launched in 2007. Figure 9.1 is a logic model showing how the SAFER Program works. DEP is the Department of Environmental Protection. DPH is the Department of Health. EOHA is the Environmental and Occupational Health Assessment Program of Connecticut DPH. On the left in yellow are the tools used to identify potential problem daycare centers. Because no tool is perfect, using a combination of tools to identify potential problems provides greater assurance that no issue will be missed. As stated previously, the GIS-based comparison is not yet being used. The daycare SAFER partners (daycare licensing program, daycare inspectors, and license applicants) use these tools to identify daycare centers that could pose exposure concerns. All daycare centers identified in the SAFER Program are referred to EOHA for follow-up consultation.

For more information about SAFER, visit **www.ct.gov/dph/safer**.

Figure 9.1. Identifying Problem Daycare Centers



CASE EXAMPLES: PROTECTING CHILDREN'S HEALTH

The ATSDR Land Reuse Team has provided the following case examples that are summarized at: Leading Change for Healthy Communities and Successful Land Reuse.

CONTAMINATED SITE TO SCHOOL

Land reuse sites can be redeveloped safely into schools. Moore Square Museums Magnet School (M2M3) in Raleigh, North Carolina, is one such example. The school is located in the low-income Moore Square neighborhood, which was plagued by blighted properties and drug-related crime until the early 1980s. In 1982, the city of Raleigh adopted the Downtown East Redevelopment Plan, which led to the rejuvenation of derelict parts of downtown over the next 20 years.

In 2000, plans were made to build the M2M3 School. The site on which M2M3 is situated previously housed a gas station, a rubber factor, an auto repair shop, and a prison. The years of industrial and commercial use left contamination behind, and the site required substantial assessment and remediation. During redevelopment, the discovery of petroleum-contaminated soil delayed the project for six months, which set the opening of the school back by one academic year. The affected soil was removed to a depth of 30 feet and construction resumed. The school opened in July 2002.

The M2M3 School is known not only for land reuse but also for its unique and compact design. The school occupies four acres, as opposed to the 35 acres a typical North Carolina middle school occupies. The school has benefitted students, stimulated business development, and brought new residents to the area.

Image of Moore Square Museums Magnet School. Source: Leading Change for Healthy Communities and Successful Land Reuse: https://www.atsdr.cdc.gov/sites/brownfields/docs/ATSDR_LandReuse.pdf

Contaminated Old Church to Community Center

The Immanuel Methodist Episcopal Church in Boise, Idaho, was built in 1907 and is listed in the National Register of Historic Places. The church was a fixture in the Hyde Park neighborhood in the North End of Boise, but its congregation began to shrink after another local Methodist church opened. By the end of the 1970s, the church was sold to a private investor who intended to create apartment units in the building; however, this project was never completed. The church eventually changed ownership and then fell into disrepair, lying vacant for years. By the 1990s, the church had become a haven for methamphetamine (meth) use and production. Typical meth production uses toxic ingredients and creates toxic, explosive, and flammable by-products and leaves behind a harmful residue. By 2007, the church was contaminated with toxic materials—lead paint, meth, and suspected asbestos. (See **http://www.atsdr.cdc.gov/HAC/pha/TricaImmanuelChurch/TRICA%20-%20ImmanuelChurch%20LHC%205-7-2008.pdf to review the Public Health Consultation.)**

Local resident and former professional ballet dancer Jon Swarthout had a vision to create the Treasure Valley Institute for Children's Arts (TrICA) community center by redeveloping the church property. Eventually, Swarthout acquired the property. In November of 2007, he launched a community kickoff event to introduce the planned redevelopment of the church. Swarthout recruited volunteers and private funds. Within four months, TrICA was awarded a $100,000 grant from the J.A. and Kathryn Albertson Foundation that helped launch a capital campaign. Architects, engineers, lawyers, residents, and landscapers provided in-kind services that totaled more than $400,000. Extensive remediation to remove lead and meth contamination began. It was especially important to remove toxins to protect young children who would participate in future TrICA programs. One unintentional bonus was the discovery of some structural weaknesses that could not have withstood the remediation; the structural integrity was restored.

Today, TrICA is free of toxins and has restored structural integrity. The center currently offers programs in dance and arts, as well as after school and summer camp programs.

CONCLUSION

Land reuse sites often are redeveloped into ECE facilities where children and other sensitive populations will spend large amounts of time. Knowing the history of these sites and ensuring that any contamination issues have been addressed is important. Children and their caregivers should be safe and protected from harmful exposures. Sites that are used before they are assessed, or that are improperly assessed, may have unknown contamination. By using approaches such as the SAFER Program, we can protect children and their caregivers from environmental hazards.

If a land reuse site is available for redevelopment into a ECE program, the ATSDR Choose Safe Places for Early Care and Education resources can help make sure redevelopment will protect future occupants of the site.

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CHAPTER 10

Communicating Environmental and Health Risks

Loretta Asbury and Germaine Vazquez

Communicating with the public is integral to health education and community outreach. We refer to this as health communication. While only one chapter is dedicated to this important activity, communicating with the public, especially communicating about environmental and health risks, is an ongoing activity associated with land reuse and potential exposures to chemical hazards. This chapter describes communication strategies that **ATSDR** uses to communicate environmental and health risks communities and other concerned citizens.

COMMUNICATING ABOUT ENVIRONMENTAL HEALTH RISKS

ATSDR's mission is to protect communities from harmful health effects related to exposure to natural and man-made hazardous substances. The agency does this by responding to environmental health emergencies; investigating emerging environmental health threats; conducting research on the health impacts of hazardous waste sites; and building capabilities of and providing actionable guidance to state and local health partners.

The **National Environmental Health Association** defines environmental health as the science and practice of preventing human injury and illness and promoting well-begin by

- identifying and evaluating environmental sources and hazardous agents, and
- limiting exposures to hazardous physical, chemical, and biological agents in air, water, soil, food, and other environmental media or settings that may adversely affect human health.

According to the **World Health Organization**, people are exposed to risk factors in their homes, work places and communities through:

- Air pollution including indoors and outdoors
- Inadequate water, sanitation and hygiene
- Chemicals and biological agents
- Radiation and biological agents
- Community noise
- Occupational risks
- Agricultural practices including pesticide use and waste-water reuse
- Built environments including housing and roads
- Climate change

WHO reports that environmental impacts on health are uneven across age and mostly affect the poor. Children under five and adults between 50 and 75 years old are most affected by the environment.

Knowing who is most impacted by the environment can help target health communication strategies.

Health communication continues to be area of emphasis and importance at ATSDR and in parts of the broader public health community. Over the past two decades, health communication has played

an integral part in ATSDR's comprehensive efforts to prevent or mitigate adverse human health outcomes related to hazardous substance exposure.

Health communication can take many forms, both written and verbal. Essential to the strategic planning for effective health communication, including social marketing is some variation on these steps:

- Review background information to define the problem (What's out there?)
- Set communication objectives (What do we want to accomplish?)
- Analyze and segment target audiences (Who do we want to reach?)
- Develop and pretest message concepts (What do we want to say?)
- Select communication channels (Where do we want to say it?)
- Select, create and pretest messages and products (How do we want to say it?)
- Develop promotion plan/production (How do we get it used?)
- Implement communication strategies and conduct process evaluation (Getting it out there)
- Conduct outcome and impact evaluation (How well did we do?)

Examples of Risk Communication Activities.

Communicating environmental health information is essential and an important part of the public health process. Messages must be clear and easy for people to understand the first time they receive it, so they can make informed decisions about the ways they can protect their health where they live, work, or play.

Health communications specialists can follow these steps to communicate with the public:

Be everywhere—Identify how your audience is getting the information and incorporate that channel into your communication strategy.

Provide consistent messages—Make sure the information you are providing is consistent throughout the channels to prevent confusion and misunderstandings. If you are working with partners and stakeholders on an outreach or activity, make sure all parties are providing the same messages to the public—this will help increase trust.

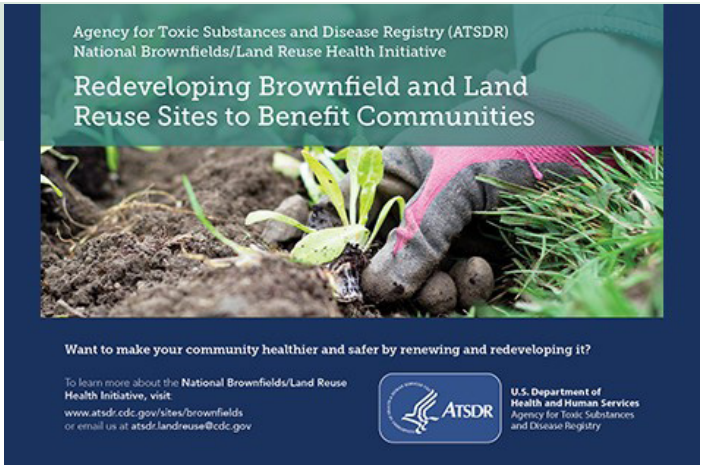
Base messages on data—Use the latest available data to create your messages and inform the public. The public might not understand all the data, and there are ways to present it, but they want to know that the information you are providing is based on the latest science.

If it's predictable, we shouldn't be surprised—Plan ahead and be prepared. Have your messages and communication materials as ready as possible. In addition, know the communication channels that your audiences prefer to use. Planning to use those channels that you know will be available, especially during a crisis will help ensure your audience receives the messages in a timely manner.

SHARING ENVIRONMENTAL HEALTH INFORMATION

By paying attention to who is most impacted by the environment and how people prefer to receive information, health communicators can explore using various channels for reaching their intended audience and share critical health information. For example, ATSDR uses public meetings, news media, social media, stories, blogs, fact sheets, publications, tools, and other resources. In addition, the agency uses infographics to visually represent environmental health information and data. Infographics are designed to present information to audiences quickly and directly, and they can help people to understand and digest information through data visualization.

ATSDR's National Brownfield/Land Reuse Health Initiative Infographic.
Source: ATSDR, 2016



Examples of ATSDR's resources for communicating about environmental health and land reuse are included below:

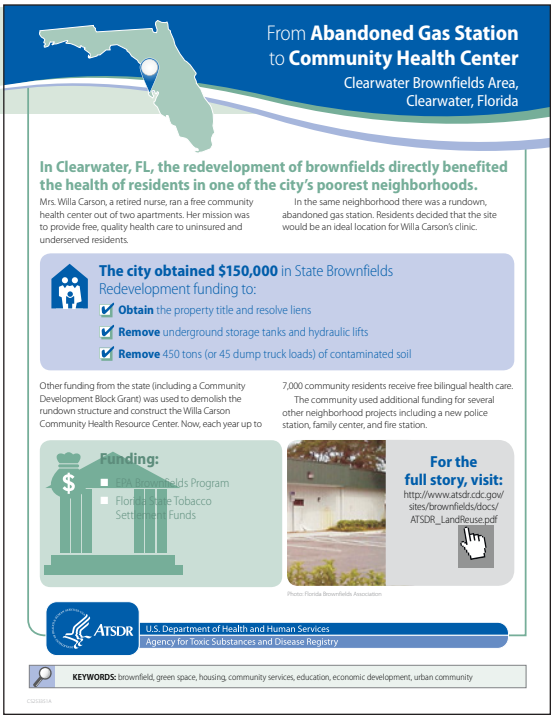
Success Stories and Blogs:

- **Sharing Our Stories: ATSDR's Impact on Public Health**
- **Success Stories in Environmental Health**
- **Choose Safe Places for Early Care and Education**
- **If These Brownfields Could Talk**
- **Soil Kitchen (SoilSHOP): Reducing Lead Exposures among Urban Residents**
- **SoilSHOP**

Leading Change Case Studies:

- From Waste Site to Thriving Neighborhood—Kenosha, Wisconsin
- From Abandoned Gas Station to Community Health Center—Clearwater, Florida
- From Polluted Flood Plain to Thriving Greenway—Jefferson County, Alabama

Image of Successful Redevelopment Story in Clearwater, Florida. Source: ATSDR, 2015



Tools

- Action Model Toolkit
- Community Health and Site Inventory Tools

Videos

- About ATSDR
- Brownfields and Land Reuse
- Screening, Health, Outreach and Partnership (SoilSHOP)
- Choose Safe Places—Animated Video (see also: https://www.youtube.com/watch?v=rIgkY0ORGYk)

Other Resources

- Promoting Environmental Health in Communities
- ATSDR Communication Toolkit
- CDC Environmental Health Infographics
- Principles of Community Engagement, Second Edition
- Planners Guide: Making Health Communication Programs Work

CRISIS AND EMERGENCY RISK COMMUNICATION

As noted in CDC's Crisis and Emergency Risk Communication (CERC) Manual, the field of environmental health elevated the prominence of risk communication. Risk communication is used to help individuals adjust to something that has already occurred.

EPA defines risk communication as the process of informing people about potential hazards to their person, property, or community. Scholars define risk communication as a science-based approach for communicating effectively in situations that are of high concern, high stress, emotionally charged, or controversial. It is how we communicate with communities about the nature and level of risks, such

as from environmental exposures, and what steps we can take to change that level of risk. Examples of risk communication situations are events such as floods, hurricanes, chemical spills, lead in water, contaminated sites, bridge collapses. Often the events we as public servants are called upon to respond to are out of our control. However, we can influence how well our communities respond to and recover from disasters.

As a leader in a crisis, you can have a real and measurable effect on your community through the words you use, the speed with which you deliver messages, and the sincerity that you convey. What you say, when you say it, how you say it, and who says it are critical elements in the emergency response. **Research indicates** that in a natural disaster, your audiences(s) will gauge the effectiveness of the operational response by the amount and speed of relevant information they receive from emergency response officials. A crisis affects the way people take in information, process that information, and act on information. That means the way you typically communicate may not be effective in a crisis.

Risk communication involves more than explaining a health risk to the public. It includes a solid understanding of community concerns and a well-planned, multi-component communication plan to help gain feedback, address concerns, establish trust, alleviate fear or anger, and explain information in an effective, yet sympathetic manner.

Communicating Risk

When communicating health risks, such as from exposures to harmful chemicals during spills or from brownfields that may have chemical contamination issues that can affect nearby residents, a crisis communication plan is typically developed. The **crisis communication plan** provides a basic, general structure that can help present information that is simple, credible, accurate, consistent, and delivered on time. The crisis communication plan should address all the roles, lines of responsibility, and resources needed for providing information to the public, media, and partners during a crisis.

Image of public meeting led by a risk communicator. Source: ATSDR, 2009.

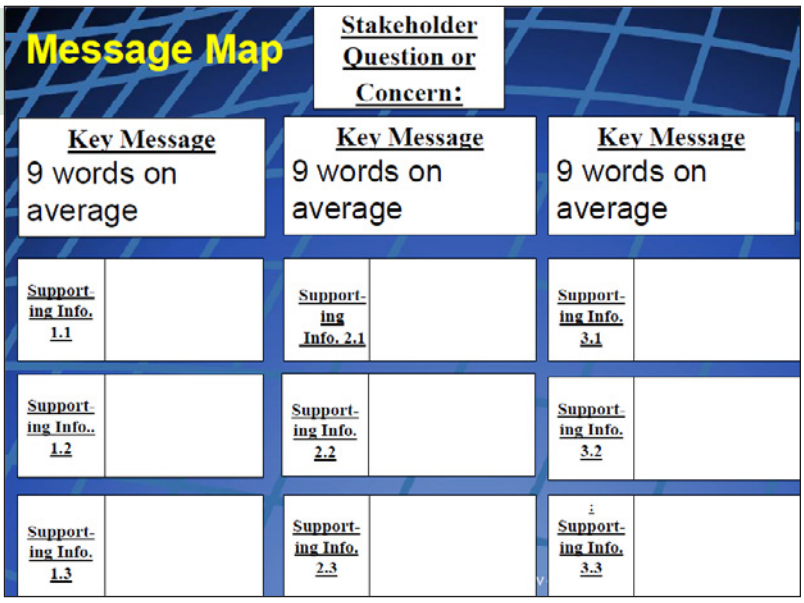
The person communicating risks to community members may be a health educator or a specialist in communication or risk communication. The communicator usually researches the community and partners with local officials and others to get a working knowledge of the community.

The audience(s) may be residents or local officials. They expect to learn enough information to make well-informed decisions that will protect them, their families, and their pets. The public typically likes to take an active, participatory role. Individuals want your message to answer **these questions:**

- Am I (are we) safe?
- What have you found that will affect me (my family)?
- Who (what) caused this problem?
- Can you fix it? If not you, then who?
- How can I protect myself (my family) in the future?

The Center for Risk Communication recommends the use of three main points, or key messages. You need to define the "who, what, where, when, why, and how" about the health risk incident. Speak in clear and concise language, without jargon and with respect for the audience. Be sure that your messages are consistent with your actions. For example, don't tell people that their homes are safe, then wear protective clothing when you enter their homes. Vincent Covello, PhD, created a useful Message Mapping document which can be downloaded **here**. ATSDR also offers a **message map template** you can use.

Image: Message Map.
Source: Covello, 2007



When communicating about environmental health risk, you can predict and prepare responses to possible **questions**. Some typical questions concerned people ask include:

- What is the effect of these chemicals on my health?
- What levels of this chemical are safe?
- Are my children at any special risk?
- We've lived here for 20 years. Are we more likely to get cancer than people who have been here for only 5 years?
- What is the worst-case scenario?
- Why has it taken so long for the government to take action?

In cases when you may not have a local risk communication expert available, especially if you are in the middle of a crisis situation, addressing an angry community, or have to work with the media, you may want to contact your state health or environmental agency for assistance. These agencies typically have professionals trained in risk communication, such as public affairs specialists or public information officers who may be able to assist you.

Engaging the Community in Environmental and Health Risk Communication

Community engagement is a critical part of the process to communicate about environmental and health risks. **Principles of Community Engagement** defines community engagement as "the process of working collaboratively with groups of people who are affiliated by geographic proximity, special interests, or similar situations with respect to issues affecting their well-being." Community residents, site personnel, citizen groups, health professionals, and state and local government representatives are all unique sources of information needed to effectively communicate about the public health risks of exposure to environmental hazards. They can provide information concerning site background, community health concerns, demographics, land and natural resource use, environmental contamination, environmental pathways, and health outcomes.

Information is needed from the community at several points in the health risk communication process. Involving the community in the information-gathering process makes messages more credible and sets the stage for community participation in helping to resolve problems. Communities need and want to be actively involved in identifying, characterizing, and solving problems that affect their lives.

RISK COMMUNICATION RESOURCES

- Center for Risk Communication—New York City, NY (Vincent Covello, Ph.D.) **www.centerforriskcommunication.org**
- Peter Sandman Risk Communication Web Site **www.psandman.com**
- Centers for Disease Control and Prevention—Crisis and Emergency Risk Communication (CERC) **http://www.cdc.gov/healthcommunication/risks/index.html**
- Agency for Toxic Substances and Disease Registry—A Primer on Health Risk Communication **www.atsdr.cdc.gov/HEC/primer.html**

SECTION III OVERVIEW:

Redesign the Community with Health in Mind

In Sections One and Two we describe the first three steps of the ATSDR 5-step Land Reuse Strategy to Safely Reuse Land and Improve Health (5-step Land Reuse Model): Organize the Development Community; Evaluate Environmental and Health Risks; and Communicate Environmental and Health Risks.

In this section, we describe **step 4,** how Development Communities Redesign the Community with Health in Mind. We introduce smart planning practices, such as developing with Smart Growth principles, redeveloping potentially contaminated or underused properties into agricultural sites, alternative energy initiatives, and housing. We describe creating highways to healthcare through land reuse and redevelopment, and we include plans for sustainability. By considering ways to redesign the community with health in mind, over the long term, we can plan smart to improve the environment—where we live, work, and play—for many generations to come.

CHAPTER 11

Planning Smart

Laurel Berman, Christopher A. De Sousa,
Lily-Ann D'Souza, and Christopher Kochtitzky

INTRODUCTION

Land reuse sites offer opportunities for "smart" planning to redesign the community with health in mind. What does this mean? Smart planning provides strategies that help create Healthfields: former land reuse sites that have been transformed from underused, contaminated properties into a vibrant area that serves a number of community health needs.

Smart planning is a long-range, comprehensive plan that can include redevelopment strategies to conserve and improve the environment while maximizing community health outcomes. Smart planning includes Smart Growth: a range of development and conservation strategies to help protect our environment and create economically diverse communities where people choose to live, work, and play because they are attractive and economical options as opposed to forced decisions (American Planning Association, 2014). As planning and public health practitioners, we see Smart Growth to be a part of land-use law and zoning, which can lay the framework for overall healthy redevelopment and can lead to a healthy community.

We can endorse the smart planning principles by considering the broader health outcomes of planning. We can base redevelopment decisions on what the community decides is best for them, including access to green space, economic development, transportation, health care and health services, nearby schools, and many other assets. At the same time, smart development plans can protect the environment and preserve natural areas.

SMART PLANNING RESOURCES

Many communities are creating development and revitalization strategies that incorporate smart planning principles. These strategies preserve land, improve the environment, reuse land, and incorporate neighborhood design to include amenities that are within walking and biking distance of housing. Several communities have employed these strategies. Kenosha, Wisconsin, relocated a middle school to a former brass foundry site that has become home to a full-service grocery store, mixed-use housing, and many new single-family houses. Blue Island, Illinois, remediated and returned a former manufactured gas plant site to a natural area that is now connected to the Cal-Sag Recreational Trail. Blue Island also started community gardens in areas devoid of nearby grocery stores, offering fresh produce to neighborhood residents. Portland, Oregon, created a park on a remediated and redeveloped landfill with a community garden bordering the site. Many of these projects benefitted the community by incorporating Smart Growth principles or other smart planning resources into them.

The following are brief summaries of some of the key programs and initiatives that support smart planning.

American Planning Association (APA)

APA has developed the **Growing Smart Legislative Guidebook**, which is the culmination of a seven-year research project. The guidebook contains the next generation of model planning and zoning (American Planning Association, 2002).

In addition, APA has an extensive **Policy Guide on Smart Growth**. APA identifies Smart Growth as "growth that supports choice and opportunity by promoting efficient and sustainable land development, incorporates redevelopment patterns that optimize prior infrastructure investments, and consumes less land that is otherwise available for agriculture, open space, natural systems, and rural lifestyles." APA's 16 Smart Growth Principles (American Planning Association, 2014) are:

- Efficient use of land and infrastructure
- Creation or enhancement of economic value
- Greater mix of uses and housing choices
- Neighborhoods and communities focused around human-scale, mixed-use centers
- Balanced, multi-modal transportation systems that provide increased transportation choices
- Conservation and enhancement of environmental and cultural resources
- Preservation or creation of a sense of place
- Increased citizen participation in all aspects of the planning process and at every level of government
- Vibrant center city life
- Vital small towns and rural areas
- Multi-disciplinary and inclusionary processes to accomplish smart growth
- Planning processes and regulations at multiple levels
- Regional view of community, economy, and ecological sustainability
- Recognition that institutions, governments, businesses, and individuals require a concept of cooperation to support smart growth
- Local, state, and federal policies and programs that support urban investment, compact development, and land conservation
- Well-defined community boundaries, such as agricultural greenbelts, wildlife corridors, or greenways permanently preserved as farmland or open space.

The U.S. Environmental Protection Agency (EPA) supports a Smart Growth initiative to help communities improve their development practices and encourage environmentally sensitive development strategies. Information about the EPA Smart Growth initiative is available at this Web links: **http://www.epa.gov/smartgrowth/basic_info.htm**

The EPA Smart Growth program helps communities improve their development practices. The EPA Smart Growth program (U.S. Environmental Protection Agency, 2013):

- Conducts research
- Issues reports and other publications
- Showcases outstanding communities
- Works with communities through grants and technical assistance
- Brings together diverse interests to encourage better growth and development

To bring smart growth practices to more communities nationwide, the **Smart Growth America Coalition, a national organization dedicated to research and advocacy**, is leading a national effort with state and local organizations. The coalition advocates for smart growth policies, supports smart growth programs and initiatives, provides technical assistance to communities that are interested

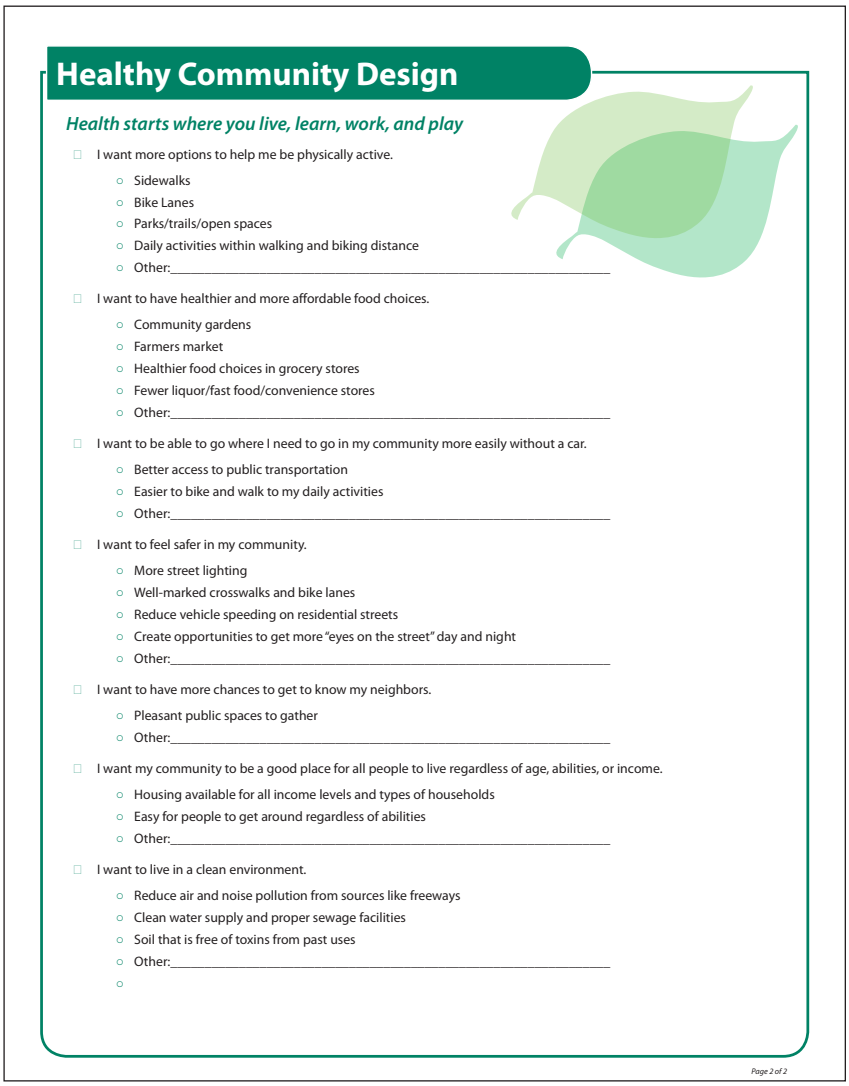
in smart growth strategies, and supports research and guides that highlight smart growth strategies. These efforts can help generate community revitalization initiatives in housing, businesses, jobs, and local transportation.

SMART PLANNING INITIATIVES

Through the **Healthy Community Design Initiative**, the Centers for Disease Control and Prevention (CDC) supported smart community planning.

CDC's National Center for Environmental Health's **Healthy Places website**, while archived, still provides additional resources for healthy community planning. See: **https://www.cdc.gov/healthyplaces/factsheets.htm**. One of the links within this Web page is the Healthy Community Design Checklist Toolkit. See: **https://www.cdc.gov/healthyplaces/factsheets/healthy_community_checklist.pdf**.

Healthy Community Design Checklist. Source: http://www.cdc.gov/healthyplaces/toolkit/default.htm. Accessed July 24, 2017.



Healthy Community Design

Health starts where you live, learn, work, and play

- ☐ I want more options to help me be physically active.
  - ○ Sidewalks
  - ○ Bike Lanes
  - ○ Parks/trails/open spaces
  - ○ Daily activities within walking and biking distance
  - ○ Other:_____
- ☐ I want to have healthier and more affordable food choices.
  - ○ Community gardens
  - ○ Farmers market
  - ○ Healthier food choices in grocery stores
  - ○ Fewer liquor/fast food/convenience stores
  - ○ Other:_____
- ☐ I want to be able to go where I need to go in my community more easily without a car.
  - ○ Better access to public transportation
  - ○ Easier to bike and walk to my daily activities
  - ○ Other:_____
- ☐ I want to feel safer in my community.
  - ○ More street lighting
  - ○ Well-marked crosswalks and bike lanes
  - ○ Reduce vehicle speeding on residential streets
  - ○ Create opportunities to get more "eyes on the street" day and night
  - ○ Other:_____
- ☐ I want to have more chances to get to know my neighbors.
  - ○ Pleasant public spaces to gather
  - ○ Other:_____
- ☐ I want my community to be a good place for all people to live regardless of age, abilities, or income.
  - ○ Housing available for all income levels and types of households
  - ○ Easy for people to get around regardless of abilities
  - ○ Other:_____
- ☐ I want to live in a clean environment.
  - ○ Reduce air and noise pollution from sources like freeways
  - ○ Clean water supply and proper sewage facilities
  - ○ Soil that is free of toxins from past uses
  - ○ Other:_____
  - ○

Page 2 of 2

The Healthy Community Design Checklist can initiate thinking about healthy community design and can be a great asset at beginning planning stages.

In addition, CDC's Division of Nutrition, Physical Activity, and Obesity's Web site focuses specifically on active living through built environment strategies. See: **http://www.cdc.gov/physicalactivity/strategies/community.html**

In partnership with CDC's Health Community Design Initiative, APA (American Planning Association, 2013) is conducting a multi-year research study. The purpose of the study is to identify, evaluate, and analyze the plan-making processes and the health goals, objectives, and policies of local comprehensive plans developed and adopted by communities across the United States. Initial findings include:

- Approximately 27% of all respondents reported that their jurisdiction officially adopted comprehensive plans clearly addresses public health

- The most commonly used types of data and data tools included the environmental impact assessment, economic feasibility study, and the brownfields study
- Fewer than one third of surveyed communities responded affirmatively when asked the following questions: Have brownfields or the improper or unsafe reuse of brownfields been identified as a potential threat to human health? Have brownfield locations been identified and inventoried for their potential liability to human health? Does the plan identify brownfield locations that may be opportunities for infill (developing within an already-developed area) or other new redevelopment if cleaned up?
- Those few communities that addressed brownfields often used resources such as Community Development Block Grants and brownfield tax credits to support their land redevelopment and reuse efforts

Image: Cover of the American Planning Association's (APA's) Healthy Plan Making report. Source: APA, 2013.

Through CDC funding, APA produced **Healthy Plan Making: Integrating Health into the Comprehensive Planning Process: An analysis of seven case studies and recommendations for change** (Ricklin and Kushner, 2013). This report provides a qualitative analysis of integrating public health in the planning process through a review of seven case studies.

SMART PLANNING MODELS AND PROGRAMS

Broader sustainable development models and programs incorporate the principles of Smart Growth. EPA is seeking to promote more sustainable and healthier approaches to redeveloping brownfield sites through various programs. In 2008, EPA provided technical assistance to 16 Brownfields Sustainability Pilot Programs to help incorporate sustainable features such as green building, energy efficiency, water conservation, and native landscaping. Beyond the technical assistance, a key benefit of the program was enlightening project coordinators and developers about concepts of sustainability, smart growth, and community health early in the visioning process. A year after the launch of this program, EPA collaborated with the U.S. Department of Housing and Urban Development (HUD) and the U.S. Department of Transportation (DOT) to introduce an initiative called the Partnership for Sustainable Communities. The program fosters smart growth outcomes at the site and on the neighborhood scale, and helps coordinate federal housing, transportation, water, and other infrastructure investments. The Partnership is guided by six principles of livability that aim to: provide more transportation choices; promote equitable and affordable housing; enhance economic competitiveness; support existing communities; coordinate and leverage federal policies and investment; and value communities and neighborhoods in a way that promotes healthy, safe, and more walkable neighborhoods.

Many communities in the development arena are seeking to develop healthier and more sustainable projects by using the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) rating systems. LEED is a green-building certification program that recognizes best-in-class building strategies and practices. The assessment tool is divided into five categories related to location, water conservation, energy, materials, indoor environmental quality, and innovation and design. Each category contains a specific number of credits, and each credit carries one or more possible points. For instance, redeveloping a brownfield is allocated points within the Sustainable Sites category. A project that earns enough points can become "LEED Certified," and more points can be earned to move up the ladder to Silver, Gold, or Platinum LEED status. The overarching goals of these green-building tools are to achieve sustainability-oriented benefits, including those related to health and safety. Although the initial rating system focused solely on the construction of new commercial buildings, many other LEED products to rate development projects have been developed or are being developed (e.g., new commercial construction and major renovation projects; homes; and schools).

While most rating systems are building specific, the USGBC, the Congress for the New Urbanism (CNU), and the Natural Resources Defense Council (NRDC) have also developed the LEED for Neighborhood Development (LEED-ND) rating system. CDC contributed to the development of the LEED-ND rating system (see **http://www.cdc.gov/healthyplaces/factsheets/leed-nd_tabloid_final.pdf**). The LEED-ND system focuses on the neighborhood scale, and rates location and design based on the combined principles of smart growth, new urbanism, and green building. Credit categories include Smart Location and Linkage (e.g., reduced automobile dependency); Neighborhood Pattern and Design (e.g., walkable streets, mixed-income residents, diverse communities); Green Infrastructure and Buildings (e.g., building energy efficiency); Innovation and Design Process (e.g., innovative performance beyond the existing credit system); and a Regional Priority Credit (e.g., significance of project to local environment). The LEED-ND pilot program was initiated in the summer of 2007 and tested on nearly 240 projects. The post-pilot version launched in 2009; 170 projects were registered in the program as of May 2013, with 19 completed projects, 10 of which incorporated brownfields redevelopment.

HEALTHY PLANNING EXAMPLE: SOUTH WATERFRONT DISTRICT REDEVELOPMENT IN PORTLAND, OREGON

A current LEED-ND project that illustrates best practices in building smarter, healthier, and more sustainable communities is the South Waterfront District redevelopment in Portland, Oregon. Situated within the North Macadam Urban Renewal Area, the South Waterfront District is located south of downtown Portland on 140 acres of former industrial land. After Portland adopted the Central City Plan in 1988, the city envisioned the South Waterfront District as an urban, mixed-use neighborhood (Portland Bureau of Planning, 2002). While the particular details of the vision for the project have evolved incrementally and adapted to meet Portland's changing economic and social needs, the primary objective of each successive plan has remained consistent. This primary objective was to re-establish connectivity between the South Waterfront District and the neighboring communities and transform the Willamette River waterfront into a public amenity with opportunities for recreational and civic activities.

Portland initiated Phase 1 of the South Waterfront redevelopment in 2003, overlapping with the environmental assessment and remediation efforts. Although Phase 1 projects were not geography specific, they were concentrated in the Central District plan area within the South Waterfront District (see following map). The South Waterfront Central District Project Development Agreement described the key Phase 1 redevelopment projects in the following terms.

Transportation. Portland prioritized multi-modal transportation options early in the redevelopment process to address the physical isolation of the South Waterfront District and re-establish connectivity between the plan area and surrounding neighborhoods. The objective of prioritizing access to public transit and bicycle and pedestrian pathways was to encourage alternative modes of transportation while reducing dependency on automobile use.

Portland Street Car Extension. Infrastructure improvements in the South Waterfront District included an extension of the Portland Streetcar, which provided employees, residents, and visitors with a connection to the city center as well as adjacent neighborhoods. Portland completed the streetcar extension in October 2006; the extension follows a 7.5-mile loop with three stops in the South Waterfront District, one of which serves as a transfer point to the aerial tram (Portland Development Commission, Undated).

Aerial Tram. The construction of an aerial tram linking Oregon Health and Sciences University's (OHSU) existing campus on Marquam Hill with its new facilities in the South Waterfront District was a critical component of the Development Agreement. The tram travels 22 miles per hour, completing a one-way trip in three minutes, and operates at a 99.8 % reliability rate (Oregon Health and Science University, Undated). This ensures that OHSU's medical and research staff can travel quickly between the campuses without compromising patient care and service delivery (Williams and Newman, 2010). The tram functions as part of Portland's transportation network, restoring public access between the South Waterfront District and downtown Portland.

Open Space. Declining water quality and habitat degradation in the Willamette River, as well as a shortage of public space in the South Waterfront District, motivated Portland to explore efforts that would renew the river ecology while providing public access to the waterfront access and parklands (City of Portland, 2010).

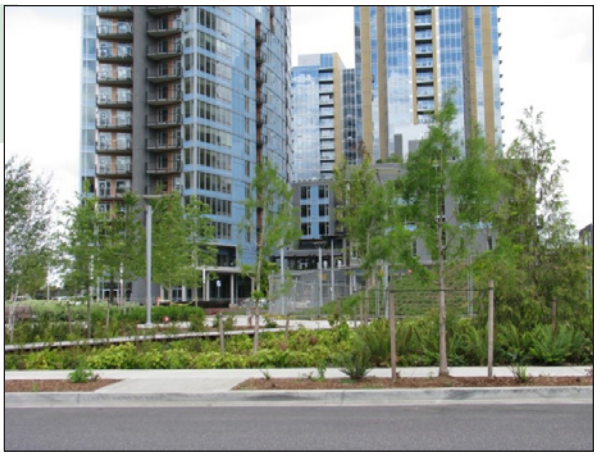
Willamette River Greenway Expansion. Extending the Willamette River Greenway from downtown Portland through the South Waterfront District facilitates connectivity between the renewal area and surrounding neighborhoods. Situated an average of 125 feet from the riverfront, the 38-acre South Waterfront Greenway offers alternative transportation routes and passive and active recreational opportunities to visitors and residents.

Elizabeth Caruthers Park. Portland completed work on a 2-acre neighborhood park in the Central District formally known as Elizabeth Caruthers Park in 2010 on land once used as a public storage facility (U.S. Environmental Protection Agency, 2012). The completed park offers active and passive recreational opportunities, while the design of its re-naturalized landscape absorbs and treats stormwater runoff. Portland considers the park a focal point for civic activity in the Central District and part of their open space network.

Housing. The renewal plan for the South Waterfront District includes developing 3,000 residential units with market-rate, affordable home ownership and rental options. Developers are pursuing LEED-ND certification for the plan. This plan could make the renewal area one of the most densely and sustainably designed communities in the country. Sustainable-design strategies include orienting buildings to optimize solar radiation, district heating, on-site stormwater management, and mixed-use and transit-oriented development. The LEED-ND certification will validate the commitment to Smart Growth and sustainable development adopted by the project partners during the project visioning.

Economic Development. The mixed-used approach to development within the South Waterfront District includes strategies to promote "a mix of occupations and wage levels that provide a range of employment opportunities" (Portland Development Commission, Undated).

Photograph of residential building in the South Waterfront District. Source: Christopher DeSousa, 2010.



Portland considered OHSU particularly inspirational to the development of a biotechnology cluster as part of the city's efforts to encourage economic development and diversification. Expansion of the OHSU campus within the South Waterfront District would take advantage of "an existing industry base" and promote industry growth (Portland Development Commission, Undated).

OHSU Center for Health and Healing. The completion of the 16-story Center for Health and Healing in 2006 provided OHSU with 400,000 square feet of additional research and clinic space. The developer, Gerding Edlen, also pursued LEED certification. Edlen integrated several sustainable design features such as solar power generators, 100% wastewater treatment and recycling, and "a large-scale onsite microturbine plant" (Gerding Edlen, undated). The Center for Health and Healing was the largest LEED Platinum project in the nation and the first medical facility in the world to be built to this standard. The building is devoted to physician practices, surgery and imaging, health and wellness, and education and research (Gerding Edlen, undated).

Photograph of OHSU Center for Health and Healing in the South Waterfront District. Source: Christopher DeSousa, 2010.

It is noteworthy that the South Waterfront project is not an isolated best-practice case, but one of a growing portfolio of smarter and healthier brownfield projects in Portland that incorporate sustainable elements. The Portland Development Commission, Portland's Bureau of Environmental Services (that manages the city's brownfields program), and other government agencies, nonprofits, and private developers are taking a very proactive and progressive approach to brownfields redevelopment. These Portland collaborators are targeting sites throughout the city and incorporating Smart Growth elements into their redevelopment. Portland has developed several exemplary sustainable brownfields projects in the city; the following sidebar outlines a few of those projects.

TABOR COMMONS

A small corner lot in inner southeast Portland was converted from a gas station to a green community cafe and now houses a new tenant, Vibe of Portland, which offers art and music education to underserved youth.

JUNE KEY DELTA COMMUNITY CENTER

An African-American sorority converted a small corner gas station and convenience store into a green building where community outreach and tutoring services are provided

THE YARDS AND UNION STATION

An EPA Phoenix Award-winning project converted a former rail yard into a LEED-rated redevelopment with affordable family housing

THE WATERSHED AT HILLSDALE

A former auto wrecking facility, rail stop, and barn in Southwest Portland was converted into a 51-unit, senior-resident, affordable housing project with extensive building efficiency and stormwater management features

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CHAPTER 12

From Brown to Green: Creating Food Systems to Grow Community Health

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INTRODUCTION

The vacant gas station at the corner, a shuttered strip mall, or an abandoned manufacturing plant all may be places rich with economic opportunity. Sites like these are common—many attest a legacy of pollution. With 10 million vacant properties and more than 450,000 brownfields across the U.S., if you have one near your community, you are not alone.

Image of a vacant commercial building.
Source: ATSDR, 2013.

Over the past several years, community leaders have worked with both public and private partners to revitalize underutilized and vacant properties and make them places where residents can grow food. This chapter shows communities how to accomplish this goal.

If your town or neighborhood has brownfield properties, you have the opportunity to work with local leaders to clean them up and help fulfill the community vision to create a healthier environment, a healthier community, and a stronger and more diversified local economy. Revitalizing brownfields is a quest that occupies **urban and rural** communities alike. Two profound ironies in the history of the U.S. fuel the need for revitalization.

First, most of our major cities were founded on some of our best topsoil. This means that much of our most fertile soil, once vital to feeding urban residents, has been planted with skyscrapers, sprawling housing subdivisions, and industrial parks. As population has increased, more and more of this land has become unavailable for food production, so food has to come from further and further away, including outside of the United States. California's densely populated Silicon Valley, for example, occupies some of the richest farmland in the state.

Moreover, industrial development often has polluted land that was once (and may still be) exceptionally fertile. As the industrial core has weakened, many of these industrial zones have become lower-income neighborhoods. Residents have few farming skills and cannot afford the highest quality food because shipping from distant sources makes it expensive. These circumstances are ironic, given that many of these residents live on urban lands that once housed proud farms.

The very existence of sites like brownfields shows that the worthiest economic development strategies may have unintended consequences over time. Indeed, having complete access to a wide range of nutritious food, or **"food security,"** is a by-product of how we have viewed "economic development" traditionally.

Second, prevailing farming practices in rural areas often have depleted the soil's fertility, eroding the soil or leaving a chemical residue. This means that many agricultural fields require restoration.

Urban and rural areas hold several other qualities in common. Both import more than 90% of their food. Even farmers increasingly rely on food they purchase at grocery stores while exporting commodities that other countries will process into food items. As such, rural and urban residents are vulnerable as oil prices rise, which in turn drives up the price of transporting food.

The cities of the future, like the cities of the past (which grew without relying upon oil), may survive only if they find ways to feed themselves from relatively local sources. Cities that depend mostly on imported food may find they cannot sustain their current population base.

The farms of the future, like the farms of the past, may be economically sustainable only if they form close connections with nearby consumers—urban and rural (including suburban areas of cities)—and provide them food reliably. Under future development pressures, farmlands that clearly feed local residents may garner the most support for protection as farm fields and rural landscapes.

This means that converting potentially contaminated sites into healthy soils may be critically important. Restoration will likely increase the amount of organic matter in the soil, improve soil percolation rates, add healthy microflora to the soil profile, and foster wildlife. Furthermore, if properly restored, these lands may play a critical role in urban and rural survival.

LAND REUSE SITES AND FOOD SYSTEMS

How do contaminated sites or potentially contaminated sites connect to the food system? Understanding this first requires the definition of a food system. Local and regional food systems, according to the U.S. department of Agriculture's (USDA) National Agricultural Library are clusters of a wide variety of agricultural producers, such as farmers, ranchers, fishers, as well as consumers and institutions that produce, process, distribute, and sell foods. Source: ***Trends in U.S. Local and Regional Food Systems: A Report to Congress***.

The **2014 U.S. Census defines a farm as**:

> *"Any place from which $1,000 of agricultural products were produced and sold, or normally would have been sold, during the Census year."*

More broadly, a food system is a complex network of social and commercial relationships that conveys food from producers to processors, wholesalers, and retail customers, and recycles organic wastes into new fertility. This entire cycle of activity depends on healthy soil, clean air, and clean water.

Because any place producing and selling $1,000 or more agricultural products in a year qualifies as a farm, many opportunities exist for urban farmers to create new livelihoods, keep property values high, and strengthen local economies.

The updated 2012 Agricultural Census (U.S. Department of Agriculture, 2014) (available at **http://www.agcensus.usda.gov/Publications/2012/#full_report**), estimates the U.S. has 2,109,363 farms. This estimate is a 4.3% decline from the earlier 2007 estimate of 2.2 million farms.[3] Our food system encompasses all the food produced from those estimated 2.1 million farms as well as the estimated 358 pounds per capita of imported food we eat. Perhaps less obviously, our food system also encompasses the harvesting, processing, packaging, and transporting of food to our supermarkets, farmer's markets, and other locations where we purchase our food.[4]

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3 For more information on the USDA Agricultural Census, please see: https://www.nass.usda.gov/AgCensus/.

4 USDA, Economic Research Service, "In 2009, U.S. food consumption totaled 654 billion pounds, or more than 2,100 per capita. Of this amount, imports accounted for 17 percent (110 billion pounds), or 358 pounds per capita." For additional information, please see: http://www.ers.usda.gov/topics/international-markets-trade/us-agricultural-trade/import-share-of-consumption.aspx.

FOOD PRODUCTION IN FORMER AGRICULTURAL AREAS

Vacant, underused, and potentially contaminated properties in many urban, suburban, and rural areas are being assessed and cleaned up for food reuse purposes. Following are several examples of properties that highlight multiple reuse approaches that can contribute to improving local food systems.

Image of Children's Garden in a Brownfields Community in Utica, New York. Source: New York State Department of Health, 2013.

Fortunately, we have encountered few former farms or food production facilities that we identified as contaminated while they were in use for food production. Greenhouses used for flower production, such as the H.L. Schenker Farm in Lynchburg, Virginia, were contaminated from past pesticide use on roses, and lead-based paint in some soil areas outside greenhouses. A community-based organization, **Lynchburg Grows**, now uses the former Schenker farm for local agriculture. The Virginia Department of Environmental Quality (DEQ) provided technical assistance to Lynchburg Grows and oversight on the testing and cleanup under their voluntary cleanup program. This assistance allowed Lynchburg Grows to expand their operations and continue their food production and educational outreach. To learn more about their efforts, please see the case study in Chapter 15 or visit the Lynchburg Grows Web site (**http://www.lynchburggrows.org/**).

In 2010, Kansas City, Missouri, received one of 23 brownfield Area Wide Planning pilots awarded nationwide by the U.S. Environmental Protection Agency (EPA). Kansas City, with an established brownfields program, planned to examine an area with multiple brownfields to determine the infrastructure and other needs. The city planned to use the new award to catalyze brownfields revitalization in part of a 327-acre historic urban farm, the Municipal Farm in the Eastwood Hills area, and an adjacent area.

Our food system begins with food production, but most consumers experience the food system in their retail, commercial, or neighborhood food store. A Hispanic grocery store in Greenville, Texas; the Main and Pavilion Shopping Center in Hartford, Connecticut; and Whole Foods in Milwaukee, Wisconsin, are examples of former brownfields that the communities have cleaned up and restored or converted into supermarkets. These former brownfields contribute to local economies and viable livable communities with access to healthy food. Food production, distribution, and retail redevelopments of former brownfields that improve access to food are of continuing local and

regional interest, but the community food safety net is another important part of the food system. Brownfields redevelopment is one option to help strengthen the food safety net.

The **Capital Area Food Bank in Washington, D.C.,** serves as part of the community food safety net as the central supplier for 700 food pantries and food banks. The recent brownfield cleanup and redevelopment of a 123,000-square-foot warehouse can store food for the 680,000 residents in the D.C. area served by Capital Area Food Bank, which distributes close to 33 million pounds of food annually. The District Department of the Environment used Section 128(a) Response Program funding to provide oversight of the assessment and cleanup process at the property selected for the warehouse that was contaminated with petroleum hydrocarbons and metals in soil and ground water. Subsequent cleanup involved the demolition of existing structures and excavation of contaminated soils; the redeveloped warehouse opened for business in 2012.

Missoula, Montana, revitalized a former warehouse with brownfield assessment and cleanup resources to serve a community food purpose. The Northern Missoula **Community Development Corporation** selected this former freight warehouse for redevelopment. After the assessment revealed likely asbestos contamination, an EPA Brownfields Revolving Loan Fund awarded a sub-grant of approximately $24,000 to clean up the site. The cooperative opened in 2011, and the Corporation plans further redevelopment efforts for expanding the new food cooperative to include a café and commercial kitchen. Learn more at: **https://www.epa.gov/brownfields/brownfields-idle-former-freight-depot-now-serves-community-food-center**.

Brownfield practitioners, Native American partners, and stakeholders across the nation are thinking about how property assessment, cleanup, and revitalization can help ensure that community food needs are considered as one of many redevelopment approaches to create healthier, economically vibrant areas.

Land reuse programs such as the EPA Brownfields Program are ultimately about safe recycling of land. The programs also consider what other safe and environmentally sound management practices the programs need, from deconstruction and restoration of cleaned structures to recycling and reuse of waste materials in new, safe ways. Creating healthy communities also requires that land reuse programs adopt ways to improve the safety and structure of the soils. As communities factor food into their healthy community revitalization equation, they must also consider ways to create more sustainable systems. Healthy communities must reduce food waste from production and distribute excess food to people in need and to the food production process, in accordance with the **EPA Food Recovery Hierarchy**. Join the challenge and think about how your community and family can adopt more holistic approaches to recycle land, food waste, or building materials, and thereby add to the environmental and public health benefits of sustainable waste management.

FEEDING PEOPLE TO IMPROVE HEALTH

CDC recognizes that good nutrition is vital for good health, disease prevention, and healthy growth and development of children and adolescents. Eating a diet high in fruits and vegetables decreases the risk for many chronic diseases, including heart disease, high blood pressure, diabetes, and some cancers, and may reduce the risk of stroke. CDC provides strategies that focus on policy and

environmental changes designed to increase access to, and improve the availability of, fruits and vegetables, with the expectation that these changes will lead to increased consumption of those fruits and vegetables. Some policy and environmental strategies related to brownfield redevelopment include **food policy councils**, access to retail stores that sell high-quality fruits and vegetables, farm-to-institution, farmers' markets, community-supported agriculture, and community and home gardens. We discuss many of these activities in this chapter and throughout this book. More information on these strategies, including evidence, action steps, and resources, can be found at: **http://www.cdc.gov/obesity/downloads/FandV_2011_WEB_TAG508.pdf**.

CDC's Healthy Places studied the ways we design and build our communities that can affect our physical and mental health. Strengthening connections between traditional land-use planning and the emerging field of community and regional food planning and public health can help build stronger, sustainable, and more self-reliant communities and regional food systems. Both land-use decisions and community planning affect the food environment, agricultural land, and access to healthful foods. Many neighborhoods and communities do not have access to healthy food options, but developers and planners can help change the food environment while contributing to positive urban revitalization and creating job opportunities. CDC described strategies such as **farmland protection**, zoning, healthy food retail, and urban agriculture on their Healthy Places Web site at: **https://www.cdc.gov/healthyplaces/healthtopics/healthyfood/farmland.htm**.

When implementing urban agriculture and community gardens strategies, testing the site for contamination should be a high priority because many plants will take up and absorb toxins from the soil, or particles may adhere to and then remain on plant leaves, stems, or roots. On land reuse sites, builders can take precautions to prevent the contamination of food products. EPA's Office of Brownfields and Land Revitalization has established an urban agriculture Web site to highlight some considerations for growing food products on former brownfields (see **https://www.epa.gov/brownfields/resources-about-brownfields-and-urban-agriculture**).

Whether urban or rural, farms rely on a dense web of relationships to be sustainable businesses. Consumers are, of course, critical. Yet several affiliations are just as important: farmers who raise crops and livestock, toolmakers who produce tools for each farm's scale, lenders, aggregators, wholesalers, planners, educators, and recyclers who convert organic wastes into new fertilizers. Relative circumstances are important equally: access to machinery suited to the farms' crops or livestock; transportation infrastructure, including good roads and rail systems; and a supportive tax policy.

USDA places special emphasis on building aggregation and distribution facilities, often called **"food hubs;"** few of these hubs are commercially viable. And, few will become viable until supportive infrastructure such as those listed earlier, created by both private and public investors, have been built.

More information about Food Hubs can be found at: **https://www.ams.usda.gov/services/local-regional/food-hubs**

FOOD SYSTEMS AND FOOD SECURITY

Current infrastructure, dedicated to long-distance importation and exportation of food, has created very appealing convenience foods with attractive packaging that require little time to prepare. Unfortunately, this system has priced a significant number of consumers out of the market. Many Americans who most need high-quality nutrition cannot afford to buy the best foods available.

Low-income consumers clearly cannot absorb the comprehensive cost of food today: land prices, farm machinery, interest costs, attorney fees, and more contribute to the overall expense. Thus, even in America, the country that claims to feed the world, many people go hungry. In an effort to measure the depth of this condition, USDA has defined three levels of food insecurity (U.S. Department of Agriculture, 2014). Those levels are:

Food secure—Households that have access to enough food at all times for an active, healthy life for all household members. USDA considers 85% of American households as food secure but considers only 80% of households with children younger than 18 years as food secure.

Food insecure—Households that are uncertain of having, or are unable to acquire, enough food to meet the needs of all their household members throughout the year because of insufficient money or other resources are considered "food-insecure." Food-insecure households include those with *low food security and very low food security*. USDA research shows that 14.5% of U.S. households, or about 45 million people, are food insecure. However, rates are higher for households with children; 20% of households with children younger than 18 years are considered food insecure.

Low food security—These food-insecure households obtained enough food to avoid substantially disrupting their eating patterns or reducing food intake by using a variety of coping strategies, such as eating less varied diets, participating in federal food assistance programs, or getting emergency food from community food pantries. USDA research shows that 8.8% of U.S. households (27 million people) have low food security.

Very low food security—Normal eating patterns of one or more household members were disrupted in these food-insecure households and food intake was reduced at times during the year because of insufficient money or other resources. USDA research shows that 5.7% of U.S. households (18 million people) have very low food security.

For communities that do not have direct access to food insecurity data, a proxy measure is the number of residents living 185% below the poverty line. Census data at the local level is reported regularly using this proxy measure. This constitutes a more meaningful measure of a livable wage than the poverty line. It also conforms to federal school lunch programs, which consider any child living 185% below the poverty level is qualified for free or reduced-price meals at school. USDA data also show that relatively few households earning more than this income level are food insecure. By this measure, approximately 93 million Americans (31% of the U.S. population) are food-insecure, about twice the official tally (U.S. Census, 2014).

The issue of food insecurity intersects with brownfields in a very intimate way; low-income residents disproportionately are more likely to live near brownfields, given that many brownfields are former industrial zones with lower property values. This means that revitalizing a brownfield to

become a productive space for growing food could have immense effects on and within low-income communities. In many cities, urban farming is seen as a vital way of creating better food choices for low-income residents.

For example, Cleveland, Ohio, has numerous vacant industrial sites, and the city planning office has determined that city-owned land can be used for commercial agriculture. This is viewed as an essential way to ensure that people who live in lower-income neighborhoods can make part of their living in a manner that fosters a sense of community connection. The city wrote special code that holds up higher standards for commercial growers, and charges them higher rates for water.

Bloomington, Indiana, has allowed commercial gardeners to use city-owned community garden plots since 1976 for many of the same reasons. In Flint, Michigan, a martial arts instructor launched a commercial vegetable operation as a way to instill work skills and practical gardening wisdom in the neighborhood youth, saying that part of self-defense involves knowing how to produce your own food.

Many cities also are combining urban food production with small commercial kitchens—often borrowed or leased from churches, schools, or other neighborhood institutions. In these kitchens, residents can or otherwise process produce livestock (e.g., poultry) they have raised, thereby adding additional value to their work. In Athens, Ohio, the Appalachian Center for Economic Networks (ACENet) has operated commercial processing plants in low-income settings for two decades. Mission Mountain Food Enterprise Center in Ronan, Montana, has partnered with a tribal college to provide processing access to growers in rural Montana.

Similarly, several food banks have begun to reconsider the role they have been asked to play in offering food handouts. Foodlink, a food bank in Rochester, New York, offers low-income residents training at their commercial kitchen, and uses their logistical expertise to transport local foods to food distributors The Community Food Bank (CFB) in Tucson, Arizona, has fostered economic development among their customers by operating a farm within city limits where low-income residents may learn how to farm desert soils organically. CFB also took the lead in bringing food banks together to form a national network that supports empowerment activities among food banks. Huntsville, Alabama, is striving to serve as a "food hub" that not only will transport fresh food from local farms right to the food banks, but also can source food for local restaurants, grocers, and institutional food services.

Certainly, growing food alone will not end poverty, but earning an additional $1,000 per year can be critically important for many low-income residents. Learning how to garden and grow your own foods can be empowering. Knowing where foods come from, how to make healthy food choices, and how to prepare food can help reduce the need for medical care and the public costs that care incurs.

Perhaps the most extensive network of urban gardens is in the city of Detroit, Michigan, where the **Greening of Detroit** has helped more than 1,600 gardeners coordinate their activities. Through neighborhood-level hubs, seeds and planting expertise are shared, tools are exchanged, master gardeners teach, and a constituency is built that helps the city embrace urban farming. The city has developed a distribution network that transports more than $50,000 worth of surplus foods from community gardens directly to public school kitchens. Many of these gardens are not on brownfield sites but in risky neighborhoods—gardening puts more people out and present on the street. When

brownfields are encountered, gardeners can work through their umbrella group to learn about and pursue safe farming practices.

Overall, low-income residents who are active in raising their own food adhere to a belief that communities should produce their own food when possible. These visionaries are quick to point out that simply adding more places where people can buy food will not be enough; building skills among residents to grow, prepare, process, and eat healthy foods will prove to be critically important. Converting brownfields into productive farmlands will be an essential strategy for overcoming food insecurity.

But the vision must not stop with the notion that productive farm fields are enough. In an age of considerable competition and uncertainty, those farms that connect more closely with their consumers will thrive best. Farms that inspire loyalty among clients are likely to be economically sustainable and politically viable. In this respect, farms converted from urban brownfields may hold a competitive edge over rural farms because they will be close to their consumer base. Selling directly to local consumers allows farms to foster and maintain relationships with their local community members.

Urban farms will require additional infrastructure as well. Farms that wish to supply larger markets such as local grocery stores, schools, or hospital food services also will need local-scale washing, packing, cooling, and storage space. A recent investment plan adopted by the state of South Carolina is "Making Small Farms into Big Business," produced by Crossroads Resource Center for the South Carolina Departments of Agriculture and Commerce (Meter, K and Goldenberg, M.P., 2013) (available at: **www.crcworks.org/scfood.pdf**). The plan calls for the creation of "food production nodes," centers that would create local efficiencies in food trade.

Once supportive infrastructure is in place, growers who supply local markets may find themselves with a comparative advantage over distant suppliers, especially as oil prices rise. Creation of these "nodes"—combining food production with light processing and distribution capability—also will tend to support ongoing efforts to grow food for decades to come. Shared use of facility space would be expected to foster the growth of collaboration skills as well. Former brownfields may be prime sites for incubator farms that include such infrastructure. These incubators would train emerging farmers in a relatively safe setting, so that they can enter the competitive marketplace with greater skill and market reach.

Urban farms also serve as a vital training ground for youth who would have no other way to learn about food, where it comes from, and how it is grown. Farms typically have been the realm where youth learn to work hard; urban youth need the opportunity to experience this environment.

Creating such food production nodes and urban farms by revitalizing brownfields will not be cheap. Because most urban areas spend billions of dollars to purchase food produced in distant lands, and hundreds of millions of dollars on food-related health care costs, such investments are likely to pay off in the long run.

To recover these costs, public officials might view brownfield revitalization as a way of selling revitalized lands to earn money to finance future civic endeavors. A better strategy, however, is for the public sector to retain ownership of these lands or to purchase development rights so the lands

can remain public food-production sites for future generations. The land must be valued based on its agricultural potential rather than its development potential; otherwise, farmers would not be able to afford the land to farm it, and the land would be sold for other uses.

This web of activity—revitalized brownfields, connection to nearby consumers, availability of packing and light processing facilities, educational programs, and protection from development pressures—must be implemented if urban farms are to survive. Peri-urban and rural farms face similar pressures and have similar needs.

ENGAGING COMMUNITIES IN AGRICULTURE

Agriculture projects can unite communities, provide recreation for residents, and provide access to healthy foods. Here we highlight some of the unique projects across the country.

Soil Kitchen in Philadelphia, Pennsylvania

Soil Kitchen was a temporary windmill-powered architectural intervention and multi-use space installed in the Northern Liberties section of Philadelphia from April 1–6, 2011. The exhibit was placed across the street from the Don Quixote monument at 2nd Street and Girard Avenue in an abandoned building. Soil Kitchen placed a windmill atop the building to pay homage to the popular windmill scene in Cervantes' Don Quixote. Rather than an "adversarial giant" as the windmills were in the novel, the windmill at Soil Kitchen was a symbol of self-reliance and literally breathed new life into a formerly abandoned building. The windmill also served as an invitation to imagine a potential green energy future and participate in the material exchange of soil for soup; citizens enjoyed free soup in exchange for soil samples from their neighborhood. This exchange provided an entry point for further dialogue and action available in the space through workshops, events, and informal exchanges. Soil Kitchen provided sustenance, re-established the value of natural resources through a trade economy, and informed about and responded to possible contaminants in the soil.

Soil Kitchen was commissioned by Philadelphia's Office of Arts, Culture and the Creative Economy using a generous grant from the William Penn Foundation. Soil Kitchen coincided with the 2011 National Brownfields Conference co-sponsored by the U.S. Environmental Protection Agency and ICMA. Thanks to EPA and volunteer assistance, the Soil Kitchen offered free pH and heavy metal testing and produced a Philadelphia Brownfields Map and Soil Archive. The project was installed in a rapidly developing neighborhood community with a long history of industrial activity.

ATSDR staff were present for the duration of the project to discuss soil results with residents and provide information about how to reduce exposures to urban soil contaminants, create a healthier urban garden, obtain more information about environmental health issues, and obtain additional soil testing.

Soil Kitchen provided soil analyses, including soil chemistry (acidity [pH], nutrients, and visual and physical evaluation) conducted by volunteer soil scientists, and x-ray fluorescence (XRF) analyses for lead, arsenic, and cadmium conducted by the EPA. The EPA Emergency Response Team provided their mobile laboratory equipped with 2 XRF units and 4 scientists, analyzing more than 350 soil samples in 3 days.

More than 1,000 residents attended Soil Kitchen; ATSDR provided environmental health education to individual people and several various groups (urban farmers, artists, and school students). Since the first Soil Kitchen, ATSDR has participated in and hosted many soil sampling events called soilSHOP, which stands for Soil Screening, Health, Outreach, and Partnership. ATSDR developed a soilSHOP Toolkit that provides guidance to communities interested in having their own soilSHOP events, which is available here: **https://www.atsdr.cdc.gov/soilshop/**.

Grounded in Philly: An Interactive Web-based Map Helps Residents Convert Vacant Lots into Green Spaces

Like many other cities with an industrial past, Philadelphia has many vacant lots created by changing demographics and economic factors. In most circumstances, property owners abandon the land because the cost of maintaining the property (or lot) surpasses its value. Unmaintained vacant lots blight communities everywhere. They can be a physical hazard and affect the environment, the economy, and the overall quality of life of area residents. Philadelphia has approximately 40,000 vacant lots of which about 25% are owned publicly (City of Philadelphia, 2017). These lots can drag down property values of surrounding properties, placing a burden on homeowners and additional burden to the city in maintenance costs and loss of revenue. Community members are often interested in turning these lots into green spaces. Many urban dwellers want to convert these lots into urban farms and community-managed gardens. A few organizations have been successful at these types of conversions. But, the process of acquiring the land or, even getting permission to use the land, is long and arduous. In most instances, residents lack the knowledge, time, and resources needed to navigate the system. A group of like-minded people recently got together to find solutions to this problem and created a Web-based mapping tool called "**Grounded in Philly**." This mapping tool allows users to identify vacant lots by address, zip code, or neighborhood. It summarizes parcel information that for various organizations and entities. Furthermore, it serves as a platform for people to connect and organize. It encourages users to share their ideas on greening the space and to work together to secure the space. The map is a "one-stop shop" to gain information about a lot's ownership, physical properties, city violations, zoning restrictions, and planning districts. It then allows users to "post a note," informing other users about their vision for the lot. Users' contact information is available on a "side bar" on the Web site's main page that informs all site visitors about recent activities. Visit Grounded in Philly at: **http://www.groundedinphilly.org/**.

Utica's Community Gardens: A "Learning Laboratory" Takes Root in Cornhill

Utica—the Cornhill neighborhood in particular—has one of the highest percent of children with lead poisoning in the state of New York. Crumbling paint in older homes is most often the source of lead exposure for small children. Soil containing lead from paint, from leaded gasoline, and from previous industrial contamination, can expose children who play outdoors.

Community members and local officials in Utica expressed the need for recreational parks and greater availability of community garden space in Cornhill, a unique, multi-ethnic neighborhood. According to the Mohawk Valley Resource Center for Refugees (MVRCR), Utica's population includes many refugees and immigrants, estimated to be about 15% of city residents. Residents

have been gardening on vacant and abandoned plots with little or no knowledge of past use of the property and foraging for greens in local parks.

To increase access to recreation and community gardens, the New York State Department of Health (NYS DOH) Center for Environmental Health partnered with the Oneida County Health Department (OCHD) to assist with the reuse of potentially contaminated abandoned and vacant properties. Key community members with an interest in community gardening or healthy nutrition formed a stakeholder group to encourage community gardens. This working committee includes local officials and groups or people active in the Cornhill neighborhood recognized for their commitment to the area and trusted by area residents.

Demonstration Garden and Cornell's Rust2Green (R2G)

Early on, MVRCR expressed interest in helping develop a "demonstration" garden to give refugees a chance to develop new skills and grow produce in keeping with their own agricultural traditions. MVRCR considered the demonstration garden an outdoor "learning laboratory." A Master Gardener candidate with the Cornell Cooperative Extension of Oneida County, who is also an experienced public health nurse, joined the team to teach a gardening program for refugee and neighborhood children.

Soon thereafter, a local businessman and the public library offered the project two parcels of land close to the Refugee Center for use as community gardens. As word of the program spread throughout the community, Cornell University, **Cornell University's Rust to Green project** offered the assistance of senior students in landscape design to help OCHD design plans for the two gardens. The Rust to Green project is an initiative that started in Cornell's Department of Landscape Architecture and works to develop partnerships and networks within New York cities to disseminate information on how to grow sustainable communities. The NYS DOH and OCHD performed environmental assessments of both sites and evaluated the past uses of the properties. They used the information gained to conduct targeted soil sampling for contaminants on the two properties.

Despite an unusually wet spring that set them back several weeks, NYS DOH, OCHD, MVRCR, and volunteers helped start the first community garden in June 2013, with 100 raised-bed garden boxes for use by refugee and immigrant families and neighborhood residents. Four boxes were designated for children's educational activities, and planting was completed by early July. As summer progressed, new relationships among the gardeners flourished alongside the plants, as neighbors met and shared seedlings, garden chores, and stories.

As the first demonstration garden began to flourish, a local manufacturing company offered funding to the group to start a second garden on a smaller parcel of nearby land, providing an additional 55 boxes. The manufacturer picked the community garden project as the recipient of their annual company-wide fundraising event. The group started work at this site in August 2013, using the model and lessons learned in developing the first garden. The County Executive joined the company president, workers, the OCHD/DOH teams, and others in a day of activity and camaraderie in building boxes and planting in the gardens, named the Utica Unity Gardens.

The new gardeners who have joined in have learned straightforward and challenging lessons in the garden. In addition to the nutrition that comes from garden-fresh vegetables, and the physical activity of gardening, neighborhood gardens can provide excellent community-building opportunities with culturally diverse populations. However, coordinating the many pieces of a gardening project often can be problematic. In Utica, OCHD interacted with disparate community groups, many with their own time and funding constraints. OCHD encountered weather-related delays, which affected the timeline to construct raised beds in time for spring planting. To overcome these and other unanticipated circumstances, OCHD learned to apply communication, patience, and persistence.

Ultimately, these lessons—in and out of the garden—have proven fruitful. OCHD's understanding of this multi-ethnic community and its unique needs continues to grow daily. In addition, the initial gardening effort has taken off, leading to the development of several other community gardens that are helping to drive neighborhood renewal in several neighborhoods.

NOTE: Please see Chapter 16 for a detailed case study featuring the Utica Unity Gardens.

USING BROWNFIELDS AS COMMUNITY GARDENS

Sabine E. Martin and Ganga M. Hettiarachchi

Growing crops locally, especially in urban areas, is rising, and many gardens are or will be located on land that might have contaminated previously. We call these kinds of properties, such as vacant or abandoned properties with real or perceived contamination issues, "brownfields." Tens of thousands of brownfields are located throughout the United States.

Of course, not all brownfield sites will be suitable for farming and growing food crops; the environmental conditions may not allow for this use. However, growing food crops on mildly contaminated sites is safe possibly (for the grower and consumer), if gardeners take precautions and adhere to best management practices.

Currently, the United States has set no soil lead maximum concentration levels (MCLs) for growing crops on brownfields. Some states set 400 milligrams per kilogram (mg/kg) soil lead as the level below which food crops can be grown safely; levels of other metals and contaminants are not addressed currently.

EPA and USDA have not set regulatory contamination levels for crops grown on environmentally impacted soil in the United States. Maximum levels (MLs) for contaminants set by the World Health Organization (WHO)/Food and Agriculture Organization of the United Nations (FAO) and designed for international trade may serve as guidance.

In the forefront of this, researchers at Kansas State University (KSU) are evaluating the uptake of heavy metals, **metalloids,** and other contaminants by food crops grown on brownfield sites. KSU researchers concurrently are developing recommendations for seedbed preparation and corrective or protective measures to address contaminants. The goals of this research are:

- to enhance the capabilities of garden and farming initiatives to produce crops locally without causing potentially adverse health effects to the grower or the end consumer;
- to increase confidence in urban food production quality;
- to provide resources for producers, urban land managers, local and state government agencies, and extension agents to implement proposed best management practices; and
- to contribute to the meaningful revitalization of brownfield sites in a sustainable manner.

EPA awarded a grant for this research.

KSU evaluated seven test sites nationwide on brownfield sites slated for community gardens by planting crops over two consecutive growing seasons. Before adding a site to the project, KSU researched historic use of all sites to narrow down potential contaminants and screened soils for heavy metals. The researchers planted three vegetable crop types with three very different growth and contaminant uptake patterns over two growing seasons and analyzed soil and plant tissue samples from each site for contaminants associated with the respective sites. The researchers evaluated the effectiveness of selected site-specific soil amendments to reduce **bioavailability** of lead, arsenic, and

polycyclic aromatic hydrocarbons (PAHs). The researchers established associated best management practices that focused on reducing both direct (soil-human) and indirect (soil-plant-human) exposure to the gardeners and their children, and potential human health risks.

The KSU research indicates the following findings:

- The potential exposure pathway of concern is direct exposure of humans to contaminated soils. The pathway from contaminated soil to plant to human is insignificant.
- In general, concentrations of lead, arsenic, and cadmium in vegetables harvested at test sites were low.
- Adding compost consistently diluted contaminants.

Soils at the various test sites exhibited lead concentrations from 100mg/kg to 2,000mg/kg. Root crops were the only crops affected by soil lead, with carrots taking up more lead than beets and sweet potatoes. In sandy soils with lead concentrations around 200–250mg/kg, lead concentrations in root crops exceeded the WHO/FAO (Food and Agriculture Organization of the United Nations) **maximum contaminant limit** (MCL) of 1-1.5mg/kg (dry weight). However, in non-sandy soils with a relatively neutral pH and soil-lead concentrations of about 250–350mg/kg, root crops did not exhibit lead concentrations greater than the WHO/FAO MCL.

Arsenic concentrations in soils from the test sites ranged from 50mg/kg to 130mg/kg. Arsenic uptake by all crop types was low, and lower than the respective WHO/FAO MCLs.

When cadmium concentrations in soils exceeded 20mg/kg, leafy vegetables exhibited cadmium concentrations greater than the WHO/FAO MCL of 4mg/kg (dry weight).

PAH uptake by all crop types was low or non-detectable, with total PAH concentrations in soil ranging as high as 107mg/kg.

Bioaccessible (able to be absorbed) lead and arsenic in soils tested were low when measured using a physiologically based extraction method (modified from Ruby et al., 1996 (Ruby, M.V., Davi, A., Schoof, R., Erle, S., and Sellstone, C.M., 1996)), mimicking gastrointestinal tract dissolution processes.

Knowing whether contaminants are present at a brownfield site beforehand will help the grower make an informed decision as to the site's feasibility for the intended use. Safe gardening and growing practices on previously used sites includes knowledge of the historic use of the site and potentially associated contaminants. Most brownfield sites present the additional challenge of poor quality soils combined with soil compaction. KSU's Web site (**http://www.gardeningonbrownfields.org/brownfields-gardening/**) currently includes fact sheets on obtaining site history information, implications of historic site use, and soil testing for agronomic parameters.

The concern when growing on brownfield sites rests mainly with environmental contaminants. Metals or metalloids belong to this group. Lead from the use of leaded gasoline and lead-based paint, and naturally occurring arsenic and arsenic from using arsenate-containing pesticides, are the most common contaminants associated with urban brownfield sites used or slated for growing crops.

When deciding to grow food crops on a mildly contaminated brownfield site, two options exist: growing in-situ (in place or in the soil) or growing in raised beds filled with imported (tested!) soils. As to choosing options, decision-making drivers may include: liability concerns, comfort levels of gardeners regarding residual contamination, soil conditions, available space, need for Americans with Disabilities Act accessibility, and cost.

If gardeners select raised beds as a best management practice, they should take care to cover the walkways in between the beds to prevent exposure to dust.

If gardeners select in-situ growing, they should very likely amend the soil using compost and fertilizer because brownfields soils tend to be of poor quality. Generally, whatever methods gardeners use to improve soil quality will also help bind and, thus, reduce the bioavailability of metals or metalloids. Examples of growing methods follow.

- Compost addition will dilute overall contaminant concentrations, and mature or stable organic matter in the compost and the iron oxides present in some products such as bio-solids will bind metals and organic contaminants in soils and reduce their bioavailability.
- Compost addition will also increase **biomass production,** further helping reduce contaminant concentration in crops.
- The nutrient phosphorus, needed for healthy roots growth and flower production, will transform metals (more specifically lead) into their phosphate forms and reduce their bioavailability.
- Adjusting pH to approximately neutral (e.g., 7) will reduce the mobility of cationic metals such as lead and cadmium. For arsenic-containing soils, gardeners should not adjust the pH to values greater than 6.5 to avoid enhancing arsenic mobility.
- More than one contaminant may affect the soil, and a mixture of amendments (compost, phosphorus, bio-solids) would be beneficial.

Depending on metals present and their respective concentrations, selection of suitable crops is very important (see above). If in doubt, gardeners should not select root crops.

Effective, preventative measures to ensure safe gardening and food growing are simply common sense. Some of those measures are washing crops thoroughly before eating to remove soil, washing hands thoroughly after gardening, keeping soil moist during dry and windy conditions to prevent dust generation, making sure no soil gets tracked into the house on shoes or clothing, and supervising children in the garden.

ACKNOWLEDGEMENTS

The authors would like to acknowledge Chammi Attanayake and Phillip Defoe, graduate research assistants at the KSU's Department of Agronomy, who diligently spent long hours in the lab preparing and analyzing samples as part of their Ph.D. research work.

ADDITIONAL RESOURCES

Brownfields and Urban Gardening, **http://www.gardeningonbrownfields.org**

Resources about Brownfields and Urban Agriculture, **https://www.epa.gov/brownfields/resources-about-brownfields-and-urban-agriculture**

CERCLA and Brownfields Research Center Publications, **http://astswmo.org/community-gardening-toolbox/**

Sustainable Management of Food, **http://www.epa.gov/compost/**

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CHAPTER 13

Reuse and Repower: Alternative Energy and Land Reuse Sites

Laurel Berman, Colleen Cain, Sabine Martin

Alternative energy projects on land reuse sites, including former industrial sites, brownfields, and Superfund sites, can provide the community with non-polluting industries and jobs, and recycle blighted, underused land. Alternative energy projects can help communities redesign with health in mind. Alternative energy projects offer long-lasting, sustainable community benefits and can protect and improve community health. This chapter provides key informational resources for communities looking to alternative energy as a reuse strategy, presents an overview of the array of alternative energy technologies available for land reuse sites, and highlights case examples of successful alternative energy development on brownfield and Superfund sites.

WHY REUSE LAND FOR ALTERNATIVE ENERGY PROJECTS?

Why are land reuse sites redeveloped into alternative energy projects? One reason is that these sites can offer large tracts of land that may be used for mid- to large-scale operations. The effects of energy production on land are significant, and electricity and fuel demands are growing in the United States. These circumstances may lead to **"energy sprawl"** as more land is needed for renewable energy projects to produce the same amount of power as energy production reliant on fossil fuels (Outka, 2011). Redevelopment of large land reuse sites into renewable energy production sites can take the burden off green, undeveloped areas for these projects and reduce "energy sprawl."

An added benefit is site location. Land reuse sites may be close to areas of high energy consumption and **energy grid transmission**. These sites offer available land with few competing uses, have existing infrastructure, and present an opportunity for sustainability and reduction of **carbon emissions** if reused for renewable energy projects, among other advantages (Adelaja, W., Shaw, J., Beyea, W., McKeown, C., 2009). The proximity to utilities and transportation networks can keep development costs low. These sites may be located also in areas with strong wind, solar, biomass (vegetation), and geothermal (heat of the earth) resources (U.S. Environmental Protection Agency, 2014). See: **https://www.epa.gov/superfund-redevelopment-initiative/alternative-energy-superfund-sites**

Economic benefits are another reason to redevelop land reuse sites into alternative energy production projects. In its study of renewable wind and solar production in Michigan, the Rutgers Land Policy Institute estimated the potential economic impacts of wind and solar energy development on Michigan brownfields. If these projects were implemented, economic impacts would total more than $15 billion in investment and create more than 17,500 construction and long-term jobs (Adelaja, S., Shaw, J., Beyea, W., McKeown, C., 2009).

Redeveloping land reuse sites for alternative energy production may also improve public health. The obvious benefits relate to cleaning up contaminated sites for beneficial reuse. But, additional positive health benefits, such as preservation of green space and job creation, exist. One interesting benefit is that the regulatory cleanup levels for sites that may be used for alternative energy production can keep the sites classified as "industrial". The cleanup levels for commercial or industrial properties tend to be less stringent than those for residential properties. This may help get a formerly contaminated site quickly back into productive reuse. From the "before" and "after" cases of hundreds of redeveloped land reuse sites, the authors have learned how successfully reusing formerly underused or deteriorated properties can add to a sense of community pride and cohesion.

KEY RESOURCES

Communities considering alternative energy projects should evaluate the cost to build a project, the cost of land, the projected profits from the sale of energy, and available incentives to determine if a project is cost effective. As in most projects, combining funding and incentives packaged together may help in financing an alternative energy project on a land reuse site. Many resources

to help communities consider alternative energy and the feasibility of specific energy projects in a community are available.

One of the most comprehensive resources is the National Association of Local Government Environmental Professionals (NALGEP). NALGEP provides a primer on renewable energy on brownfield sites, "Cultivating Green Energy on Brownfields: A Nuts and Bolts Primer for Local Governments" (National Association of Local Government Environmental Professionals, 2012). The purpose of the primer is to help local governments investigate whether renewable energy development may be the right choice for brownfields in their communities. NALGEP includes an overview of the following types of renewable technologies on brownfield sites: wind, solar, biomass, hydroelectric (electricity produced from water), and geothermal technology.

Federal agencies, such as the Environmental Protection Agency (EPA), the Department of Energy (DOE), and the Department of Agriculture (USDA), promote and support alternative energy at Superfund and other land reuse sites. At least 45 **Superfund sites** exist in planned or actual renewable energy reuse nationwide. EPA highlights some of these projects on its **Superfund Site Use Spotlights: Green Remediation** Web site. EPA's Office of Solid Waste and Emergency Response (OSWER) sponsors the **Re-Powering America's Land** initiative that provides a comprehensive overview of alternative energy technologies and feasibility studies for placing these projects on brownfield sites. Through this initiative, EPA reviews the economic benefits of alternative energy, including local, state, and federal incentives.

Another useful resource for communities considering energy projects is the **National Renewable Energy Laboratory (NREL)**. NREL is DOE's primary laboratory for renewable energy and energy efficiency research and development. NREL provides a variety of resources on wind, solar, biomass, and water-based renewable energy, including **maps** for renewable resources and projects. These maps show resources for available biomass, enhanced geothermal systems, solar radiation, wind potential, market potential for solar technologies at federal facilities, and many other aspects of renewable energy. DOE's Loan Programs Office is the principal funding mechanism for energy projects in the United States. DOE finances the growth of many alternative energy technologies, from biomass and solar to carbon sequestration and pollution control equipment.

DOE highlights successful projects they have funded on their **Web site**. Additionally, DOE provides support for the **Database of State Incentives for Renewables and Efficiency** Web site, through which users can search for incentives by state.

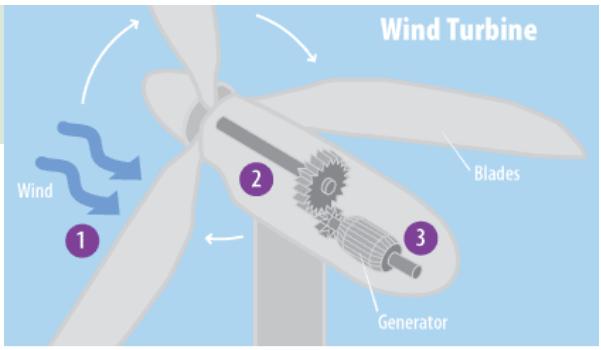
USDA's Rural Development Program also finances energy programs. Funding is available for **energy audits**, feasibility studies, energy efficiency improvements, and installation of renewable energy systems. In addition, USDA Rural Development has programs to help convert older heating sources to cleaner technologies, produce advanced biofuels, install flexible fuel pumps and solar panels, build **biorefineries**, and many other activities.

ALTERNATIVE ENERGY TECHNOLOGIES OVERVIEW

This section provides a brief overview of the types of alternative energy technologies available for land reuse sites.

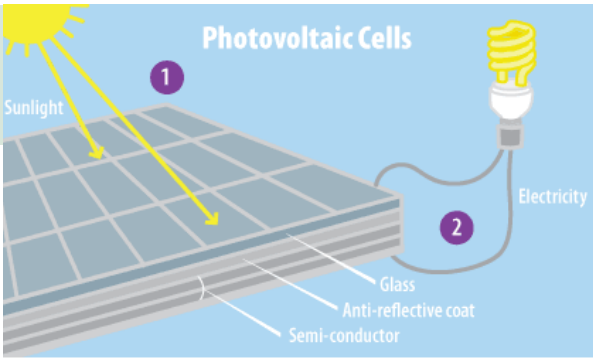
Wind. The cost competitiveness and widespread availability of wind makes it an attractive option for land reuse sites such as brownfields. Small wind turbines, which typically produce less than 100 kilowatts (kW) of power, can be placed on rooftops and provide energy generated on-site in small, even urban, areas. Large wind turbines, which typically produce in excess of 100 kW of power, can be used to generate energy for a particular site, or can be grouped—as in wind farms—to deliver electrical power to one or more communities (National Association of Local Government Environmental Professionals, 2012).

Image: Diagram of a wind turbine. Source: https://archive.epa.gov/climatechange/kids/solutions/technologies/wind.html (EPA, 2017)



Solar. Solar **or photovoltaic (PV) systems** can be used to provide energy on a small scale (such as parking meters), medium scale (such as commercial and residential buildings), or large scale (grid). PV systems consist of a series of panels that "absorb" sunshine to produce electricity. These systems can be mounted on roofs, poles, or the ground. While not as common as PV systems, Concentrated Solar Power (CSP) facilities can be installed on some land reuse sites. CSP technology uses mirrors and reflectors to concentrate sunlight and heat a liquid medium that produces steam to generate electricity (National Association of Local Government Environmental Professionals, 2012).

Image: Diagram of photovoltaic cells. Source: https://archive.epa.gov/climatechange/kids/solutions/technologies/solar.html (EPA, 2017)



Biomass. Biomass-generating plants create electricity by converting the energy potential from formerly living organisms, such as crops, wood, and organic wastes, in landfills. Biomass manufacturing plants can be installed at landfills, water treatment facilities, and agricultural facilities to capture anaerobic gases produced by decomposing waste. The captured gas generates electricity through gas turbines or fuel cells. Brownfield sites can host biomass facilities that burn crop or wood

residues to generate electric power (National Association of Local Government Environmental Professionals, 2012).

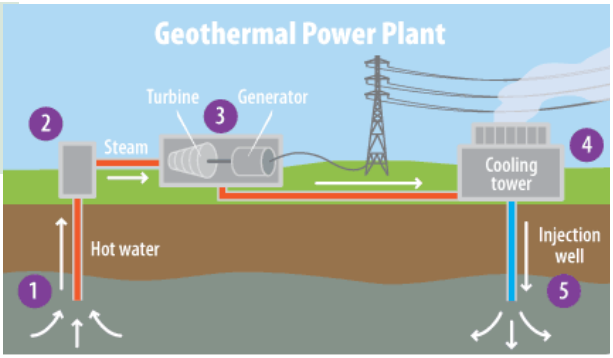
Combined Heat and Power. Combined heat and power (CHP) simultaneously generates electricity and heat from a single fuel source (cogeneration) and can achieve twice the fuel efficiency of conventional power-generation plants. The heat generated during electricity production is captured to provide heating or cooling for structures or to generate hot water for distribution. Most CHP systems use natural gas, but can use various fuel sources, such as biomass, waste heat, or oil, and can switch among the sources. CHP can be useful in places where other forms of alternative energy cannot, such as central business districts, medical and educational campuses, and brownfields in urban areas that may accommodate small power plants.

Hydroelectricity. Hydroelectricity projects capture energy from falling water and may be suited for land reuse sites with existing water resources and elevation drops, such as mines or brownfields in hilly areas.

Geothermal. Geothermal facilities convert heat extracted from the earth into useable electricity for the grid. These facilities are suited for land reuse sites located above geothermal resources.

Geothermal Heat Pumps. Geothermal heat pumps can heat or cool buildings of all sizes, including private homes. Geothermal heat pumps are used to circulate water or refrigerant below the surface where the temperature is a constant 50–60°F. During the winter, the water (or refrigerant) absorbs warmth from the earth, and the pump brings this heat to the building above. In the summer, some heat pumps can run in reverse and help cool buildings.

Image: Diagram of geothermal power plant. Source: https://archive.epa.gov/climatechange/kids/solutions/technologies/geothermal.html (EPA, 2017)



LAND REUSE SITES TO GREEN ENERGY IN PRACTICE: CASE EXAMPLES

The following projects, which are beneficiaries of public and private support, provide concrete examples of the variety of alternative energy technologies used to redevelop land reuse sites productively.

Wind

The **Steel Winds Project** in Lackawanna, New York, transformed a former slag pile into a 20-megawatt (MW) wind energy facility. This former Bethlehem Steel Corporation site was a steel production facility from the early 1900s until the mid-1980s. In the mid-1990s, EPA's Resource Conservation and Recovery Act provided for investigation of this contamination from steel production; subsequently the site underwent cleanup activities. In 2006, BQ Energy and UPC Wind proposed a wind energy farm at the site. This former Superfund and industrial brownfield site became the Steel Winds project; 14 turbines, 2.5-MW utility-scale, now generate enough electricity to serve about 9,000 homes in western New York (U.S. Environmental Protection Agency, 2013).

Solar

Solstice Manufacturing is a private industry in New Jersey that has specialized in solar energy projects for more than 20 years. The business has completed two of numerous projects on brownfield sites for the local utility, Public Service Electric and Gas. These projects, in Linden and Edison, New Jersey, are on former **manufactured gas plant** sites that were contaminated. Solstice Manufacturing representatives credit their flat ground systems as ideal for brownfield site redevelopment because installation does not require penetration of the land surface, thus preserving the integrity of caps covering contamination. Solstice Manufacturing uses a combination of federal, state, and municipal policy incentives and funding to implement solar projects (Sedano and Rawlings, 2013).

Green Mountain Power (GMP) is a local utility company in Vermont. The company is implementing several **renewable energy projects**. In Rutland, Vermont, GMP built the 149-kW Creek Path Solar Farm on a land reuse site. The Creek Path project operates on a 3-acre lot that formerly housed an old coal gasification plant (Green Mountain Power, 2018).

Image: Photo of Creek Path Solar Farm.
Source: Steve Costello, Green Mountain Power, 2012

In November 2013, GMP opened the Energy Innovation Center in Rutland, converting one of the most blighted brownfield properties in downtown Rutland into an educational center where customers can learn about energy innovation and the environmental impacts of energy decisions. This project is described on the **GMP** Web site. In another Rutland project, GMP built a 2-MW solar farm that is one of the nation's first micro-grids powered solely by solar and battery back-up on the former city landfill site. This project, the **Stafford Hill Solar Farm**, was completed in 2016.

Biomass

An alternative energy **biomass project and Superfund site reuse** is the former Rose Township (Michigan) Dump. In the late 1960s and into 1970, unauthorized disposal of paint sludge and volatile organic materials occurred at the 110-acre dump, which was also receiving and storing drummed wastes from Detroit area industries. EPA began cleanup activities of contaminated groundwater and soil in the mid-1980s and completed the activities in 1996. In 2006, a research partnership led by Michigan State University conducted a biomass project to grow crops at the site for use as renewable fuels (biofuels). The National Biofuels Energy Laboratory at NextEnergy's headquarters in Detroit tested the resulting biofuels. The results of this three-year demonstration project indicated that the biomass from the site was comparable in performance to biomass from crops grown on conventional farmland.

Landfill Gas

The **Lowry Landfill Superfund site** in Aurora, Colorado**,** provides 3.2 MW of electrical power to homes and businesses though a methane gas-to-energy plant. From 1966 to 1980, the city and county of Denver operated a municipal, hazardous, and industrial waste landfill at the site. The site continued as a municipal solid-waste disposal site until 1990. The site had contaminated soil, shallow ground water, and subsurface soil vapors, which led to its inclusion on the Superfund National Priorities List in 1984. The Lowry Landfill is adjacent to the Denver Arapahoe Disposal Site, an active municipal landfill. Both sites produce landfill gas from decomposing materials; the landfill gas is 50% methane and 45% carbon dioxide. Through a partnership with Xcel Energy, a landfill gas-to-energy plant was opened in September 2008. Four combustion engines convert 630 million cubic feet of landfill gas from both the Lowry and Arapahoe Disposal sites into 3.2 MW of electrical power. Xcel Energy distributes the electrical power to area residents and businesses.

In 2007, Ameresco Federal Solutions Group, the city of Baltimore, and the U.S. Coast Guard began working together to productively reuse gas generated by the city-owned Quarantine Road Landfill. They coordinated the construction of approximately 1.5 miles of pipeline from the landfill to the renewable energy center at the **U.S. Coast Guard Yard—Baltimore.** Four (1-MW) reciprocating engines with heat-recovery steam generators comprise a CHP system (1500-kW capacity). The $31 million project is notable as the largest renewable energy project in Coast Guard history and the first co-generation plant in Maryland. An Energy Savings Performance Contract, an energy service company, and a federal agency partnership, through which the company guarantees that improvements will generate energy cost savings to pay for the project over the contract term (up to 25 years), funded the project. In this case, Ameresco designed, constructed, and arranged funding for, the project to meet the Coast Guard's needs. Each year, the Coast Guard pays Ameresco its

accrued energy savings. Ameresco reports greater operational efficiency with the new plant, as well as greater energy security, cost savings, and cost stability. The plant's benefits extend beyond the shipyard; it removed 4 MW of electricity from the regional electric grid and reduced local greenhouse gas emissions.

Geothermal

The **Guthrie Green project** in Tulsa, Oklahoma, transformed a 2.7-acre former industrial site and freight yard into a community park complete with gardens, interactive fountains, an outdoor stage, a multi-purpose lawn for performances and festivals, and a café pavilion. Geothermal wells underneath the park supply heating and cooling to the park's café pavilion, the neighboring Tulsa Paper Company building (a large, 3-story, historic building converted into a center for the arts), and the nearby Hardesty Visual Arts Center by circulating water through the earth and bringing it to a temperature of 66°. This water feeds ground source heat pumps in the aforementioned buildings, thereby reducing their heating and cooling costs by approximately 60%. The 120 wells drilled to 500 feet below surface have a capacity of 600 tons of heating and cooling.

CONCLUSION

Communities considering developing land reuse sites for green, renewable energy production have many informational resources at their disposal, including useful online tools from NALGEP, DOE, and EPA. These resources provide guidance to communities and developers who must weigh reuse options, determine project feasibility, and consider using multiple incentives. Depending on the location and type of land reuse site, a variety of alternative energy technologies, ranging from solar to wind to geothermal, could provide a fitting reuse strategy. In fact, green energy production may be the only redevelopment option for some contaminated sites. The surrounding community can look forward to benefits such as preserved green space, job opportunities, reduced risk of exposure from the site, and a local source of clean energy to power homes and businesses.

Not all land reuse sites, however, may be suitable for alternative energy generation. Constraints include site location, topography, site size, grid infrastructure, and economic feasibility. For example, wind speed necessary for wind generation is not available everywhere; hilly terrains are not suitable for larger facilities, and sites may be too small to develop the desired alternative energy solution. Grid infrastructure requirements may not be available or may be too expensive to implement. Further, some states do not provide incentives for alternative energy. As always, site-specific considerations, including alternative energy re-use options, apply when weighing redevelopment options for brownfield sites.

The cases highlighted here illustrate the potential diversity of sites redeveloped for green energy production. Projects across the country that repurpose contaminated land rely on public incentives and private funding, take place in large cities and small towns alike, and harness energy from the wind, sun, and biomass and geothermal sources to supply local power.

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CHAPTER 14

No Place like Home: Reusing Land to Create Housing

Brian Burns and Ann Carroll[5]

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5 The authors wish to acknowledge Loretta Asbury, with the Agency for Toxic Substances and Disease Registry, for her contributions to this chapter.

INTRODUCTION

Many of us are fortunate to live in safe, healthy homes near the amenities of daily life and close to family and friends or have the resources to live in neighborhoods where we can meet our daily needs. Down the street, right around the corner, or a short drive away you can find a grocery store, church, bank, pharmacy, post office, park, school, or library that serves as a gathering place and connects us to our community, neighbors, and others.

The Joint Center on Housing at Harvard University noted that we spent $275 billion in 2011, which was an estimated 1.8% of our **gross domestic product** (GDP), on housing renovation in the United States. This level of investment exceeded that for single or multimode construction. The Center noted that investors directed 82% of housing renovation investment toward owner-occupied housing. Despite this spending, the Center also noted a decline in the quality of housing stock due to reductions in maintenance and home repairs. Due to these and other contributing factors, the Center has deemed approximately 2.4 million owner-occupied units as "inadequate" (Joint Center for Housing Studies of Harvard University, 2013).

For far too many people, however, home is not a defined place or address—it is only a dream. For other people, finding or keeping a home they can afford is a daily struggle. In many areas of the country, finding a home you can afford based on the wages you can earn is a primary challenge, particularly after accounting for other necessities such as food, medicine, transportation, heat, and utilities, as well as clothes and shoes for growing children or support for other family members. Finding an affordable home may require other compromises; renters or owners may discover that the home is unsafe or unhealthy.

"There's no place like home." This phrase evokes a film classic; sadly, we do not have Glinda the Good Witch from the Wizard of Oz waving her magic wand over us to meet our housing needs. Nor do we have ruby slippers that we click three times to transport us safely to our home surrounded by family who cares about us.

Federal Brownfields Programs, such as those of the U.S. Environmental Protection Agency (EPA), the U.S. Department of Housing and Urban Development (HUD), and other federal agencies, have spearheaded the process of developing vacant or underused parcels within existing areas that are largely developed. This is known as infill redevelopment: building within unused and underutilized lands within existing development patterns. The redevelopment of these sites to create and incorporate housing into mixed use and infill redevelopment has been a hallmark of these programs. By affording access to housing, this type of redevelopment can help communities redesign with health in mind and may also spur development of other community assets, such as grocery stores or medical clinics.

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT AND BROWNFIELDS

HUD incorporates brownfields into their mission through programs such as the following ones.

Community Development Block Grant. The Community Development Block Grant (CDBG) program is a flexible program with resources to address a wide range of unique community development needs.

Section 108 Loan Guarantee Program. The Section 108 Loan Guarantee Program (Section 108) provides communities with a source of low-cost, long-term financing for economic and community development projects. Section 108 financing provides an avenue for communities to undertake larger, more costly projects, where they may have limited resources to invest in upfront.

HUD Policy Areas. HUD's efforts support a variety of interrelated policy areas, such as affordable housing development and preservation, community and economic development, environment and energy, fair housing, health and housing, ending homelessness, homeownership, rental assistance, and supportive housing and services.

Home Investment Partnership Program. The Home Investment Partnerships Program (HOME Program) provides formula grants to states and localities that communities use—often in partnership with local nonprofit groups—to fund a wide range of activities including building, buying, or rehabilitating affordable housing for rent or homeownership, or providing direct rental assistance to people with low incomes.

Lead-based Paint Hazard Control Grant Program. The purpose of the Lead-based Paint Hazard Control (LHC) and the Lead Hazard Reduction (LHRD) grant programs is to identify and control lead-based paint hazards in privately owned housing for rental or owner occupants.

These programs focus on state and local governments and provide block grants and competitive awards for revitalizing communities.

THE NUTS AND BOLTS OF REDEVELOPMENT TO HOUSING

What is required to incorporate housing into land reuse and redevelopment?

To be successful, a redevelopment project must begin and continue with a collaborative effort from all entities and stakeholders involved. Developers, financial investors, design and construction professionals, and government officials must collaborate at every step of the process for the development to ensue. Often, stakeholders must develop diverse funding strategies, including funding at federal, state, and local levels, to drive the process.

The EPA Brownfields Program has been a leader in helping communities consider housing needs and ways that property assessment and cleanup can expand housing through redevelopment. EPA developed the Land Revitalization Toolkit to help communities identify the possibilities for reusing

a contaminated, or potentially contaminated site. This toolkit guides community members and partners through each stage of the redevelopment process. For more information, see **https://www.epa.gov/land-revitalization/land-revitalization-toolkit**

The U.S. Department of Agriculture (USDA) supports redeveloping brownfields into housing and provides redevelopment assistance to brownfield communities. USDA uses their Rural Development and Natural Resources and Environment Mission areas to provide this type of assistance. For a description of USDA's assistance, see: **http://www.dm.usda.gov/emd/responserestoration/brownfields.htm**

These programs are only a few of the federal strategies used to support brownfields redevelopment into housing and other end uses. In reality, reusing a former brownfield for housing may be a several-step process based on the community's desire to create housing or incorporate housing into redevelopment. Along with federal, local, or state funds, public and private redevelopment interest is generally necessary for assessment or cleanups, and to support the redevelopment with housing renovation, retrofit, or new construction.

In areas where existing zoning and comprehensive and master plans are aligned to allow residential uses, projects may go forward with ease. However, if existing plans and zoning do not permit residential use, changes in zoning or master plans will be needed.

In the brownfield context, it is also important to ensure that site assessment and cleanup focuses on meeting requirements for housing and residential reuse. Cleanup standards for commercial and industrial properties often are less stringent than the standards for residential properties; people do not live where they work, and usually are at work less time than they are at home; also infants or children sensitive to environmental exposures do not work and spend much of their early years at home or care settings. Additional assessment or cleanup may be needed to ensure that a site meets residential cleanup standards or unrestricted reuse requirements. Tribal and State response programs overseeing brownfields cleanup activities may provide a "**no further action**" letter to document that the level of cleanup and any ongoing activity or land use restrictions that exist on the property are met.

BROWNFIELDS TO HOUSING RESOURCES

Several government agencies and other organizations are at the forefront in brownfields redevelopment. Communities, lenders, and local leaders seeking to build a bridge from their immediate brownfield assessment and cleanup project to larger neighborhood revitalization can look to HUD's Neighborhood Stabilization Grant Projects examples. Case studies from many other organizations such as **NeighborWorks**, **Local Initiatives Support Corporation**, and **Smart Growth America** also provide information about brownfield redevelopment. The U.S. Census' American Housing Survey, which asks communities nationwide about the characteristics of their residents and homes, provides information as well. For census information, see: **https://www.census.gov/programs-surveys/ahs.html**.

Results and examples of sustainability pilots and partnership projects focused on expanding and improving safe and affordable housing, as well as other resources, are available at: **https://www.epa.gov/smartgrowth/tools-and-resources-sustainable-communities** (jump to Housing).

State and tribal response programs overseeing community assessment or cleanup activities, or both, are also contributing to the efforts of EPA and community brownfield programs. These efforts improve and expand housing stock and create amenities such as pocket parks adjacent to existing residential areas. See the state and tribal program highlights at: **https://www.epa.gov/brownfields/highlights-about-state-and-tribal-brownfields-response-programs**

Brownfields to Housing Examples

Many people now call former brownfields home. Not all the properties were houses or were contaminated; for some buyers, it was simply the fear or perceived risk from contamination that caused concern. Contamination existed in some houses at low levels; in these instances, the contamination level was not considered a risk to human health, even for the most sensitive populations. In some houses, the risks were real; several cycles of assessment occurred to ensure identification of all contamination to be removed, cleaned up, or capped and managed in place.

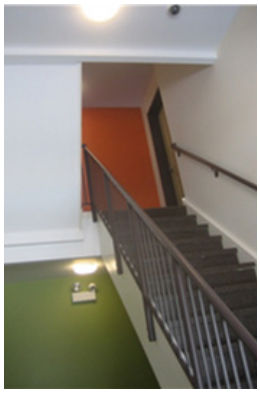
Chicago, Illinois

The City of **Chicago is one example of the effort to redevelop brownfields into housing**. Recent government programs have furthered realization of sustainable goals in housing improvements across many urban sites around the Chicago area. By combining funding specifically intended for brownfields and environmental cleanup with financing tools, Chicago has redeveloped brownfield sites into housing. Some of the financing tools Chicago has used are combined low-income housing and energy tax credits, Capital Advance, HOME grants, and green retrofit weatherization programs. The demand for quality affordable housing has never been greater; using these combined measures ultimately allows for more quality, energy-efficient housing choices and healthier communities.

Some urban case studies of successfully developed housing on former brownfield sites in Chicago follow.

Bronzeville Family and Senior Campus—This campus consists of seven three-story buildings of 66 family units, and the substantial rehabilitation of one 12-story building consisting of 97 senior units. Occupancy occurred during 2012–2013. Tax credit and HOME funding programs financed total development costs.

Images of Bronzeville Family and Senior Village Campus, Exterior and Interior Views, Chicago, Illinois. Source: HUD Region 5, July 2012.



Enola Dew Village Senior Apartments—This is a five-story, 60-unit building for senior citizens in the North Lawndale community of Chicago. Occupancy commenced in the fall of 2011. Capital grant programs and other sources from public and private sponsors funded total development costs.

Images of Enola Dew Village Senior Apartments, Chicago, Illinois. Images include before, during, and after redevelopment. Source: Brian Burns, HUD Region 5, 2011.

Roseland Place and Village Campus—This campus consists of one 5-story, 60-unit building for senior citizens, one city satellite center that provides supportive care for seniors, and one 2-story, 10-unit intergenerational housing campus in the Roseland Community of Chicago. Occupancy commenced in the fall of 2011. Tax credit and grant funding programs financed total development costs.

Victory Centre of South Chicago Senior Living Facility—This facility consists of a five-story building and 112 assisted-living units in the South Chicago community. Occupancy began in the spring of 2009. Low-income housing tax credits, HOME funding, and Federal Housing Authority (FHA) insurance programs financed total development costs.

Brownfields to Housing across the United States

Other states also have built housing successfully on brownfield redevelopment sites. For example, affordable housing was a community priority as part of the cleanup and redevelopment of a former textile mill built in the 1890s in Taunton, Massachusetts. The following fact sheet highlights this project: **https://www.epa.gov/sites/production/files/2015-09/documents/tauntonmabrag.pdf**. Removal of lead, asbestos, underground storage tanks, and polycyclic aromatic hydrocarbons (PAHs) from nearby railroad easements preceded community and state investment. The project included redevelopment and creation of 64 affordable housing units and commercial space that abuts a riverside park on the mill parcel. Constructing new homes in a sustainable manner and using sustainable materials to redevelop existing structures were practices incorporated into the redevelopment efforts.

In **Silverton, Colorado**, new housing was developed in former historic mine-ore processing and waste areas after assessing, cleaning up, and stabilizing the sites. The developers carefully selected material design choices to maximize energy efficiency and sustainability while creating affordable and low-income housing. The National Renewable Energy Lab (NREL) of the Department of Energy provided technical support and assistance for this project in designing the building and by optimizing energy efficiency in a challenging climate and location. More information is available about this project at: **https://www.epa.gov/brownfields/anvil-mountain-site-silverton-co-technical-memorandum-energy-efficiency-affordable**

Environmental specialists found soil and groundwater contamination at a former service station and supermarket in **Greenville, South Carolina.** Project managers removed nine underground storage tanks and one aboveground tank, initiated groundwater cleanup, and monitored gasoline constituents, thus adopting the sustainable approach in this project that focused on storm-water management to minimize the spread of contaminants. They also added the physical barriers or **engineering controls** and land use restrictions or **institutional controls** to ensure cleanup remained protective as they created new affordable housing for the local workforce. More information on this project is at: **https://nepis.epa.gov/Exe/tiff2png.cgi/P100829O.PNG?-r+75+-g+7+D%3A%5CZYFILES%5CINDEX%20DATA%5C06THRU10%5CTIFF%5C00000847%5CP100829O.TIF**

In **Clearwater, Florida**, an aging apartment complex had fallen into disrepair; the absentee owner had provided virtually no maintenance in 40 years. The 200 units had numerous code violations and safety hazards, including asbestos and lead.

Recognizing the great need for decent, safe housing in the area, Clearwater Neighborhood Housing Services worked for several years to acquire the complex and renovate it for low-income tenants. Housing Services financed the $14 million-project though bonds, loans, tax credit equity, development fees, and grants, including a brownfields grant. Over 14 months, they remediated lead and asbestos, and completely remodeled interiors and exteriors. The key to this success was a partnership with Bank of America, which stepped in to help renovate the complex. The bank funded the "Make a Difference Center" at the apartments, with a computer lab, library, playground, and laundry facilities.

The Agency for Toxic Substances and Disease Registry (ATSDR) highlighted the full story in their book, **Leading Change for Healthy Communities and Successful Land Reuse**. The Clearwater Brownfields Area case study is available at: **http://www.atsdr.cdc.gov/sites/brownfields/docs/ATSDR_LandReuse.pdf**.

Images of Housing Redevelopment in Clearwater. Source: http://www.atsdr.cdc.gov/sites/brownfields/docs/ATSDR_LandReuse.pdf.

CONCLUSION

Brownfields are opportunities to provide housing. By cleaning up and redeveloping these properties, communities can create safe, healthy, livable places. Land recycling—reusing infrastructure and removing the need to use green, undeveloped land is but one of the many benefits of this "brown-to-housing" approach.

Often communities focus on areas where they can clean up potentially contaminated sites for redevelopment. These situations provide the opportunity for community leaders and lenders, advocates and activists, job training and workforce development organizations, and environmental and public health agencies to focus on improving existing community housing stock.

REFERENCES

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CHAPTER 15

Creating Healthfields: Redeveloping Contaminated Sites to Improve Access

Miles Ballogg, Laurel Berman, Ann Carroll, Christopher Kochtitzky, Steven McNeely, and Suzi Ruhl

This chapter examines the Healthfields movement and the various ways communities across the country have already benefitted from putting health at the center of land reuse and redevelopment efforts. Following an introduction that defines Healthfields and their importance, authors demonstrate the positive impacts of Healthfields on public health concerns, including environmental health and access to fresh food, green space, and health care.

HEALTHFIELDS: FROM WILLA CARSON TO A NATIONAL MOVEMENT

A Healthfield is a former land reuse site that has been transformed from an underused, potentially contaminated property into a vibrant area that serves a number of community health needs. The concept of Healthfields is simple: take abandoned and blighted properties and, using coordinated funding and community-based mechanisms, turn them into thriving economic developments that also improve access to healthful lifestyle choices for all (Ballogg, 2013).

Healthfields start with a vision to create a healthy community through land reuse and redevelopment. They simultaneously address many health-related issues, including:

- Contaminant and exposure reduction
- Environmental heatlh
- Fresh food availability
- Community recreation and green space
- Health care access
- Employment
- Crime

By providing long-term solutions that address the root causes of health and economic disparities, Healthfields are already changing communities across the country. The Healthfields movement owes a tremendous debt to Ms. Willa Carson. In 1998, Carson was a retired nurse in Clearwater, Florida. She ran a health clinic that provided basic medical assistance to friends and neighbors who lacked health insurance and the means to travel to the nearest hospital. When the City of Clearwater designated the Greenwood area of Clearwater as a Brownfields Redevelopment Site, Carson saw an opportunity. She had the pioneering vision to turn Greenwood, an abandoned gas station site, into a stand-alone health care facility.

Today, the Willa Carson Health and Wellness Center provides over 3,500 underserved residents with local access to preventive health and dental care, a pharmacy, and health education programs. Carson's work serves as the basis for community-driven Highways to Healthcare initiatives to turn abandoned properties with underground storage tanks across Florida into health centers and public service facilities.

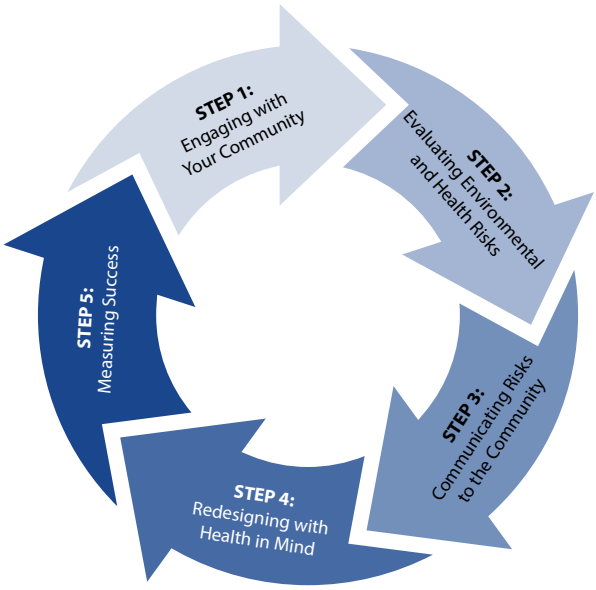
PROMOTING HEALTHFIELDS

Creating Healthfields requires an engaged development community and a clear process. The Agency for Toxic Substances and Disease Registry (ATSDR) has five steps to integrate health in redevelopment, which was presented in the Introduction to this book and is a great model for promoting Healthfields.

Understanding How You'll Work within the 5-Step Land Reuse Model

ATSDR 5-Step Strategy to Safely Reuse Land and Improve Health

The structure of this toolkit follows the **ATSDR 5-Step Land Reuse Model** used by communities to safely reuse land and improve health. As a Developer, you play a critical role in redeveloping the site with health in mind.



The Five-step Strategy to Safely Reuse Land and Improve Health (5-Step Land Reuse Strategy) provides a logical and routine process for communities to simultaneously address multiple problems in land reuse areas by integrating health in all aspects of a revitalization vision. Contaminated sites can be assessed and remediated while maintaining a broad vision for future possibilities, including access to health care, recreation, healthful foods, jobs, and other community benefits.

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FUNDING FOR HEALTHFIELDS

As with any development effort, funding is a key concern for Healthfields. Fortunately, a strong funding base exists for Healthfields projects. The first step in developing a resource base of funding options for a Healthfields project is connecting brownfield grants to health needs. From there, a diverse Development Community can provide funding and other resources. In addition, funding may be available through several resources, including:

- **HHS Health Resources and Services Administration** (HRSA)
- **EPA Brownfields Program**
- **EPA Environmental Health Program**
- **U.S. Department of Agriculture** (USDA)
- **U.S. Economic Development Administration** (EDA)
- **U.S. Department of Housing and Urban Development** (HUD)
- State and local foundations

The **Partnership for Sustainable Communities** is a cross-agency partnership among the U.S. Department of Housing and Urban Development (HUD), the U.S. Environmental Protection Agency (EPA), and the U.S. Department of Transportation (DOT). Building on the success of the EPA traditional funding mechanisms, multi-purpose grants have recently been added to the arsenal of tools to help in redevelopment efforts.

Florida's East Tampa community is one of the first recipients of the EPA's multi-purpose pilot grant, receiving a total of $1.2 million in EPA funding. Two federally qualified Tampa Family Health centers were recently built in the city, which has a large underserved population. More information about Healthfields in Tampa is highlighted in Ed Johnson's essay, *Long-term Results: The "Highway to Healthcare" Model Works as a Brownfields Redevelopment Project* in Chapter 20.

POSITIVE HEALTH OUTCOMES FOR ALL

A key factor in Healthfields has always been a strong community-led effort coupled with cooperation between various private and public agencies. These efforts also need individual leaders who have a passion to make a difference in the lives of residents and the drive to seek out and piece together all possible federal, state, and local resources.

Incentivizing cooperation among all stakeholders is also the key to making a true impact on positive health outcomes for all. The Healthfields concept demonstrates that brownfields and other related redevelopment funding has and will continue to be a powerful tool to implement environmental health and improve the health of underserved communities.

ENVIRONMENTAL HEALTH

Health disparities have been documented for many serious conditions, including asthma, cancer, cardiovascular disease, infant mortality, and low birth weight. They are also associated with significant health costs to individuals and society in general. These disparities are a critical environmental health concern because contaminated sites are often located in minority and low-income communities, including tribal lands, which suffer from pollution, lack of access to economic opportunities, and lack of access to health and prevention services. The contaminated properties may be Superfund sites, brownfields, or petroleum sites, and they have a direct effect on the health and wellness of residents.

Pastor (Pastor, 2001) has shown that, often, minority populations in communities precede the arrival of toxic storage and disposal facilities (TSDF). This may indicate that in some cases, with the appropriate kinds of support, potentially vulnerable subpopulations may have the opportunity to avoid having new environmental health threats enter their community. However, it may also mean that communities with existing environmental health threats find it much more difficult to address potentially hazardous land uses. This and related research indicates a strong need to develop

social capital across racial and ethnic lines through an explicit commitment to a strategy of coalition building between multiple potentially vulnerable subpopulations.

The strategies outlined in EPA's environmental health plan, called *EPA Plan EJ 2014* provide a roadmap for advancing environmental health and can be applied to the reuse of properly remediated contaminated sites. These strategies are:

- Protect the environment and health of overburdened communities
- Empower communities to take action to improve their health and environment
- Establish partnerships with federal, state, local, and tribal governments and organizations to achieve healthy and sustainable communities

When contaminated sites are remediated and reused for public health purposes, the benefits are multi-dimensional. In addition to the restoration of blighted properties and the removal of contamination, local communities receive increased access to health care, economic opportunities, and additional improvements that enhance quality of life. By addressing the complex issues of environmental degradation, public health, and social capital in land reuse and redevelopment, Healthfields more effectively advance healthy, sustainable, equitable, and resilient communities.

Case Study: Old Mercy Hospital

Old Mercy Hospital was an abandoned, 1923 historic hospital that had served minority and low-income populations in St. Petersburg, Florida until the mid-60s. Recognizing a critical need to revitalize the neighborhood and the facility, the City of St. Petersburg designated the site a brownfield area. Following the designation, the City successfully applied to the EPA for a Brownfields Assessment Grant, including the Mercy Hospital property among several other brownfield sites to be environmentally analyzed and potentially revitalized with the federal funds.

During the environmental investigation, researchers found off-site petroleum contamination from an abandoned underground storage tank on an adjacent site. In addition, they found on-site contamination from an underground petroleum storage tank used to fuel the hospital boiler.

Outcomes

The Johnnie Ruth Clarke Health Center, a state-of-the-art, federally qualified health center, opened on the remediated site of Old Mercy Hospital in 2004. The Center has created more than 100 jobs and serves up to 300 patients per day. Florida A&M University provides a pharmacy program and training facility while the University of Florida provides a dentistry program to provide services to the community while training future health care providers.

In addition to providing affordable and accessible health care, health-related education, and employment, the project removed a growing blight condition from a depressed neighborhood, spawned a retail and grocery shopping plaza, and catalyzed economic development in the area.

In recognition of the social and health issues resolved through the St. Petersburg Brownfields Program, the City and the Johnnie Ruth Clarke Health Center were recognized in 2005 at the

National Brownfields Conference in Denver, Colorado, as the EPA Region 4 Phoenix Award winner for excellence in brownfields redevelopment.

Keys to Success

Public support for redeveloping Old Mercy Hospital was essential. Through a concentrated community outreach campaign, the community of St. Petersburg accepted the challenge to save the 1923 historic hospital and to restore access to health care to the community. In addition, creative partnerships with local universities, philanthropies, and businesses provided even greater capacity to serve the community's health care needs.

Funding

Funding for the project came from multiple sources. The Florida Department of Environmental Protection's Storage Tank Compliance program provided funding to address cleanup of the underground contamination from abandoned tanks.

A $3.75 million HHS grant and a $463,000 HUD Block Grant covered demolition of unsalvageable portions of the building, cleanup of other areas of the site, and construction.

Finally, the City of St. Petersburg provided supplementary redevelopment funding through the City's General Fund.

ACCESS TO FRESH FOOD

Good nutrition, critical to overall health and disease prevention, relies on the availability of healthful food. Recent research has shown many health risks associated with a lack of regular access to food, particularly healthful, fresh, and affordable food. Compounding matters further, our fast food culture and increases in individual portion sizes have led to an increase in diet-related diseases such as obesity, diabetes, and cardiovascular disease (National Alliance for Nutrition and Activitity, 2010).

Many efforts to influence dietary choices and combat chronic disease and obesity rates focus on individual patients and families. However, this approach has limited impact, if any, in areas where the only food source is canned or processed food from local minimarts. Researchers, policy makers, funders, and public health advocates are now examining neighborhood, social, and community approaches to dramatically change and support increased food access, as well as more healthful buying and consumption patterns. This shift from the personal to the communal complements and is often directly linked to the Healthfields initiative.

As brownfield communities nationwide have secured funds to assess and clean former abandoned and contaminated sites, local leaders and advocates increasingly recognize that improving access to healthful and fresh food in underserved areas can be an economic development tool. This has prompted the conversion of former gas stations and other brownfield sites into farmer's markets, grocery stores, urban farms, and greenhouses. It has even strengthened the food safety net by creating food banks, cooperatives, and commercial kitchens that are used by local entrepreneurs and chefs to teach cooking and nutrition classes.

In addition, many local leaders and advocates have turned to urban agriculture and community gardens on vacant lots as avenues to improve access to healthful fresh, and locally grown food. Urban agriculture also provides an opportunity to educate and engage community residents in learning about food, how it is grown, and the importance of fresh and healthy food in community life. Through redevelopment of brownfields and land reuse sites, many communities are being introduced to fresh vegetables and fruits for the first time, with some even learning how to grow their own food. Learning how to select a site for safe planting that reduces and restricts exposures to potential contamination is another means to encourage Healthfields redevelopment.

Case Study: Lynchburg Grows

Now firmly entrenched in the community of Lynchburg, Virginia, **Lynchburg Grows** was established in 2003 to redress the destruction of a well-tended garden established and maintained by an intellectually disabled man. Local news accounts of the mistaken removal of the garden plot prompted concerned local citizens to find a new location and establish a garden. However, this effort to help one disadvantaged man prompted them to consider other community members in need and how gardens and healing green spaces could help.

Organizers turned to the owners of the derelict Schenkel Farm, a six-and-a-half acre rose growing facility with nine historic greenhouses, a farmhouse, a root cellar, and other farm buildings. Inspired by the Lynchburg Grows mission, the family provided attractive terms for the organization to acquire the property, now known at the H.R. Schenkel Urban Farm and Environmental Center. Once transferred, the fledgling Lynchburg Grows appealed to community groups and local schools to clean the space and prepare for growing food. More than 2,300 volunteers contributed over 25,000 hours to clear out dead rose plants and install new growing systems.

Mindful that historic greenhouses and rose production may have left contamination, Lynchburg Grows also contacted the Virginia Department of Environmental Quality (DEQ). With support from the DEQ, staff members and contractors identified areas with high pesticide and lead levels. After cleanup of these areas, Lynchburg Grows incorporated over 3,000 tons of compost from local universities to create safe soil amendments and add new, safe material in garden areas.

Outcomes

In their first two years of production, Lynchburg Grows produced 1,500 pounds of organic food, of which over 700 pounds of it was donated to local food pantries. By 2013, more than 5,000 volunteers contributed over 70,000 hours working with Lynchburg Grows staff. They have produced over 100,000 roses and 80,000 pounds of food, donating almost 75% to Lynchburg-area food banks and soup kitchens.

In 2014, Lynchburg Grows hosted the first Urban Agriculture conference in Virginia, attended by participants from Virginia, Maryland, Kentucky, and Washington, DC. They planned to make this conference an annual event to highlight urban agriculture and demonstrate community and healthy food options from the most unlikely of brownfield locations.

Keys to Success

A compelling personal story, local leadership, community ownership and a network of relationships, funders, and supporters all proved essential to the success of Lynchburg Grows. This broad base of support allows for the expansion of the property, including poultry growing areas, an environmental education center, and a community-supported agriculture subscription system. Learn more at: **http://www.lynchburggrows.org/**.

Funding

Since 2003, Lynchburg Grows has been run by volunteers and a staff that includes 11 workers with disabilities who have been employed with the project for as many as nine years. A brownfield grant supported sampling and technical assistance from the Virginia DEQ. Lynchburg Grows actively solicits donations. Additional funds come in from Community Support Agriculture shares.

ACCESS TO RECREATION AND GREEN SPACE

According to the U.S. Centers for Disease Control and Prevention (CDC), daily physical activity reduces the risk of developing or dying from some of the leading causes of illness in the United States, such as heart disease, diabetes, high blood pressure, and colon cancer (Centers for Disease Control and Prevention, 2009). Physical activity may also reduce depression and anxiety and promote psychological well-being, among other benefits.

In the Netherlands, a study found that as green space increased, so did people's positive perception of their health. In areas with 90% green space around homes, only 10% of residents reported feeling unhealthy. But in areas where only 10% of the environment was green, 15.5% of residents felt unhealthy (Mass, 2006).

Many communities are incorporating green and recreational spaces, even in tight urban areas. Tree-lined boulevards, pocket parks, and walking trails are some of the ways communities can integrate aspects of Healthfields into community design plans. These amenities are not only aesthetically pleasing, but may encourage people to exercise more, indirectly improving overall physical and mental health.

While access to green space and recreational sites can improve physical and mental health, many urban—and even some rural towns—lack the area or resources to increase green spaces. Below is an example of how one community found creative ways to increase green spaces and access to recreation.

Case Study: Baraboo, Wisconsin Riverwalk

The City of Baraboo is a river community of 12,000 people with the Baraboo River essentially bisecting the town. Much of the community's focus has been on redeveloping the "Ringling Riverfront" area, which is adjacent to the town center and includes the famous Circus World Museum, a well-known tourist attraction.

The Ringling Riverfront Redevelopment was home to 10 land reuse sites, including an automotive garage, a former manufactured gas plant, and an active waste transfer facility, among others. The city was concerned about contamination from these sites in this popular tourist destination and residential area. An active group of volunteers in Baraboo created redevelopment plans that not only improved the environment, but also the health of the community in the redevelopment area.

Outcomes

Several community organizations helped support the development of a 2.92-mile recreational trail along the riverfront. As a result, the area has seen increasing numbers of residents and visitors alike—walking, jogging, picnicking, and using several parks linked by the trail.

In the middle of the downtown area, the Kiwanis club funded "Kiwanis Park" and in 2009 placed a small gazebo along the trail. This gazebo is adjacent to two main roads and behind an auto parts store, adding a touch of green to this busy part of town. Walkers and picnickers frequently use the gazebo to rest and view the Baraboo River. It is also a central point to access the riverfront trail from the downtown area.

Also in 2009, several volunteers hosted a rain garden planting party and created a stormwater biofiltration pond near the gazebo to collect and filter stormwater runoff. Approximately 700 native plants were planted and grow throughout the biofiltration pond, attracting bees and butterflies and adding to the beauty of the area. The biofiltration pond is in full bloom to this day.

Kiwanis gazebo and stormwater biofiltration pond along Baraboo Riverfront. Source: ATSDR, 2010.

Keys to Success

The success of the Kiwanis Park and the adjacent biofiltration pond can be attributed to the strong partnerships between the City of Baraboo's administration, local organizations, including Baraboo Kiwanis, Baraboo Citizens for Waterfront Revitalization, Baraboo River Canoe Club, Baraboo Pack 393 Cub Scouts, and volunteers.

Funding

Funding, materials, and labor came from several sources:

- Glenville Timberwrights in Baraboo donated the wood timbers and built the gazebo.
- The City of Baraboo and Kiwanis Club paid about $5,000 in labor to have the gazebo made and installed.
- The Baraboo Public Works Department and several volunteers installed the biofiltration pond and native plants.
- The Sauk County Land Conservation Department helped select the plantings.

ACCESS TO HEALTH CARE

Gas stations and other petroleum brownfields—brownfields where petroleum is the contaminant—are found wherever people travel. These sites provide an opportunity for state regulatory programs to highlight their role in protecting residents and the environment.

One of the greatest challenges federal, state, and local regulators face in the revitalization arena is educating and informing stakeholders about limitations imposed on their cleanup funds. In 2019, EPA awarded $64.6 million in grants to 149 communities nationwide. Nearly one-quarter (23%) of this allocation targeted "petroleum brownfields." Effective use of these funds requires considerable coordination and collaboration. Communities need to have a clear vision for the end use of a formerly contaminated site.

Fortunately, the development of community health clinics has become a rallying point for helping communities of need grasp a better understanding of the partnerships, resources, and processes available to help them develop their own community clinic. By putting clear health care needs at the heart of petroleum brownfields redevelopment, Healthfields provided the necessary motivation and framework for engaging communities of need. The process also provided an excellent outreach platform for government agencies.

Case Study: Whittier Clinic in Hennepin County, Minnesota

When Hennepin County, Minnesota needed a new health care facility, they turned to an existing petroleum brownfield site for a location. The site had not only petroleum contamination, but lead paint, asbestos, and more. The Minnesota Pollution Control Agency spearheaded efforts to remediate contamination and bring new life to the site.

Outcomes

The new Whittier Clinic, completed in 2011, covers an entire city block and offers primary care, orthopedics, obstetrics and gynecology, certified nurse-midwives, cardiology, pediatrics, sports medicine, physical therapy, surgery, a pharmacy, and integrative health services. The building is also **LEED-certified**, with rain gardens featuring native plants that filter roof drainage to lower the impacts of stormwater runoff.

Because residents were actively involved in the process, the clinic also includes meeting rooms for neighborhood groups. In addition, the clinic created jobs and contributes to the tax base of Hennepin County.

Keys to Success

Collaboration between all stakeholders, including the developer, community, and local leaders, keyed the success of the Whittier Clinic project.

Funding

For cleanup efforts, the Whittier Clinic received (Minnesota Brownfields, 2013):

- $444,498 from the Minnesota DEED Contaminated Cleanup and Investigations Grant
- $76,854 from Hennepin County Environmental Response Fund

Case Study: Hilltop Health Center in Tacoma, Washington

Tacoma, Washington's Hilltop Health Center, opened in the fall of 2013, represents the culmination of years of community planning that capitalized on several brownfields assessment grants to meet community health needs. A former petroleum brownfield, the site is now home to a new three-story health care facility that serves 17,000 patients a year.

Outcomes

The new Hilltop Health Center provides medical, dental, and pharmaceutical services to mostly low-income and uninsured patients. It's also the first new construction project in the neighborhood in quite some time, creating jobs and serving as an anchor for even more development.

Keys to Success

The City of Tacoma had developed and implemented city-wide planning measures for years. They also created an inventory of underground storage tanks through their Project Abandoned Commercial Tanks (Project ACT). Project ACT helped them define the socioeconomic and health implications of these sites on their residents. By leveraging opportunities associated with their socioeconomic growth and quality of life efforts, the integration of petroleum and other brownfields into their area-wide plans became a much easier task to manage. In addition, with a clear understanding of what their residents needed, they could rally community support for the Hilltop Health Center.

Funding

The Hilltop Health Center received a $12 million Health Resources and Service Administration (HRSA) grant, the single largest grant award issued for the construction of a clinic. This grant was the starting point to raise another $14 million to cover construction costs. The project also received $7 million in equities through the New Market Tax Credits program, supported by the National Development Council, Low Income Investment Fund (LIIF) and U.S. Bank.

MORE SUCCESS STORIES

When communities share their Healthfield success stories, they help motivate others to make positive health changes in their own communities. Below is a list of additional success stories in each of the areas explored by the authors.

Environmental Health

- Environmental Health, Equitable Development and the Spartanburg Story
- **Pilot Framework for Integrating Community Health and Wellness into the Superfund Reuse Assessment Process (PDF)**
- **Unintended Impacts of Redevelopment and Revitalization Efforts in Five Communities (PDF)** (2006)
- **Addressing Environmental Health in Brownfields Communities (PDF)** (2009)

Access to Fresh Food

- Rutland, Vermont Farmers Market **http://vtfarmersmarket.org/**
- Brass City Harvest, Waterbury, Connecticut **https://brasscityharvestwaterbury.com/**
- Aquaculture and Lobster Pound, Eastport, Maine **http://gro-wa.org/assets/files/brownfields/Consea_FINAL%5B2%5D.pdf**

Access to Recreation and Green Space

- Manchester Street Park, Lawrence, Massachusetts **http://www.groundworklawrence.org/manchesterstreetpark**
- Liberty Lands Park, Philadelphia, Pennsylvania **https://www.epa.gov/sites/production/files/2015-09/documents/libertylandspass.pdf**
- Bruce Vento Nature Sanctuary, St. Paul, Minnesota (a petroleum brownfield) **https://www.stpaul.gov/facilities/bruce-vento-nature-sanctuary**

Access to Health Care

- "Healthfields" Improving Access to Healthcare through Brownfields Redevelopment **http://www.georgiaenet.com/wp-content/uploads/2015/01/23MilesBallogg.pdf**

- Central Florida Healthcare, Mulberry, Florida (a petroleum brownfield) **https://www.prweb.com/releases/2015/04/prweb12683170.htm**
- Brownfields to Healthfields: Florida Healthfields Successes **https://www.epa.gov/environmentaljustice/brownfields-healthfields-florida-healthfields-successes**

ADDITIONAL FUNDING RESOURCES

The Financial Resource Guide for Cleanup and Redevelopment (**http://dnr.wi.gov/files/pdf/pubs/rr/rr539.pdf**)

EPA'a Brownfields Program Grants and Funding (**https://www.epa.gov/brownfields/types-brownfields-grant-funding**)

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CHAPTER 16

Making it Last: Sustainable Community Design

Gabriel Zawadzki, Gita Rampersad, Ana Pomales, and Cathe Bullwinkle

Communities across the country have successfully supported "healthy redevelopment" to increase access to amenities such as green space, health care, and healthy foods. In the process, some have also incorporated sustainable community design practices. This combination of sustainable and healthy redevelopment can help communities redesign with health in mind to meet present and future needs while maximizing overall health status.

Healthy redevelopment is inherently sustainable. It aims to improve health with a long-term vision to increase community assets, reduce contamination, and protect public health and the environment. Just like community gardeners who project how much food they will need to grow for a target population, planners will assess population trends before launching development plans. Likewise, health care providers will site facilities in areas of population growth or areas underserved by health care. These considerations embody sustainable planning goals.

Still, work is needed to ensure that land reuse aligns with a community's sustainability plan. To be successful, healthy redevelopment needs to be incorporated into overall sustainability visions from the early planning stages. It also needs strong support at all levels, especially the grassroots level.

The series of essays presented in this chapter takes a closer look at sustainable community design. The first essay defines sustainable development and considers its biggest challenges. The second essay decribes the role of Community Health Coalitions in sustainability. The third essay describes how public art can be a part of redesigning communities with health in mind. The fourth essay describes how community gardens can lead to sustainable community design.

SUSTAINABLE DEVELOPMENT AND LAND REUSE

Gabriel Zawadzki defines sustainability in the context of redevelopment, considers the barriers to sustainability, and offers solutions for overcoming these challenges.

Sustainable development takes a holistic view of the systems at work in a community. It helps lay the groundwork for future redevelopment and development projects by considering the community's:

- Natural and built assets
- Character assets and values
- Preservation elements
- Long-, middle-, and short-term goals and objectives
- Barriers to development
- Access to housing, food, and transportation

Too often, unknown costs, additional time requirements, and unknowns, such as environmental contamination and historical factors, can derail redevelopment projects. Residents and other community stakeholders can use sustainability planning to address these issues before potential developers get involved. Developers may be more inclined to invest in a community when they know upfront the infrastructure they can reuse, the economic incentives, and that contamination has been addressed or removed.

Sustainability planning can make local economies more resilient by decreasing the impact of an industry or business moving elsewhere. This improves the community's ability to recover while preventing the development of green space and the exhaustion of physical and character resources that make the community an attractive place to live.

Although sustainability planning has clear benefits, it still faces two main challenges: funding availability and time constraints.

Funding Availability

Funding can be difficult to get in both good and bad economies. When the economy is strong, sustainability planning is challenging because it may be viewed as an extraneous expense. Why spend money on sustainability when industry is booming and jobs are plentiful? Will it be an economic disincentive that encourages business to go elsewhere?

In a weak economy, just the idea of redeveloping, let alone sustainability planning, is daunting. The expenses, time, and effort involved in sustainability planning may be seen as unaffordable at a time when everyone is struggling to make ends meet and reduce costs.

In addition, funding often favors larger communities with more resources and connections.

Funding Favors Larger Communities

Funding sources that assist with sustainable development planning are increasingly competitive. Grants from federal and state agencies often require that applicants contribute their own money in the form of in-kind contributions or dollar match. Applicants that have already made progress toward including sustainability planning in their economic revitalization and improvement efforts may receive higher grant scores and an advantage over applicants that have not.

One example is the Housing and Urban Development (HUD), Department of Transportation (DOT), and Environmental Protection Agency's (EPA's) Partnership for Sustainable Communities. A community applying for an EPA Brownfields Site Assessment grant needs to demonstrate how it is meeting the Partnership's "Livability Principles" (Environmental Protection Agency, 2014), including:

- Increasing transportation choices
- Expanding affordable housing options
- Promoting economic competitiveness
- Supporting communities
- Coordinating and leveraging federal policies and funding
- Valuing communities and neighborhoods

Typically, the communities that most successfully compete under these criteria are the largest communities with resources dedicated to meeting specialized requirements. This can be demoralizing for small and rural municipalities, discouraging them from continuing sustainable redevelopment efforts.

Funding May Require a Community Sustainability Plan

To compete for some funding programs, communities need to have a community sustainability plan. This can be both a help and a hindrance to funding. On the one hand, this is often how community sustainability plans get started—someone realizes that incorporating sustainability measures in overall planning can increase funding resources. For example, communities applying for EPA Brownfields funding have to address sustainable practices, such as reusing infrastructure or protecting the environment, in their proposals. On the other hand, sustainability plans take time to develop. If a community sustainability plan is not in place, it may take months or years before a competitive application can be submitted for a project.

Image of a Community Planning Meeting.
Source: Gabriel Zawadzki, 2013.

Sustainability planning takes time because it needs as many stakeholders as possible, including community members. Long-term acceptance and success of the sustainability model requires people from the community to champion the process and push it forward if it stalls or is in danger of being forgotten. If community members feel that they are not part of the process and that their concerns are not taken into consideration, it does not matter how good the final plan is—the risk of community rejection can prevent any of its aspects from being implemented.

Communities change as people move away and new ones move in. A community sustainability plan needs to be a living document, tweaked over years and decades to remind everyone what they agreed to and why. As goals and objectives are reached or it becomes important to include new ones, the plan needs to be revisited and updated to prevent it from becoming obsolete.

Time Constraints

Time is a challenge because sustainability adds another layer to the planning process. It takes time to build strong relationships, to identify needs, and to get community buy-in for a sustainability vision. In addition, sustainability programs often come with their own jargon, adding more time to the process as community members get acclimated to a new vocabulary.

Building Relationships Takes Time

Creating a solid footing for sustainable development is not a rapid process. It takes time to figure out who the community stakeholders are and who needs to participate at different steps in the process. To see a sustainability plan through to completion, community members are needed to champion the sustainability planning process, find resources, develop funding sources, hold outreach meetings, gather data, develop reports, shepherd the effort to completion, and perform caretaking and maintenance.

Sustainability Planning: Start Early

Everyone involved in sustainable community revitalization needs to understand the time required for planning. Sustainability planning needs to begin as far ahead of redevelopment as possible. It is too late to start developing a community sustainability model after a project is underway. Stakeholders will feel slighted by not being included earlier, and they will be frustrated by development-driven timelines. Tight timelines will limit public involvement, causing more frustration and resulting in low support with less stakeholder buy-in.

Jargon Undermines Good Intentions

Every redevelopment planning concept and program has its own terminology, methods, guidelines, and practices. In Michigan, for example, every four to eight years seems to bring a new plan. On top of federal programs promoting sustainable development, Michigan residents have seen programs like *Cool Cities, Redevelopment Ready Communities, Placemaking,* and *Michigan Main Street.*

Regardless of the programs' merits, the jargon used when pitching an idea and explaining the process can create a language barrier between the communities and the promoters and experts. When a program introduces its own jargon, it takes even more time to explain the concepts to stakeholders: citizens, non-profits, business owners, developers, investors, and government officials. It makes the process of achieving sustainability more opaque to the uninitiated and creates barriers to understanding, acceptance, and buy-in. For people familiar with sustainability, it takes up precious time to learn a whole new language for concepts they already understand, which can be frustrating and demoralizing.

This lack of accessibility and understanding also opens up sustainability terms to appropriation and redefinition for use in political battles, sometimes making sustainability a toxic term when attempting to recruit community champions and build stakeholder support.

The best approach is to use basic explanations in plain language. If jargon cannot be avoided, it needs to be explained simply and clearly.

Overcoming Challenges through Grassroots Support

Sustainable development needs to start at the grassroots level and it needs to start early. Assistance can come from planning organizations, government agencies, advocacy organizations, service organizations, or the business community, but it will only be successful with grassroots support.

Once a community is engaged in redevelopment and community planning, a project can move forward with a broad base of support. This support is built by engaging communities early in the planning process, which gives community members a sense of ownership of a project by feeling that their voices are heard and respected in a redevelopment plan. This helps community members become key stakeholders, willing to donate their time to ensure that a plan will serve the greatest community good.

In addition, this base of stakeholders can enhance a redevelopment plan by adding a diverse layer of expertise to a project. For example, some community members may have grant-writing skills, others

may have a sense of community history, and other members may have a knack for piecing together funding packages to bring resources into the community. When community members offer this kind of support, they help directly address the funding and time challenges that can stall sustainable community design projects.

Another way communities can overcome sustainable development challenges is by working with county advocacy organizations. One example is Michigan Association of Counties (MAC). MAC uses its Grant Services Program to provide rural counties with the resources they need to work toward sustainable redevelopment. Associations like MAC can help communities integrated sustainability in community planning. MAC helps communities develop their needs and redevelopment goals, reviews potential sources of funding, helps write grants, and helps communities implement planning, community outreach, and other redevelopment efforts.

Communities–especially small rural ones–have to know what is available and how to request this type of assistance. MAC helps communities access these resources and often lines up multiple meetings between resource personnel and communities in a region. This can help justify outreach and travel when budgets are tight. In other regions of the United States, state associations often provide similar services as MAC. The **National Association of Counties** is a good resource to discover what is available in each state.

CONCLUSION

Sustainability planning faces the same challenges as many other municipal programs: money and time. Knowing this, communities can apply lessons learned from their previous efforts and from the work of other communities. This common experience develops a long-term perspective and provides inspiration for ongoing work.

To maintain motivation for longer term planning goals, communities can celebrate small wins, such as establishing a Brownfields Redevelopment Authority, organizing a community advisory group for planning, or starting a community garden. Over time, these small gains help drive the planning process forward while waiting for funding for larger planning goals. In addition, through community involvement, creative funding mechanisms, and partnerships with advocacy organizations, a community can develop a sustainable revitalization vision that maximizes healthy redevelopment while keeping community members engaged and supportive of long-term goals.

COMMUNITY HEALTH COALITIONS: A TOOL FOR CREATING SUSTAINABLE HEALTH IMPROVEMENT INITIATIVES THROUGH LAND REDEVELOPMENT

Gita Rampersad offers community health coalitions as one tool for working toward sustainable redevelopment.

Multiple factors influence health, and well-being in a community. Many entities and individuals have a role to play in responding to a community's needs, and organization is essential for success in driving sustainable community health initiatives associated with redevelopment. Community health coalitions (CHCs) can provide an effective source of leadership by convening key stakeholders, planning and executing public health interventions and promoting change and healthy community revitalization at a local level. With solid community health advocacy models in place, health policymakers at the local, state, and federal levels will be more inclined to consider community-level performance indicators when planning large-scale, publicly funded health services programs and community development initiatives.

What Is a Community Health Coalition?

A CHC is a group of individuals from diverse backgrounds (organizational and otherwise) united around a shared vision to advance overall health and wellbeing for all residents in the region. CHCs function to **connect, engage, educate,** and **collaborate** across local sectors to achieve common goals and objectives. They can provide a forum for stakeholders to develop a broad perspective on community health needs and produce a formal strategy on how these needs might be prioritized and addressed. Leadership is essential to initiating and maintaining an efficient, effective and sustainable CHC. With strong leadership, CHCs can provide a comprehensive approach to maintaining and improving community health and wellbeing. Over time, CHCs may also aid in the advancement of health policy.

Connect: CHCs serve as a vehicle to convene a broad range of individuals interested in equitably addressing a community's health needs and consider unique circumstances facing residents such as health concerns, resources and capacities, economic, social and political perspectives and competing needs.

Engage: CHCs establish a centrally coordinated environment where individuals become members, form trusting partnerships and committees, develop plans, and work towards advancing common goals. A multisector membership makeup is useful in exploring and tackling issues impacting health and wellbeing and finding practical resolutions.

Educate: Aside from forming partnerships and committees, identifying needs and setting goals, CHCs can leverage funding and member power to provide technical assistance to address health needs, building capacity to fill in the gaps on critical community-led priorities. An informed community leads to a healthier community.

Collaborate: CHCs benefit from a strength in numbers approach yet must agree to share responsibility and accountability for a region's health portfolio. Teamwork makes the dream work!

Leadership Structure of a Community Health Coalition

A typical start up CHC often includes the following roles:

Positions can range from general members up to a chair and an executive sponsor, such as a municipal agency or a hospital. While the CHC may be completely voluntary, assigning members to roles and sharing responsibilities can help ensure that the CHC will be sustainable over time.

Potential Outcomes from Using a Community Health Coalition in Land Redevelopment Projects

A CHC can help assess community health, measure changes in community health status, play an active role in revitalization, and evaluate changes in the community over the course of the redevelopment process.

Assess: An established CHC can choose the appropriate assessment tool for identifying and addressing community concerns. For example, the **ATSDR Brownfields/Land Reuse Action Model** (Action Model) (Chapter 3 describes the Action Model) was developed to enable a community to quickly identify and inventory potential public health impacts Communities engaged in land reuse strategies that address a broad array of health concerns have used this tool nationwide.

Measure: An organized CHC can host town forums to develop public health indicators and increase resident involvement in redevelopment activities.

Play an active role: With the creation of special interest subcommittees, CHC members can take part in community revitalization efforts.

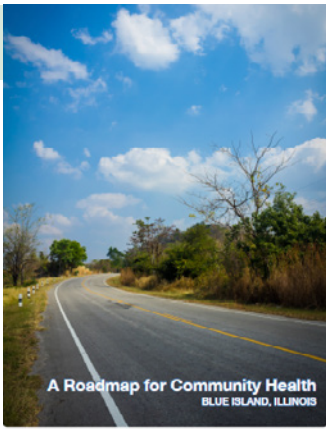
Evaluate: CHC members can update and evaluate change over the long term with proper training, relationship development, and subcommittee appointments.

Land redevelopment is often part of a city's comprehensive plan. It can be helpful to establish a CHC as a city's official public health advisory body. The CHC can then work closely with planners and elected officials on long-term economic development initiatives resulting from effective land revitalization. CHCs build trust, create awareness, and improve communication, increasing the chances of success.

Case Study: The Blue Island Community Health Coalition

Blue Island, Illinois is a 4.5 square mile community of 23,706 people located southwest of Chicago. In 2010, Blue Island's ethnically diverse community is 47% Hispanic or Latino, 30.8% African American, 21% non-Hispanic whites, and 1% "other." The 2010 median household income in Blue Island is $40,851, well below the State median household income of $56,797. The 2010 unemployment rate in Blue Island is 21.7% as compared to 14.1% state-wide (United States Census Bureau, 2010).

Like many communities, Blue Island's economy deteriorated over the last decade. In addition, the city is plagued with over 400 suspected land reuse and brownfield sites. Blue Island is a vulnerable community, at risk for poor health outcomes, mostly due to its physical, demographic, and socio-economic composition. Residents face environmental health risks, such as elevated blood lead levels from older housing. They also have health problems such as obesity and other chronic diseases like diabetes and hypertension, and cancer.



Blue Island Community Profile. Source: Gita Rampersad, 2014.

Blue Island's Vision

Despite the challenges faced by Blue Island, it is a city with many assets. Blue Island is a champion for public health prevention and promotion efforts, as well as a community health compass. Its residents have a shared vision toward improving health where they live, play, work, learn, and pray. Since 2005, Blue Island has worked to improve the lives of its residents through population planning efforts, policies and programming, and systems and environmental change. The community's vision is to see, "a healthier, safer Blue Island community through the practice and promotion of prevention and wellness" (Blue Island Community Health Charter, 2011).

Believing that "a single hand cannot cover the sky," and that "it is critical that a diverse group…work together for change," leaders from many prominent local organizations and activists formed the **Blue Island Community Health Coalition** (BICHC). The BICHC was committed to forming effective partnerships to tackle the area's biggest health challenges through redevelopment planning (Blue Island Community Health Coalition, 2011).

BICHC's Beginnings

The BICHC grew out of an existing Development Community of individuals and groups interested in improving community health while assessing and remediating the hundreds of potentially contaminated sites throughout the city. City leaders had been holding required brownfields outreach meetings, but these meetings were not well attended.

This changed in 2007 when the city's Community Development Department, who were the leading members of the Development Community began participating in events focused on community health, such as local fitness events and health fairs. They wove brownfields outreach activities into these health-based events to reach a larger part of the population. The Development Community then used the ATSDR Action Model to address community concerns, suggest redevelopment solutions, identify health benefits of redevelopment, and create nearly 50 community indicators to track changes in health outcomes over the course of redevelopment, from one to 10 years or more.

In 2010, organizational leaders and interested community members in South Suburban Cook County, Illinois formally established the BICHC in order to partner with federal, county, and local health agencies to help make Blue Island healthier and safer for its residents and surrounding communities.

BICHC Today: The Blue Island-Robbins Neighborhood Network

With a 2012 municipal ordinance, the City of Blue Island moved its major project support for health improvement to the BICHC, making it the city's official public health advisory body. The BICHC adopted an official logo and tagline, "Be Healthy, Blue Island." In May 2014, the coalition also launched a **website** to engage the community and encourage involvement in BICHC committees and events. The BICHC continued to grow. By 2017, the BICHC joined their neighboring suburb Robbins, to create the **Blue Island-Robbins Neighborhood Network** (BIRNN), a coalition of community partners providing neighborhood specific solutions to unique community challenges. The BIRNN is an example of collective impact in action, encouraging collaboration between a variety of groups including government, non-profit, institutions, funders, and other organizations and becoming a catalyst for moving the community forward. BIRNN is working to inspire others to join a collective cause and be a useful model for addressing social issues that affect other communities (Blue Island-Robbins Neighborhood Network 2019).

Lessons Learned

The BICHC and BIRNN are both examples of sustainable and scalable public/private partnerships consisting of dozens of organizations and hundreds of individual members committed to improving health and quality of life for residents of Illinois' Chicago Southland region. Both include local government, public health, healthcare professionals, business leaders, CBOs, the faith-based sector and residents as members. All members are committed to addressing public health concerns, the social determinations of health through community health promotion, education, advocacy, capacity building and research. These coalitions chose to center their work on community driven focus areas, including Healthy Lifestyles, Financial Health, Environmental Health and the Built Environment.

By participating, coalition members learn important lessons about the:

- Need for long-term commitment to deal with the time and effort involved in developing a coalition
- Value of identifying and understanding the need for community-wide projects
- Importance of creative approaches to engage all community stakeholders
- Need for alignment around common goals
- Impact of staff changes on relationships and productivity levels
- Usefulness of established tools developed by public health agencies to aid in the assessment and planning processes

Through their collaborative efforts, coalition members have learned that mutually beneficial relationships can best be built over a long-term series of demonstrated successful collaborations, each building on trust, respect, and the alignment of common agendas. In addition, they have found that public health partners may have multiple resources for incorporating evidence-based best practices into projects, many of which are low cost or free.

The BICHC and BIRNN serve as great models for other communities. It is helpful to remember that successful organizations do not spring up overnight. It takes tremendous commitment and leadership. It also takes time. Years of work went into creating these coalitions that celebrated and built on small successes along the way, all the while strengthening their commitment and outreach necessary for creating healthy, equitable, sustainable communities.

ART AS A CATALYST FOR URBAN RENEWAL AND SUSTAINABLE COMMUNITY DESIGN

Ana Pomales considers the relationship between art and sustainable communities with two case studies from Philadelphia, Pennsylvania.

Investment in the arts and culture industries has gained popularity as a strategy for sustainable economic development. Development of a geographic "cluster" of art-centered venues and businesses is a cornerstone of this approach. These areas are often referred to as "art corridors" or "art districts." These newly established (or redeveloped) districts benefit the local economy by creating jobs and by increasing tax revenues through tourism and consumer product purchases. This strategy has been successfully implemented in Philadelphia's "Avenue of the Arts" area and in Taos (New Mexico's) Arts and Cultural district. In the Menomonee Valley of Milwaukee, Wisconsin, public art was incorporated as part of a brownfields redevelopment plan.

The arts can reinvigorate communities in an "organic" manner. That is, art-centered clusters can result out of necessity and opportunity, without the direct influence of private investors and policy makers. Neighborhood characteristics such as location, costs, and available space can trigger the relocation of artists' residences, galleries, and workspaces. New businesses are established to cater to the needs of the newly established residents and out-of-town visitors.

Arts and culture can be used to increase social capital and to highlight the historical and cultural identity of communities. Furthermore, art and cultural activities can help long-time residents and new residents connect when they have strong, opposing views on issues affecting their community. For example, community festivals celebrating cultural heritage can attract people and businesses from within and outside the community. They can also encourage the interaction of community residents. Various forms of public art, such as community murals and temporary art installations, present opportunities for community members to engage with each other and to validate their heritage and sense of place. These activities not only beautify abandoned and blighted spaces, they also give a sense of pride and ownership to community members.

Case Study: Philadelphia Mural Arts

Philadelphia Mural Arts is a public/private partnership that has successfully painted over 3,600 murals and led to Philadelphia being called the "City of Murals." What started as a component of the City's anti-graffiti initiative has become an exemplary national model for using art to engage communities, educate at risk-youth, and revitalize decaying urban areas.

In 1984, Jane Golden, the program's director, started conversing with city graffiti writers. Instead of antagonizing them, she gave them opportunities to develop and use their skills. As of 2014, community engagement is still at the heart of the mural design and painting process. The Mural Arts' projects often compliment other ongoing community revitalizing initiatives and seek the input of community members during the design and painting processes.

One of the program's largest projects was completed in 2012. The project, "Philly Painting," involved painting an abstract mural that ran along 51 storefronts on three blocks of Germantown Avenue. The internationally renowned artists Haas and Hahn (Jeroen Koolhaas and Dre Urhahn) led the project over a 16-month period. Over $130,000 was paid to community residents for 9,200 hours of work repairing and painting the buildings' facades. While it is too early to know the long-term benefits of this project, the murals give new life to a highly blighted section of Germantown Avenue. To learn more about Philly Painting, visit **https://www.youtube.com/watch?v=jxDD6rOaNVA**.

Images of Artists Haas and Hahn with community residents working on Philly Painting, a Mural Arts' project. See: https://www.muralarts.org/artworks/philly-painting/

Case Study: Future Farmers

Another group in Philadelphia, Future Farmers, highlights the nexus between art, gardening, and social activism. Future Farmers is an international collective of artists, researchers, farmers and architects who work together to propose alternatives to the social, political, and environmental organization of space (Future Farmers, 2014). Founded in 1995 by artist and designer Amy Franceschini, they have created, developed, and exhibited numerous art projects exploring environmental and social topics. Future Farmers are the creators of a temporary art installation project called Soil Kitchen.

Soil Kitchen was commissioned by Philadelphia's Office of Arts, Culture, and the Creative Economy and it coincided with the 2011 National Brownfields Conference co-sponsored by the U.S. EPA. Soil Kitchen was a collaborative effort bringing together alternative energy, environmental health, and urban gardening in a temporary art project. The project ran from April 1 through 6, 2011, in the Northern Liberties section of Philadelphia, a rapidly developing neighborhood community with a long history of industrial activity. In addition to providing informational sessions and free soup to the community, the Soil Kitchen project provided soil analyses, including soil chemistry (pH, N/P/K, visual and physical evaluation) by volunteer soil scientists and x-ray fluorescence (XRF) analyses, for lead, arsenic, and cadmium. Soil Kitchen is highlighted in Chapter 12.

Connecting Art, Culture, and Planning

Communities that have connected arts and culture to sustainability planning have realized economic, aesthetic, and social benefits. However, it is not always clear how to make that connection. The American Planning Association (APA), a non-profit organization dedicated to the education and practice of planning, created a series of briefing papers on art-based strategies to achieve economic, environmental, and community development goals. The table below is presented directly from APA briefing papers (American Planning Association, 2017) and summarizes examples of various art-based strategies for community development.

Examples of Art-based Community Development Strategies

Category	Planning Goals	Summary Activities	Actors
Environmental	Preserve and enhance a place's local identity and character Preserve and protect the community's parks and open space Restore, protect and preserve the community's waterways Implement sustainable practices Encourage healthy practices, including bike/ped-friendly travel, outdoor activities, etc.	Integrate public art in transportation, parks and open space, water, and sewer infrastructure Engage the community in a multidisciplinary exploration of environmental degradation and preservation through community performances and festivals Inventory, assess, and map a community's artistic and cultural characteristics Encourage zero-waste practices at festivals, public venues, restaurants, hotels, etc. Locate or develop performance spaces and public gathering places on public transportation routes Include sustainable practices incentives in site-review regulations Creatively reuse and preserve historic structures	Planners Nonprofit organizations Design professionals Artists Environmental planners Developers and builders Policy maker
Economic	Develop and expand upon local economic opportunities for members of the community Ensure quality affordable housing for all members of the community Attract businesses, new residents, and visitors Provide or facilitate public transportation	Create and provide maps, signs, and other products to educate consumers about locally owned and operated community businesses Use public art within streetscape improvements to increase traffic to underutilized corridors Provide cultural assets in new affordable-housing developments Encourage use of public transit, including ensuring safety Create live/work spaces Create incubator spaces for individual entrepreneurs, including artists	Planners Economic developers Engineers Business investment districts Nonprofit organizations Artists Financial institutions Policy makers Residents Visitors and tourists

Category	Planning Goals	Summary Activities	Actors
Community	Engage the public in transparent planning processes to assess the current and future needs of the community Promote community pride and stewardship of place	Use interactive, online community forums Empower and engage racially and ethnically diverse groups of youths and adults to participate in planning decisions through innovative tools such as drawing, sculpting, modeling, and painting Engage artists to provide or help develop a vision	Planners Nonprofit organizations Local businesses Neighborhood groups Artists Individuals
Social	Preserve the historic and cultural heritage of a place Provide a better understanding and an appreciation for a community's cultural diversity Facilitate connections among or reduce barriers between diverse groups (e.g., age cohorts, ethnic groups, socioeconomic classes)	Engage community residents in a PhotoVoice or storytelling exercise to identify shared needs and values Create and unveil a community mural or other form of public artwork to validate or celebrate the past Organize a community festival to celebrate local cultural diversity Provide arts and cultural education programs, such as workshops, interactive classes, and performances, to encourage an understanding and awareness of a community's historical and cultural context Use cultural and noncultural venues to facilitate participation from different parts of the community	Planners Nonprofit organizations Neighborhood groups Artists Individuals Funders Policy makers

HOW COMMUNITY GARDENS CAN LEAD TO SUSTAINABLE COMMUNITY DESIGN

Cathe Bullwinkle explores community gardens as an avenue for sustainable design, highlighting successful efforts in Utica, NY.

How do you rebuild a community in a way that respects existing neighbors and also welcomes newly arrived refugee families? As it works to improve the health of their 61,000 residents, the local health department in Utica, New York faces these and other unique challenges, including:

- High lead poisoning rates in children
- A large stock of older housing with lead-based paints
- A large refugee resettlement population that speaks over 46 languages

In 2013, the New York State Department of Health's Center for Environmental Health and its community partners, including the Oneida County Health Department, decided to try community gardens to start solving these challenges. They worked together to turn unused city lots into green spaces where families could grow fresh vegetables and children could learn and play. The gardening project is showing promise as a sustainable community design, serving as a catalyst for urban renewal, partnership-building, and food access.

From Frustration to Green Space

In 2013, the Utica School District and the City of Utica agreed to swap properties to allow the park project to move forward starting in 2014. This park site, located in a low-income area of the city, was planned to provide children and seniors with a green, natural environment for play and exercise. Its location in a low-income area of the city that lacks parks and play fields enhances the work done by the local health department's childhood lead prevention program and improve the overall health and safety of the neighborhood.

The Utica Unity Garden Project

Community groups also named refugee health issues as a concern, including:

- Hypertension from high sodium diets and the consumption of fish paste
- Diabetes related to excessive intake of high glycemic foods, such as jasmine rice
- Planting gardens in contaminated soils near houses
- Foraging for greens along roadways

To address these concerns, the New York State Department of Health partnered with the Oneida County Health Department in 2013 to test and develop a large parcel of land in the Cornhill area using funding from ATSDR's National Land Reuse Health Program. This partnership created a raised bed community garden that now serves as a demonstration garden. The garden is located across the street from the Mohawk Valley Resource Center for Refugees, which has space for up to

100 families to learn to grow vegetables similar to those they ate in their country of origin. Typically, these countries include those in Africa, Asia, and other areas with a long growing season. With the shorter growing season in Upstate New York, this is a big challenge. Local neighbors have joined the garden to plant vegetables and flowers to support their own families' needs.

A Space for Healthy Play

A Children's Garden Project was later added to the garden, where children from the neighborhood and the local childcare center can play, learn about gardening, and plant their own vegetables. The local Cooperative Extension program provided a **Master Gardener** Candidate who taught children how to prepare healthy snacks and led the children in fun, garden-themed activities. Their Children's Garden Sign and Morning Glory trellis, with its fragrant purple blooms, soon attracted honey bees to the garden.

A Growing Garden

As tall, yellow sunflowers stood like sentinels at the garden entrance, community interest was piqued. Downtown workers started walking to the garden as part of their lunchtime routine. All of this interest prompted a local businessman to offer the use of a large lot for gardening. In addition, a local company, the Mele Corporation, provided an employee workday and over $7,000 to build another 55-plot raised bed garden just down the street from the initial site. As of 2013, these two sites formed the Utica Unity Garden Project.

The addition of a community garden to this once beautiful, now blighted Park Avenue neighborhood prompted a buyer to purchase an old, dilapidated Victorian house across the street from the garden. The house was for sale by the local Urban Renewal Agency. The new owner began extensive renovations. Then, the next-door neighbor painted his house. This illustrates that attracting a few key property owners who will invest, live in, and maintain their properties is essential to neighborhood revitalization efforts.

Photograph of Community Garden in Utica, NY.
Source: Cathe Bullwinkle, 2013.

An Engaged Community

In 2013, local partners worked with the New York State Department of Health team to develop a 10-week horticulture class offered in seven languages to increase garden knowledge for neighbors and refugees who come from agrarian backgrounds. The Workforce Development Institute provided over $6,000 in funding to the project to support gardening skills development and employment opportunities in local greenhouses and garden supply shops.

In partnership with the local community college entrepreneur program, this partnership developed classes for residents who wanted to sell the food they were growing and offered support for marketing their products at local farmers' markets. The county then donated a stall at the Regional Farmer's Market where multiple families can sell their excess produce. After hearing about the gardening initiative, several local farmers just outside the city limits offered free use of unused acreage for larger scale production of cash crops. They also donated two goats to start a goat herd for milk and cheese production.

In 2014, the City of Utica included the Utica Unity Gardens as part of its neighborhood branding project for the Oneida Square District. This will bring in additional funding for facade and neighborhood improvements. In addition, the Community Foundation is providing over $14,000 in funding for paint stabilization efforts (a program to remove lead based paint hazards) to improve the appearance and safety of housing in targeted neighborhoods.

Other Projects

The New York State Department of Health partnered with the Utica Rescue Mission, Kennedy Plaza Apartment Tenant's Association, the **Women, Infant, and Children's Program** (WIC) in Oneida County, the Central Association for the Blind and Visually Impaired, and Sculpture Space to plan five additional garden sites in 2014. One garden was at the local WIC office. The purpose was to allow WIC nutritionists to offer hands-on education to mothers and children on increasing their children's intake of fresh vegetables.

Another garden was planned for the local Rescue Mission to support their food kitchen and pantry and provide garden skills to their clients. A larger community garden at a low-income high-rise building was planned to partner with the tenants' association to provide fresh vegetables to this complex, which lacked access to a grocery store. It also provided children's gardening programming for after-school and summer programs.

In addition, a partnership between a local arts organization, a children's childcare program, and a food pantry formed to support growing healthy foods in the Brewery District of West Utica, which lacked a community garden. Plans were considered for a trail to link the community gardens into an art and garden trail that links the Oneida Square District neighborhood in Cornhill to the Brewery District in West Utica.

Keys to Success

The success of the gardening project was driven by strong partnerships and the ability of a local health agency to lead and coordinate the effort. The keys to success in creating the sustainable community design included:

- Neighborhood improvement, which can lead to additional funding resources
- Training in sustainable gardening and business practices
- Creation of food systems, which improve health and build partnerships

Rebuilding communities is challenging and requires nurturing partnerships that can leverage and braid together diverse resources. In the City of Utica, with the help of ATSDR grant funding, the New York State Department of Health and its partners are empowering local residents to grow their own food while revitalizing an urban neighborhood one street, one block, and one garden at a time.

Note: Cathe Bullwinkle received the 2014 EPA Environmental Quality Award for sustainable community development work in the City of Utica, including this ATSDR Brownfield Land Reuse Project.

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CHAPTER 17

A National Model for Sustainable Land Reuse and Healthy Community Redesign: Green Historic Preservation

Yolanda Bouchee[6]

Green Historic Preservation is a process of stewardship that advances the goals of green building and historic preservation. It takes full advantage of traditional sustainable features of older buildings, such as passive ventilation (i.e., natural ventilation), and integrates new green building elements or technologies. By doing so, it improves energy performance in existing buildings, minimizes environmental impacts, and preserves the community's look and feel. Green Historic Preservation can help communities redesign with health in mind.

■■■

6 The author would like to acknowledge the contributions of Danielle Potts to this chapter

Green Historic Preservation integrates **Smart Growth Principles** (United States Environmental Protection Agency, 2000), which can have a significant impact on energy conservation and climate change mitigation. In a 2004 report, the Brookings Institute projected that by 2030, we will have demolished and replaced one-third of our current building stock (Nelson, 2004). If we were to rehabilitate and adapt even 10% of our building stock, we would save enough energy to power the state of New York for well over a year (Preservation Green Lab, Undated).

In dense urban environments, rehabilitating existing buildings saves money and even more embodied energy by using existing infrastructure and services and by offering the potential for district energy strategies. This translates into a positive, equitable, community-wide impact, as well as sustainable development based on smart growth principles and stewardship values.

REUSING ORIGINAL GREEN DESIGN

Many historic buildings are inherently energy efficient due to their durable materials and design. For example, an older building's thermal mass, spatial relationships, and natural ventilation may reduce mechanical heating and cooling needs. Retrofitting older buildings with new, environmentally friendly materials integrates the best of old design with new green technology.

BOOSTING ECONOMIC DEVELOPMENT

Investing in neighborhoods by retrofitting existing buildings has multiple economic benefits (Rypkema, Cheong, and Mason, 2011) (Center for Urban Policy Research, Rutgers University, NJ, 2013), including:

- Cost savings for local governments and residents
- Increased property values
- Job creation
- Downtown revitalization and heritage tourism
- Environmental benefits
- Health benefits

Existing buildings represent a prior investment of resources, including design, construction, and development costs, such as supporting infrastructure and services. Adaptive reuse of buildings—finding a new purpose for an old building—allows developers to use transportation, water, wastewater, and electricity infrastructure that are already in place. Through adaptive reuse, old, unoccupied, or underutilized buildings can become suitable sites for many different purposes, which is a sustainable and cost-saving alternative to demolition and new construction.

Green Historic Preservation also creates jobs (PlaceEconomics, 2011)—skilled contractors are needed to retrofit existing buildings. These renovated structures then attract residents and businesses, thereby bringing more activity to the community and spurring additional redevelopment and investment. A green historic building can serve as an anchor for redevelopment of a block, street, or district.

It can also contribute to overall cultural heritage, which attracts new residents and visitors who explore and invest in the community.

Finally, building retrofits can contribute to broader economic growth by helping create, expand, and shape markets for sustainable products and services (United States Environmental Protection Agency, 2013).

MAINTAINING A SENSE OF PLACE

Green historic buildings may have a number of unique design and construction features that contribute to a community's identity and to a strong value in the market. Tall ceilings, generous daylight, and grand ceremonial spaces give historic buildings enduring investment value and make them attractive for a variety of uses. Historic buildings were often built with quality craftsmanship, using durable, high-quality materials (e.g., old growth wood) that are no longer affordable, readily available, or sustainably obtained.

Green Historic Preservation efforts can foster vibrant, distinctive, attractive communities with a strong sense of place and cultural identity (The Guild Foundation, 2013). They also contribute to building sustainable, equitable communities by improving the quality of life for residents.

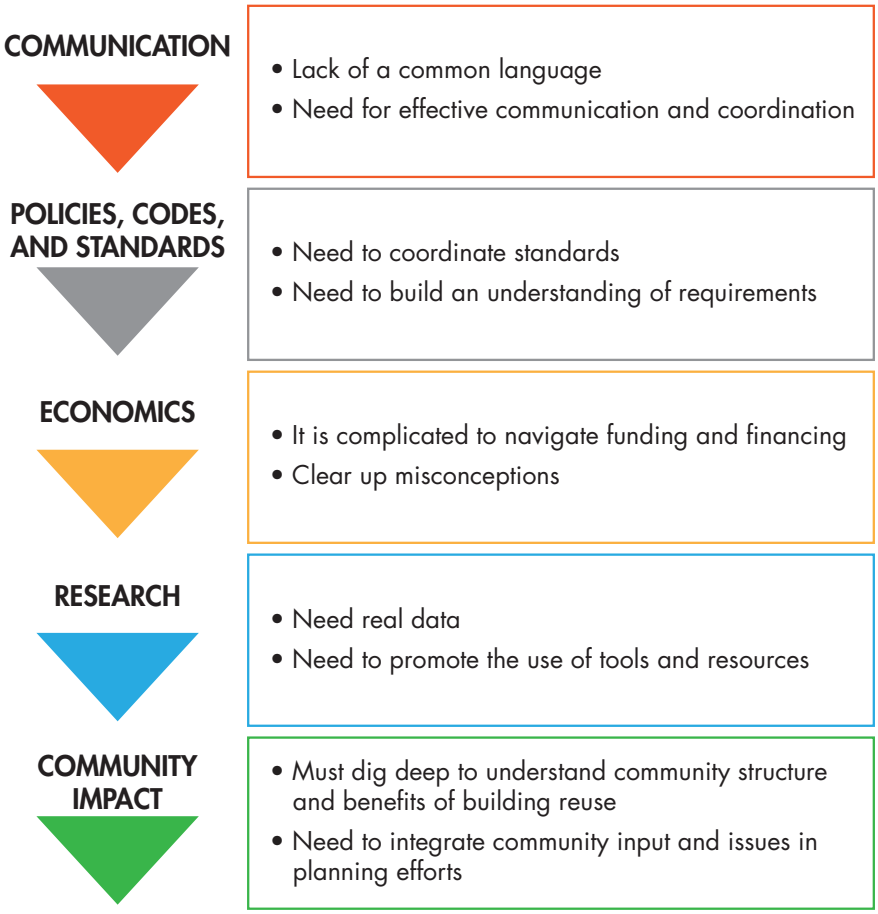
IDENTIFYING BARRIERS TO GREEN HISTORIC PRESERVATION

Image: LEED® Silver Rated Balfour—Guthrie Building, Portland, Oregon. Source: the Whole Building Design Group Historic Preservation Subcommittee, 2013: http://www.wbdg.org/resources/sustainable_hp.php

Despite the clear benefits of Green Historic Preservation, the movement faces challenges. In 2010, EPA hosted a series of symposia around the country, titled "What Works, What Doesn't, and What Should Change?" In it, EPA staff asked practitioners to let them know what works or should be changed in policy and practice regarding the reuse and proper renovation of old and historic buildings. Symposia participants identified five barriers to Green Historic Preservation:

- Communication issues
- Complicated policies, codes, and standards
- Economic misconceptions
- Lack of research
- Community impact

Some of the recommendations to remove barriers are summarized in the figure below.



OVERCOMING BARRIERS TO GREEN HISTORIC PRESERVATION

After identifying the barriers to Green Historic Preservation, EPA symposia participants removed them by developing six principles:

- Promote collaboration
- Integrate green historic preservation values into policy
- Make building revitalization economically viable
- Fill in data gaps
- Support sustainability-focused decision-making
- Demonstrate federal leadership.

These principles are summarized in the figure below.

ADDITIONAL RESOURCES

EPA Smart Growth and Preservation of Existing and Historic Buildings: **https://www.epa.gov/smartgrowth/smart-growth-and-preservation-existing-and-historic-buildings**

Whole Building Design Guide's Sustainable Historic Preservation **http://www.wbdg.org/resources/sustainable_hp.php**

EPA Region 5 Moline, Illinois: **https://archive.epa.gov/region5/sustainable/web/html/moline.html**

National Park Service, Technical Preservation Services, Sustainability: **http://www.nps.gov/tps/sustainability.htm**

GSA Preservation Tools and Resources: **https://www.gsa.gov/real-estate/historic-preservation/historic-preservation-policy-tools/preservation-tools-resources**

Greenguard Environmental Institute, Rahel Belews Article: **http://www.greenguard.org/uploads/images/EDCMagazineRachelArticleAugust2011.pdf**

Young Preservationists Association of Pittsburgh: **http://www.youngpreservationists.org/**

Milford Wayne Donaldson FAIA Advisory Council on Historic Preservation Memories: **https://www.achp.gov/sites/default/files/2018-12/DonaldsonMemoryPortfolio_090618.pdf**

National Main Street Center, Main Street Solution Center: **http://www.preservationnation.org/main-street/resources/?main_street_issues=communications-marketing-branding**

Green Impact Zone of Missouri, **http://www.greenimpactzone.org/**

GREEN HISTORIC PRESERVATION SUCCESS STORY: MOLINE, ILLINOIS

The City of Moline in Illinois planned a multi-modal transit station project involving the rehabilitation and LEED® certification of a historic warehouse building on a brownfield site. The building, located in Moline's downtown commercial historic district, represents a unique preservation challenge for developers, as they need to meet LEED® Silver certification requirements as well as the **Secretary of the Interior's Standards for Rehabilitation**. The Standards for Rehabilitation are intended to assist the long-term preservation of historic materials and features. These standards comprise a list of 10 requirements, including how a property may be used to reflect its historic purpose; preservation of distinctive construction and craftsmanship; and restrictions on chemical or physical treatments, such as sandblasting, among others. Despite the challenges, there is tremendous opportunity. The station development will not only bring intercity rail service to the Quad Cities, it will also spark more redevelopment in Moline's downtown area.

The site for the project directly adjoins another brownfield redevelopment project, the John Deere Commons, which helped revitalize Moline's downtown area. Developing the warehouse site is another important step that will spur additional reinvestment in surrounding properties, many of which are identified in the city's brownfield inventory.

Image of Moline, IL Multi-modal Center. Source: https://www.moline.il.us/710/Quad-Cities-Multimodal-Station

When it is completed, the Moline Multi-Modal Station Project will:

- Reduce air emissions
- Increase transportation efficiency
- Reduce vehicle miles traveled
- Retain a significant amount of the warehouse building's embodied energy
- Mitigate climate change with green building features
- Contribute to the city's Green Enterprise Zone with a focus on energy efficiency and renewable energy
- Serve as a model for future green renovations in the historic downtown commercial district, promoting sustainable development and livable communities

EPA provided technical assistance to the City of Moline by helping develop a package for potential developers with the right mix of financial and other incentives. Participating federal agencies helped produce workshops and present the material in Moline and Chicago. EPA Land Revitalization funds were also used to develop case studies that demonstrated the successful renovation of existing and historic structures to meet LEED® certification standards, including:

- King Street Station, Seattle, Washington **http://www.seattle.gov/transportation/projects-and-programs/programs/transit-program/king-street-station**
- Union Depot, St. Paul, Minnesota **https://archive.epa.gov/region5/sustainable/web/pdf/union-depot-case-study.pdf**
- Uptown Station, Normal, Illinois **https://archive.epa.gov/region5/sustainable/web/pdf/normal-uptown-station-case-study.pdf**
- Christman Building, Lansing, Michigan **https://www.hpbmagazine.org/the-christman-building-lansing-mi/**
- Wabash Station, Columbia, Missouri **https://archive.epa.gov/region5/sustainable/web/pdf/wabash-station-case-study.pdf**

This Moline multi-modal station project illustrates how historic preservation, green building innovation, and Smart Growth can work together to invigorate a city's central core. It also demonstrates a successful partnership between EPA and Federal Transit Administration to achieve mutual agency goals. This federal agency collaboration was an outcome of the HUD-DOT-EPA Partnership for Sustainable Communities.

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SECTION IV OVERVIEW:

Measure Success: Evaluate Environmental and Health Change

In Sections I, II, and III we describe the first four steps of the ATSDR 5-step Strategy to Safely Reuse Land and Improve Health: Engage the Development Community; Evaluate Environmental and Health Risks; Communicate Environmental and Health Risks; and Redesign the Community with Health in Mind. In this section, we describe **step 5,** Measure Success: Evaluate Environmental and Health Change.

Most programs have an evaluation component to determine if they are working effectively. It is no different with community revitalization projects. We want to know if our actions produce measurable changes in health outcomes over time. We measure health broadly, in terms of the environment; physical and mental health; safety and security; and many other categories of health selected by Development Communities to characterize their overall health status. We typically create indicators and track them over time. For example, environmental indicators may track the number of contaminated sites that are remediated or secured from public access or may track air or water quality data over a period of months or years. In Chapter 3 we describe one tool, the **ATSDR Action Model**, which incorporates measurement indicators to track changes in health outcomes over the course of redevelopment.

The format of the chapters in this section is a bit different from other chapters in that each chapter is a more personal essay contributed by BROWN partners that focuses on the evaluation or measurement of change.

CHAPTER 18

Measuring Systemic Change

This essay is centered upon a personal narrative written by BROWN partner Ken Meter, of **Crossroads Resource Center**. It is based upon professional experience engaging community residents in efforts to measure change in complex systems for use in sustainability initiatives.

One of my more lasting memories is working closely with a group of Minneapolis residents to devise a set of sustainability measures for their neighborhood. The local residents' organization had convened a group of seasoned elders to guide the process. Each had been dedicated to improving the neighborhood for years, but each also wanted a chance to step back to gain perspective. They welcomed this challenge that allowed them to reflect on their own work, and to ponder where the neighborhood needed to move.

During our first meeting, we had long, rambling conversations about what we meant by sustainability. At our second meeting, two of the residents brought their favorite systems analysis texts. We pored over them looking for new approaches. We explored the pragmatics of getting resident buy-in. A poet, who lived close by, was part of the group and contributed important insights into what made the neighborhood unique, and how this could be measured quantitatively.

We quickly concluded that neighborhood sustainability was foremost a process of linking residents into effective networks so they could respond in a coherent manner to unpredictable change. We considered ways to measure the neighborhood's "social capital" without relying upon expensive professional assessment. In the end, we came up with profound and straightforward indicator measures that excited the participants.

One neighborhood leader rose to her feet at the end of our process and beamed, *"Even if we never use a single indicator, the process has given us so much."* It was a strong outcome.

Ultimately, her words were prophetic, because the neighborhood itself did not implement the indicators we put forward. This was for mundane reasons, primarily staff changes and budget cuts. Yet, the approach was solid and led to the creation of a comprehensive set of **sustainability indicators for the city of Minneapolis.** These helped the city gain national recognition as a leader in sustainability initiatives. In turn, this body of work has informed work that I do internationally. Now, more than 15 years later, it is woven into the fabric of my professional work and welcomed by clients globally. This indicators framework just became the core of a new approach to measuring the strength of **local food networks** in the United States.

WHAT ARE THE KEY CONCERNS?

Building long-term sustainability involves addressing an intensely complex set of issues. It is certainly a daunting challenge for any neighborhood or municipality. Several key concerns guide the work:

1. How do we create an inclusive process?
2. How can we set a galvanizing vision for sustainability for our community?
3. How do we measure progress toward that vision?
4. Given that the issues are so complicated and entangled, how do we simplify our measurement process without losing important details?
5. How many measures do we need?

Before I offer some suggestions, let me say more about the organization I work for. **Crossroads Resource Center**[7] is a research, technical assistance, and consulting group dedicated to building capacity among our local partners. Our overall mission is to develop new approaches and new tools that communities can use to advance their own visions, such as the "**Tools for Community Self-Determination**" that we created. Basically, we believe that the better local communities become at organizing independent responses to the major environmental, social, and economic challenges of the day, the better off our society will be.

This can be highly unpredictable work, but it has paid off in a variety of ways. For one thing, local leaders often bring us profound challenges that we would never have dreamed up ourselves—and then we get to work alongside them to devise a solution. Finding ways to be engaged with the huge issues of the day and working closely with people who care about improving their communities, is intensely gratifying.

We have developed specialties in diverse areas that overlap closely. We have become global pioneers in both sustainability measurement and in building local food systems. We address ways that communities can build stronger local economies. Doing this has also given us effective tools to understand how complex and rapidly changing systems function—and how change can be measured within these evolving contexts.

As a matter of practice, however, we now spend less time on technical measuring exercises, and more on bringing these technical tools to ground level. We have found that the emerging local foods movement addresses sustainability concerns in a very forceful way. Moving toward more localized food systems requires us to pay attention to social, economic, and environmental concerns all at once. Yet, unlike technical measurements, food issues have the potential for engaging every local resident to make a difference in advancing sustainability—everyone eats several times a day. Issues that are very difficult or abstract to convey in discussions of indicators become crystal clear when the context is food. As one example, one can publish lots of data about income inequality, or one can work to create change in communities where people are hungry. Both are important to do. The latter is far more immediate than the former. For more information, see (Meter, Hoosier Farmer? Emerging Food Systems in Indiana, 2012) (Meter and Goldenberg, Making Small Farms into Big Business, 2013) (Meter and Goldenberg, Building Food Security in Alaska, 2014) for systemic views of local food systems. More recent studies are also posted at **http://www.crcworks.org**.

HOW CAN CHANGE TOWARD SUSTAINABILITY BE MEASURED?

Many discussions of sustainability begin by asking (and properly so): How do we make our community a more sustainable place? This often moves to a discussion of measuring sustainability through indicators. This chapter is for those who are entering into that process.

I should begin by pointing out that my thinking about indicators has changed since I wrote several of the articles cited in this paper. Over time, I have made a closer distinction between "indicators" and "measures." I used to use the terms interchangeably. Now I think of them in this way: an

7 **www.crcworks.org**

"indicator" expresses the broader concept one is trying to strive to express through measurement, and a "measure" is a metric. The first can be more qualitative, and the second often more quantitative. If you look up some of my earlier writing, cited in this chapter you will see that I used the word *indicator* where today I would use *measure*.

As one example, if you are driving a car and think that the speed at which you travel is an *indicator* that helps you plan your journey, you would *measure* that speed by looking at the speedometer. But there would be another way to measure the same indicator: the highway patrol might be measuring your speed using radar, for example.

In common usage, though, most of us would say that the speedometer *indicates* the speed at which we are traveling. This is fine for most purposes.

So, let us address the question I posed above: How do we make our community a more sustainable place? We need to have an inclusive process, create a shared vision, measure progress towards that vision, and simplify our measurement process.

1. How Do We Create an Inclusive Process?

The best way to create an inclusive process is to include all stakeholders. Nothing is worse to a potential partnership than providing news to someone(s) that important decisions have been made before they were invited. It is very difficult to recover from such an oversight, because trust has been broken from the beginning. Especially in the early phases, it is important to move slowly and to talk to *everyone* (or at least every interest group) who has a legitimate concern regarding the sustainability challenges you want to address.

This does not necessarily mean that you put everyone in the same room for a meeting immediately. You probably want to form a leadership team by having close, individual, and informal conversations with as many people as possible to learn what capacities they have, and what concerns they might want to raise. It is critical to reach out to specific communities that have been marginalized to learn how their community functions, how it makes decisions, and how the residents would like to be engaged on their own terms. You will want to seek out people who disagree with you, too, so you can learn from their positions.

As you move through these conversations, you will learn more about the timing for convening a larger stakeholder meeting. From this earlier work you will know what the primary sustainability challenges are to the people you are going to invite. You will learn even more once diverse people speak directly to each other. We have used a "roundtable" process (see (Meter, Fifty-Year Vision and Indicators for a Sustainable Minneapolis, 2004)) effectively, in which no one is the expert and all are seated in one circle. The moderator suggests issues for all to address, and each person helps frame the solution.

2. How Can We Set a Galvanizing Vision for Sustainability for Our Community?

One of the first steps you will need to take once you have brought diverse stakeholders together is to establish a local vision for sustainability. There are several good reasons to do this. One is that building a vision can be a connecting conversation that brings people into closer knowledge and trust

with each other. Another is that if you do not spell out where you are trying to head, it is impossible to develop measurements that will tell you if you are getting your community where it wants to go.

What has worked best for us is to invite people—in a roundtable setting—to devise their own *image* of what they would notice in their community if the changes they sought were to come true. I like asking for imagery because images carry a lot of information very succinctly. If I describe what my community might look like in the future, I can rely upon all of my senses: What would I see? What would I hear? What would I feel, taste, or smell?

As one example, during our sustainability process for the city of Minneapolis, one of our participants said, when Minneapolis is more sustainable, *"I will be able to walk safely with my grandchild from my house to the train station so we can visit our relatives in Chicago."* Note the elements this simple sentence conveys: I would feel safe; I would feel connected to my family; I would be able to walk rather than drive; I would have access to a train; I would have a sense of peace and possibility that I do not have today. This is very rich material. Indeed, it helped inform our conclusion that the most significant step Minneapolis could take would be to create a walkable city. That has started to happen since we convened our process, though of course we cannot claim credit for the outcome—we merely were one voice among many realizing the shift had to be made.

Another reason to focus on imagery is that people usually do not argue about images. One person may say, *"That's not my truth,"* but they are unlikely to argue that the other person did not have, or should not have, that image. When people put abstract ideas forward, often people feel they should offer a counter analysis, even if they are not being argumentative. Images tend to evoke other images, and a greater sense of connection. This is especially fruitful in diverse settings. In our session, no one disagreed with taking one's grandchild to the train station—and some who heard the image started to think more expansively about their own grandchildren.

The question then becomes how to winnow these images into an overview of what life would be like in an imagined better time. We invited people to consider a very distant future—50 years out. Our rationale was that this would push people to imagine something they did not think could come true easily. It encouraged folks to imagine what they would really like to experience, not what they think would come true in their lifetimes. Twenty-five years can also be good, and perhaps even 10, but the closer one gets to the present day, the more people's imagination gets confined to the way things already are.

This was a simple question, but we developed detailed materials and a careful strategy for launching the conversation. All of this is available for free at: **http://www.crcworks.org/msi.html**. Please adapt it freely to your own circumstances.

3. How Do We Measure Progress Toward that Vision?

Once a long-term vision has been defined, it is often useful to "back-cast," or, in other words, to write down together the steps that would be needed in order to arrive at that vision. In the grandfather's case: (a) What would we need to accomplish if we are going to create a more walkable city? (b) What needs to be done to make sure the trains run often and on time? (c) What do we do to establish safer neighborhoods? And so forth. This process might tell you, for example, that in five

years, this initiative should have worked with police officials to ensure that walking is safe in one key neighborhood. Whether this happens or not becomes a measure of progress.

4. Given That the Issues are So Complicated and Entangled, How Do We Simplify our Measurement Process Without Losing Important Details?

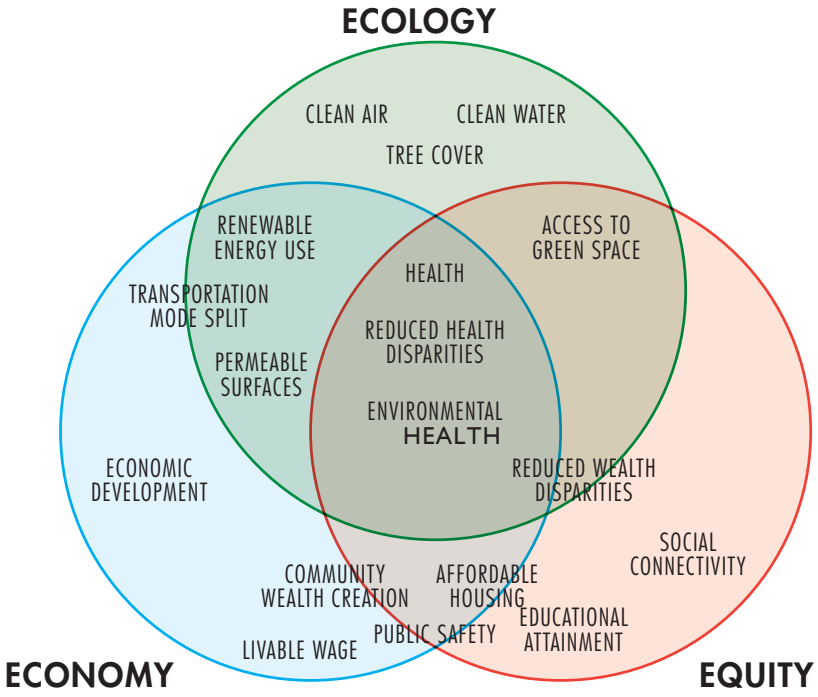
This is a critical issue. In my experience, the best way to do this is to devise indicators and measures that link across issues. This is in sharp contrast to the typical approach that suggests each issue requires its own measures.

This strategy is informed by early work I did combing through long lists of potential indicators and measures of sustainability. We looked at more than 200 possibilities. All of them were useful and practical measures. A team of us wrote them down on index cards and shuffled them around on a large table, hoping to find categories that would integrate them all. We did indeed find some, but also had a deeper realization—many of the measures applied to more than one issue or category of concerns. Our categories were not as neat as we had hoped.

The more we thought about it, the more we realized this was because the very issues we were trying to address were so entangled. What really brought this home was when we drew on the white board the three-circle diagram that conveys to so many people the three major realms of sustainability: environment, society, and economy (see below). Those three circles intersect because their concerns are connected to each other. Moreover, local residents often perceive these interconnections more quickly, or more astutely, than professionals. This is mostly because they live inside the context and have experienced how the prevailing system pushes back when they try to improve their lives. Yet, a second important reason is that residents typically have not been trained to see things through the lens of a specialist or an academic discipline. Their life experience has taught them how to see *connections*. Combining this integrating knowledge with specialized technical knowledge is far more potent than relying solely upon one or the other.

A non-comprehensive example of how sustainability indicators may be placed on the three-circle diagram.

(Adapted from (Meter, Fifty-Year Vision and Indicators for a Sustainable Minneapolis, 2004))



When we placed measures and indicators physically on this diagram, we gained new insights. Not all indicators are equally close to the activities you are mounting in your sustainability initiative. Some are more critical to your work than others. Some are placed more centrally on the diagram. Some indicators were more *highly linked* than others.

For example, when we spoke about measuring environmental health issues, we realized that this issue stands right at the center of the diagram: it involves income inequality, social distinctions, and environmental health. This makes it a potent issue to address, because one involves several concerns at once. This also can make it more difficult to address, because the forces are so complex. Measuring the number of people who were disproportionately affected by environmental concerns became a *highly linked* measure.

As we worked, we learned that a citizen's group in Manitoba, Canada had devised a very straightforward way of assessing linkages (Meter, Neighborhood Sustainability Indicators Guidebook: How to Create Neighborhood Sustainability Indicators in Your Neighborhood, 1999). They developed a matrix (or a spreadsheet) for doing this. Each of the columns listed one of the core issues their neighborhood was addressing. Each of the rows listed a potential indicator or measure (see below). Group members worked together to place a check in each box where proposed measures intersected with one of the core issues in an important way. For example, "environmental health" got three checks out of three possibilities in the example above. A longer list of neighborhood goals could elicit a more elaborate scoring system. The more checks in each row, the more highly linked that indicator turned out to be.

A simple test of issue linkages. (Adapted from Meter, 1999. The framework was originally developed by a citizen effort in Winnipeg, Manitoba)

Linkage matrix	Housing	Community Economic Development	Transportation	Public Safety	Ecology	Social Capital
Clean air		X			X	X
Clean water		X			X	X
Educational attainment		X		X	X	X
Health disparities	X	X		X	X	X
Affordable housing	X	X	X	X		X

HOW MANY MEASURES DO WE NEED?

So, in the end, we opted for a relatively short list of measures: 30. As it turns out, there is no golden number that is correct. The city ultimately distilled our list into 23 and has since added a few more. Even then, it is difficult to focus public attention on more than one or two issues at a time, so implementation of a sustainability initiative can prove difficult. We would love to winnow our list down to four or 10. Yet the most common complaint we received from our stakeholders was, "You did not include the issue I care about." People (usually managers speaking up to keep their agency visible) actually wanted more numbers!

My sense is that, in the long haul, the better we get at understanding how closely linked the issues are that we address, the more content we will develop with a shorter list of highly linked measures. This requires practice and visceral work. It takes some intuition and estimation to learn which of the linked indicators is most central. As conditions change, our understanding of what is most important is also likely to shift.

Another way we focused attention on a smaller number of indicators was to distill our story down to bare essentials. Despite the intricacies of having 30 concerns to measure, one element of our vision stood out as most transformative: Are we making the city more walkable? The city already collects data annually in its survey of modes of transportation to work, which includes a count of those walking, so this was relatively easy to track. Walking meant stepping out of our cars and meeting each other on the street. This meant more eyes on the street in many places, thereby enhancing public safety. This placed more attention to people connecting with each other, and less on how one's

car reflects status or personality. Increased public transit options should mean more equitable access for those who cannot afford a car. More of the city's surfaces could be kept permeable. It suggested cleaner air and water would be more likely.

This rallying cry was good for public outreach, although at first city officials merely asked, "What is a walkable city?" Now they know. Yet if we placed too great attention on this issue alone, and ignored other measures in our city's indicator slate, the city could run into deep trouble. For example, we've opened up new light rail options, and they are great ones. Yet, light rail does more to dictate where developers will invest rather than acting to reduce the number of cars on the streets. This is still a gentrifying strategy for the most part, rather than promoting sustainability in important ways.

TYPES OF INDICATORS

We also simplified the measurement process by looking closely at the roles certain types of indicators played. As we winnowed out our favorite indicators, we learned that they fell into four groups. Some were central to our overall vision, and others less so. Some were critical for understanding the context in which we worked. Some were highly linked, and others stood alone. Some were best left to professionals, and some were best created by the residents themselves. Accordingly, we broke our indicators and measures into four (Meter, Neighborhood Sustainability Indicators Guidebook: How to Create Neighborhood Sustainability Indicators in Your Neighborhood, 1999). I will outline each type below and then explain them in greater depth.

1. **Data Poetry Indicators** are highly linked indicators that are most useful for local stakeholders. They have the quality of transforming the discussion of the neighborhood's future toward a more long-term view.
2. **Core Indicators** are linked indicators useful for local residents as well as for external investors, funders, and researchers. These more readily allow for comparisons among diverse communities.
3. **Background Indicators** offer interesting background information that helps define the context in which sustainability initiatives take place. These are useful for both internal and external stakeholders.
4. **Deep Sustainability Indicators** assist local stakeholders to define a longer-term vision for life in their community. These are often very highly linked and look far to the future. Years of activity may be required to realize progress in such indicators.

Embedded in this description is an important concept: our indicators also served diverse audiences. The neighborhood deserves to develop and use certain indicators and measures that are strictly for their own use, without trying to please external stakeholders. External stakeholders may also have a right to access information from their outside point of view. Our summaries should suit diverse learning styles and attention spans.

Data Poetry Indicators (1) are those that capture the imagination of local residents, express in a concise way the linkages among several issues important to sustainability, and have the quality of transforming the discussion of the future of the neighborhood into a longer-term perspective.

We believe these indicators are best defined by neighborhood residents. They should express local priorities and local visions and are not appropriate for comparisons across communities.

One example of data poetry indicators (we are indebted to **Maureen Hart**, one of the pioneers of sustainability measurement, for this term, though we use it in a slightly different way) is Sustainable Seattle's count of the salmon run through local watersheds in Seattle, Washington. A healthy salmon run indicates that the environment in the local watershed is relatively healthy. This is a very potent indicator, since it covers a wealth of issues at once. With one count, we get information that suggests how clean the water is, and its temperature, which is connected to land management practices as well as natural weather cycles. Moreover, a solid salmon count implies that people will have access to nutritious food. This could reduce health care costs, and a substantial fish harvest should help fuel the local economy.

In our neighborhood process, our data poetry indicator was: *"How many spaces has the community constructed that encourage residents to meet with each other and get better acquainted?"* This covered good-natured folks who placed a bench in their front yard near the sidewalk so hikers could stop for a rest. It included graffiti walls where youth could come together in a sanctioned way to paint in plain view, if they chose. Parks were critically important. We even developed a point system so this would be quantitative. Pink flamingoes in parks received one point.

Core Indicators (2) reflect a need for more data-intensive measures that may require special study or surveys. While core indicators are central to local sustainability, they also suggest questions that could be raised on a city-wide or regional level. Further, core indicators may help measure concerns not easily expressed as data poetry. One example of such an indicator would be the income disparities in the community. This might be measured with a **Gini index of inequality**: a statistical coefficient that is commonly used to measure inequality. This would link strongly to the social, environmental, and economic realms. Similarly, measures of health disparities or environmental health would serve as core indicators. See also the list of indicators we presented to the city of Minneapolis (Meter, 2004), which were all core indicators.

The third type of indicator we identified were **Background Indicators** (3). One useful analogy here is to imagine actors in a play. If data poetry indicators are the central characters of a play or the transformations they go through, and the core indicators speak to the lesser roles, then background indicators are the scenery. Not as central to the action involved in making the neighborhood more sustainable, they are nevertheless useful, especially for external use. It matters whether the dialogue is spoken in front of a set depicting a home, a ballpark, or an office. The same words might take different color on a stormy day rather than a clear one.

One example would be measuring the median income. Or one may want to measure the water quality in a nearby lake, to know if it is swimmable or not. There may be little the community can do to change either number but knowing what it is helps the community understand what conditions are and which powers it can exercise at one point in time.

Funders who want to compare conditions or results across neighborhoods, researchers who want to know when a strategy may work best in a certain kind of neighborhood, public officials who want to compare impacts in one part of the city with those elsewhere, all may rely heavily upon background

indicators. The neighborhood itself may find it is useful to communicate with their external audience using such indicators.

Background indicators may not be as adept at expressing linkages among various issues and may not be as concise in expressing sustainability concerns, but they still help fill in the picture. One difficulty I have encountered, however, is that some observers feel the background indicators are the most important, because they can be verified from outside.

Deep Sustainability Indicators (4) assist local stakeholders to define a longer-term vision for life in their community. These are often very highly linked and look far to the future. Years of activity may be required to realize progress in such indicators. One key example has already been mentioned: Has our city become a walkable city?

ORIGINAL LOCAL DATA REQUIRED

Finally, I would add that while there is a wealth of public data available through the internet, and these data should be martialed in any way possible, it is unlikely that these existing data sources would be sufficient for assessing local sustainability. Resident surveys, for example, might help illuminate local conditions, or which issues people feel are most important.

Data poetry indicators may generate effective local action, because people will see that their own actions can make a difference, and that what they measure is valid. Our neighborhood gathering spaces indicator also proposed that neighborhood youth collect the data. This builds more connections and is more empowering than hiring a data guru.

When we reach the broader, more verifiable numbers, we also enter the realm where issues are entangled, systems are complex, and distant change affects our choices in unpredictable ways. As residents we have very little control. As we build social networks and greater capacity, however, we can be more resilient in the face of these changes.

One of the dilemmas of a hard, fast suite of accurate measures is that it can quickly become a rigid system that cannot accommodate new and surprising conditions. So, we use them if possible and interpret them with care.

This is primarily to underscore the conclusion the residents drew in their deliberations. Sustainability is more about creating connectedness than about strict measurement. Good counts can help people build social bonds, but they can also interfere with the flow of activity. This is all a matter of balance. In the crunch, it is all about our ability to work together with respect and mutual influence.

The ultimate test is what happens when the indicators show negative results. In many civic processes, these findings are swept under the rug to keep a positive face forward. In effective communities, these are discussed as ways of rolling up our sleeves and getting to work. Connected communities realize that issues are entangled, and they give themselves time to understand the complexity, and time to respond to changing circumstances.

One might say, in fact, that a connected community constitutes a “greenfield” for growing sustainability, while a less connected community acts much like a “brownfield”—where speed,

toxins, and neglect have created imbalance. Investing in restoring or creating these "social greenfields," connected microbes and all, makes as much sense as investing in remediating a Superfund site.

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CHAPTER 19

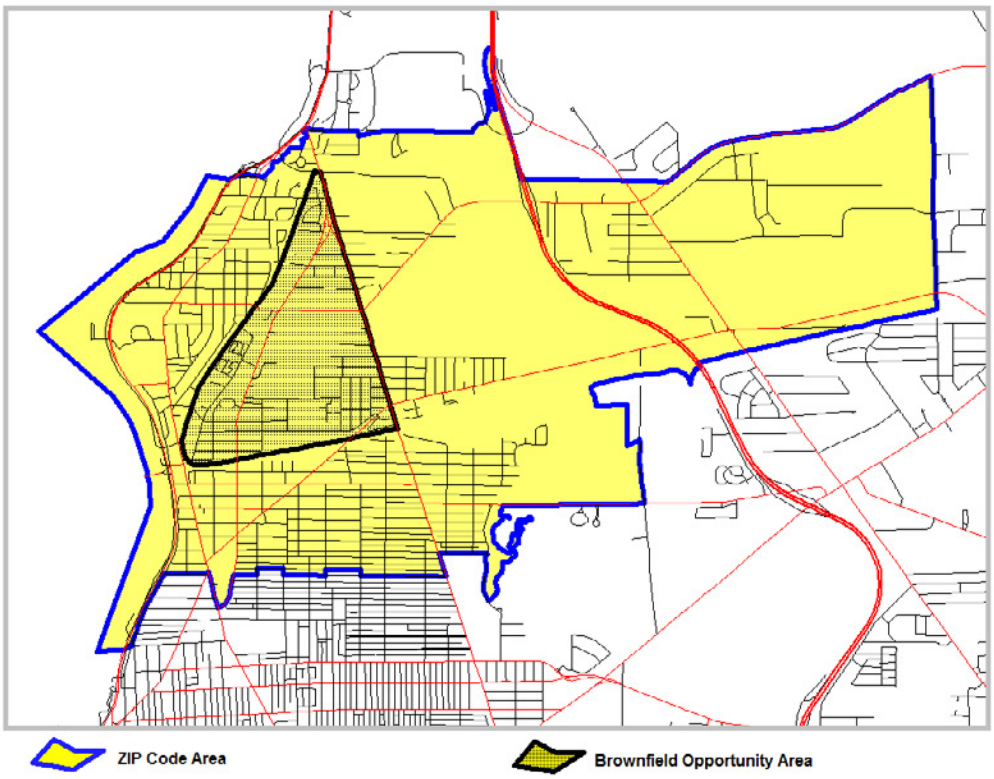
Challenges in Measuring Changes in Health and Exposure

This essay is provided by BROWN partner Thomas Talbot, who previously worked with the New York State Department of Health

The New York State Department of Health (NYSDOH) works with communities concerned about land reuse sites. We have used the **ATSDR Action Model** process (see Chapter 3) in several communities with brownfields or land reuse concerns. As part of the Action Model framework, state and local health agencies often determine the health and exposure data needed to measure changes in adverse health outcomes and exposures in land revitalization areas. Existing data sources are hospital records, **disease registries**, **vital statistics**, or childhood lead-exposure–reporting systems. However, the ability to measure change using these data is challenging for the following reasons:

1. The sociodemographic makeup of the community can change as people move in and out of the area. These circumstances make it difficult to compare disease rates in the area population before and after the land revitalization because the two groups of people could be very different.
2. If the population of the revitalization area is small, then the estimates of change in health outcomes could vary widely due to chance. Consider two communities in which the number of low birth weight babies declined by 50%. In the first community, the number of low birth weight babies declined from 50 to 25, a meaningful decline in a population where the birth rate was stable. In the second, smaller community, the number declined from four low birth weight births to two. Because of the small population size, this decline would be more likely due to chance.
3. It is difficult to detect **statistically significant** rate changes for rare adverse health outcomes because they occur so infrequently. In New York State, about five of every 1,000 newborns die, making this a rare occurrence. We are more likely able to detect a significant change in the **prevalence** of more common outcomes such as low birth weight births, which occur in about 82 of every 1,000 births.
4. Health and exposure data may not be available on a geographic scale that conforms to the revitalization area. Due to confidentiality concerns, data stewards may make data available only available at the ZIP-code or county level. In the example shown in Figure 19.1 (health data by ZIP code), we would have preferred to isolate health indicators for a brownfield-opportunity area in Niagara Falls, New York (shaded on the map), but we were provided only the health data for the much larger ZIP-code area. Because the opportunity area contained only 13% of the ZIP-code population, estimating the health status in the community of interest was difficult.
5. Health care providers often fail to report all the cases of an illness or chronic disease regularly. Recurrent reporting problems in a health care facility that provides treatment for residents in the study area make comparing health-outcome rates over time difficult.
6. Diagnostic procedures, disease case definitions, or the coding schemes used to report medical diagnoses are changed. For example, on October 1, 2015, version 10 of the International Code of Diseases (ICD-10) used by medical facilities to report medical diagnoses and inpatient procedures replaced ICD-9 code sets. These revisions challenge our ability to measure the true changes in disease prevalence and incidence.

Figure 19.1. Health data were available only by ZIP code. If address-level data is accessible, widely available **geocoding** tools can isolate the location of the cases within the area of interest to facilitate calculation of their **health and exposure indicators**.



For the reasons listed earlier, it is important to determine if available health date can realistically quantify the changes in community health status or whether additional data is needed. In addition, when measuring change over time, it helps to know whether these trends are occurring only in the revitalization area or in other comparison areas as well. For example, we conducted a study using childhood lead reports from across New York State that showed a 24% decline in the **geometric mean** of blood-lead levels in children over a four-year period (Haley, Valerie B., Talbot, Thomas O., 2004). Therefore, a revitalization area showing no decline in children's blood-lead levels over the same period might be a cause for concern.

MEASURING CHANGES IN THE SOCIODEMOGRAPHIC CHARACTERISTICS OF A COMMUNITY

The United States Census Bureau collects a variety of sociodemographic information during the national decennial Census and the annual American Community Survey. Data are collected on age, sex, race, ethnicity, income, age of houses, and when and where people move. These data are used to standardize **rates of disease** by age and sex and compare them across communities and help determine if the sociodemographic characteristics of the community have changed. Changes in the sociodemographic characteristics may contribute to changes in the health status of the community.

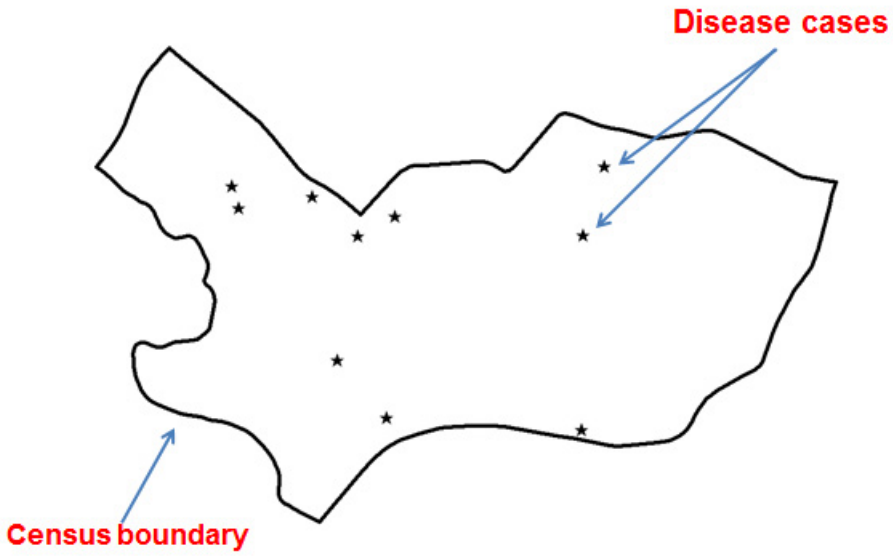
COMMUNITY HEALTH MAPPING TOOLS DEVELOPED BY THE NEW YORK STATE DEPARTMENT OF HEALTH

How data are depicted can be an additional challenge when using health data to characterize community health status in brownfield communities. This is primarily because we often need health data at a finer scale for target populations.

In addition to the challenges mentioned earlier, presenting health data for small areas may reveal confidential information. To address this concern, we created both the Geomasking Tool (Talbot and LaSelva, 2013) and the Geographic Aggregation Tool (Talbot and LaSelva, 2010), which are described in the following text.

Health care providers maintain health records with street addresses and ZIP codes but presenting these data on a map risks inadvertently disclosing confidential personal health information. One common but flawed way to reduce the risk of disclosing confidential data is to plot the cases on a map without providing the proximity of roads and buildings. This method provides a general idea of where adverse health outcomes, exposures, or crimes occur in a revitalization area without identifying individual households. In the hypothetical example shown in Figure 19.2, cases of disease are represented as stars within a boundary of a census area.

Figure 19.2. Hypothetical example showing disease cases on a map.



Conversely, we can geographically register and overlay this type of image onto a more detailed map using free tools such as Google Earth (Figure 19.3). As we enlarge the map, we can identify the indvividual homes, indirectly revealing confidential information (Figure 19.4).

Figure 19.3. Geographically registering a map image with Google Earth.

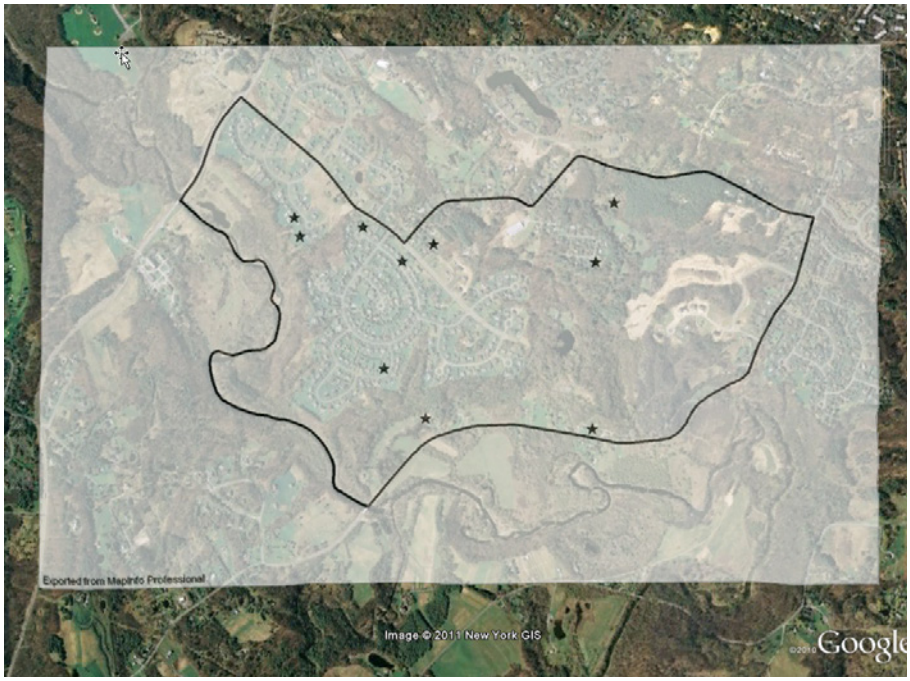
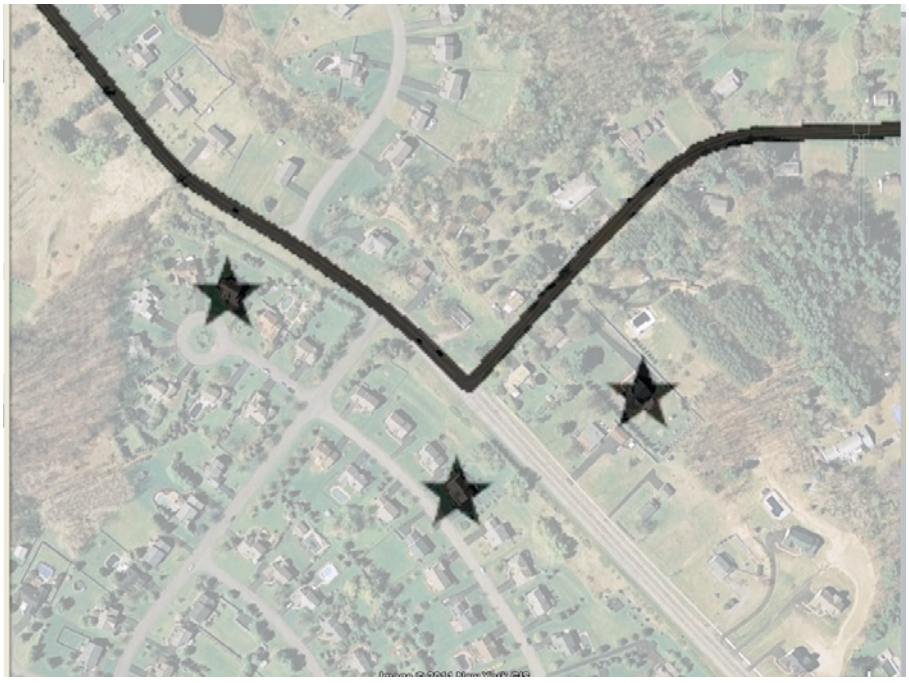


Figure 19.4. Enlargment of the map shown in Figure 19.2 using Google Earth.



GeoMasking Tool

To reduce the risk of disclosure in showing health-related outcomes on a map, the New York State Department of Health created the Geomasking Tool. The tool randomly moves each point within a user-defined distance from the original location (Figure 19.5). This tool provides a picture of the general locations of disease cases, crimes, or people that have been exposed to hazards without revealing confidential information. The tool can vary the maximum distance the points are moved based on housing density. For example, points could be moved a greater distance in rural areas than in urban areas.

Figure 19.5. Geomasking Tool randomly moves points within a user-defined area.

The tool is also designed to ensure the new locations shown on the map are not moved out of the study area or potentential exposure zone. Figure 19.6 shows how the tool was applied to a study area where we mapped blood-lead levels in children living near a historic lead smelter site (New York State Department of Health, 2005).

The locations of the childrens' homes on the map have been moved within each of the exposure zones. The red areas indicate the prevailing downwind areas and the blue indicate the upwind areas. The map with statistical tables was presented to the public to show that childhood lead values did not vary by prevailing wind direction or distance from the site.

Figure 19.6. Blood-lead levels in children living near a historic lead smelter site in Colonie, New York.

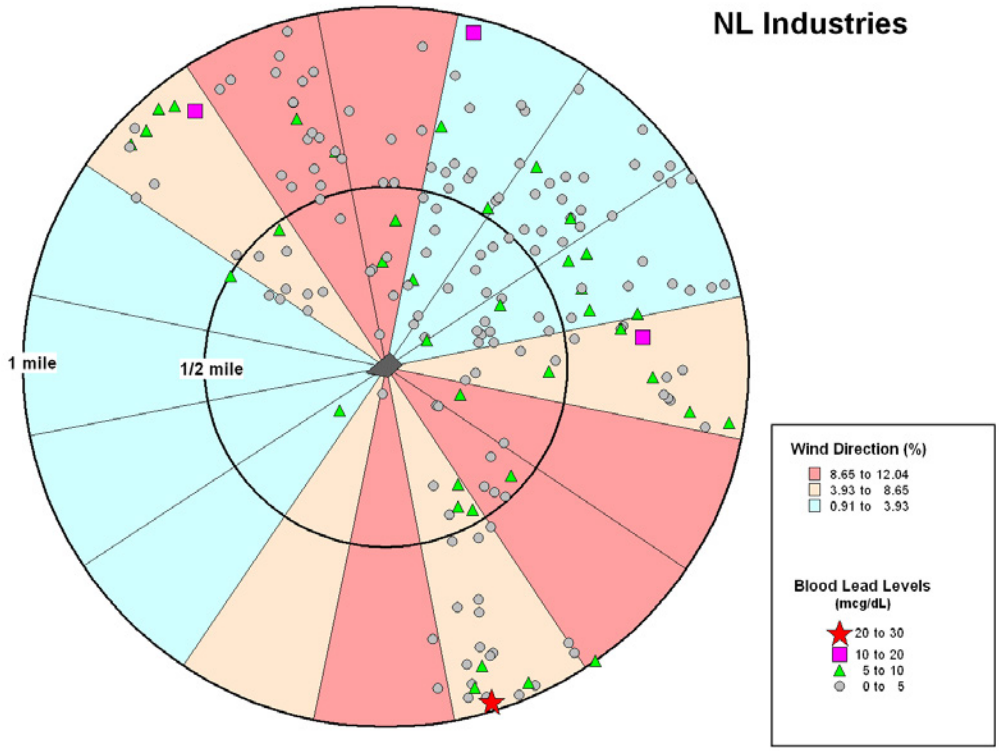


Figure Footnote: Blood-lead levels (indicated as Blood Lead Levels in the legend) are typically expressed in concentrations of micrograms (mcg) lead per decilter (dL) of blood.

Geographic Aggregation Tool

Health data stewards have been reluctant to release health data to the public at geographic scales that would help assess community health status in revilization communities. This reluctance is because health data provided for small areas could be linked to other available data to reveal personal health-status information inadvertently. Due to concerns about the disclosure of confidential data, the federal government passed the Health Insurance Portability and Accountability Act (HIPAA) Privacy Rule in 1996. This rule helps health care providers protect patient privacy by restricting the release of health data using the **Safe Harbor Method**, which provides guidance to de-identify protected health information (Office of Civil Rights, U.S. Department of Health and Human Services, 2012).

Using the Safe Harbor Method, health data are assigned to a ZIP code, and then the ZIP code-level–data are combined further by pooling all ZIP codes with the same first three digits. For example, New York State has only 51 distinct three-digit ZIP-code areas. Several of these areas contain more than one million people. Clearly, data at this scale would not be appropriate for measuring the health status of a local community.

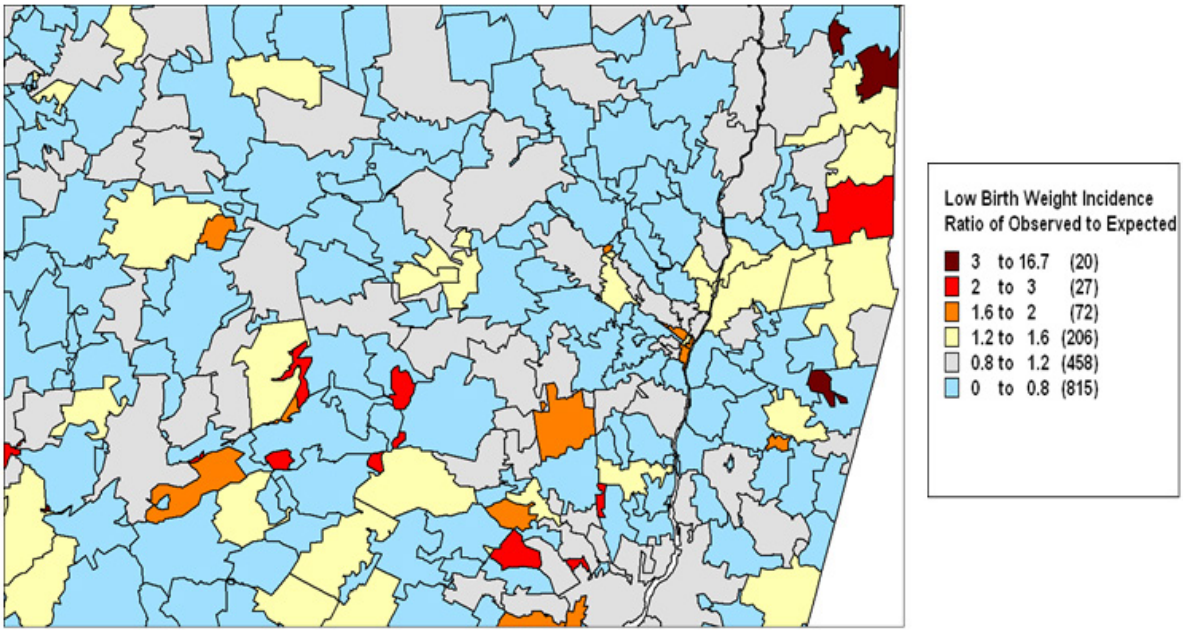
The other option for releasing data at finer geographic scale is to use generally accepted statistical methods to render information not individually identifiable. To facilitate the release of finer-scale data, the New York State Department of Health created the Geographic Aggregation Tool (GAT) (Talbot and LaSelva, 2010). The tool is designed to:

- Aggregate small areas with neighboring areas into larger zones so data can be released without risk of disclosing personal health information.
- The tool also reduces the random fluctuations in in health-outcome rates due to small populations.
- Allow users to decide how much aggregation is needed based on the number of health-related events and the underlying population.
- Work with various levels of geography.
- Nest one level of geography into another. For example, census tracts are aggregated, but aggregated zones do not cross county borders.
- Use open source statistical software, such as "**R**"
- Depict the boundaries of these newly created regions so health indicators can be displayed on a map.

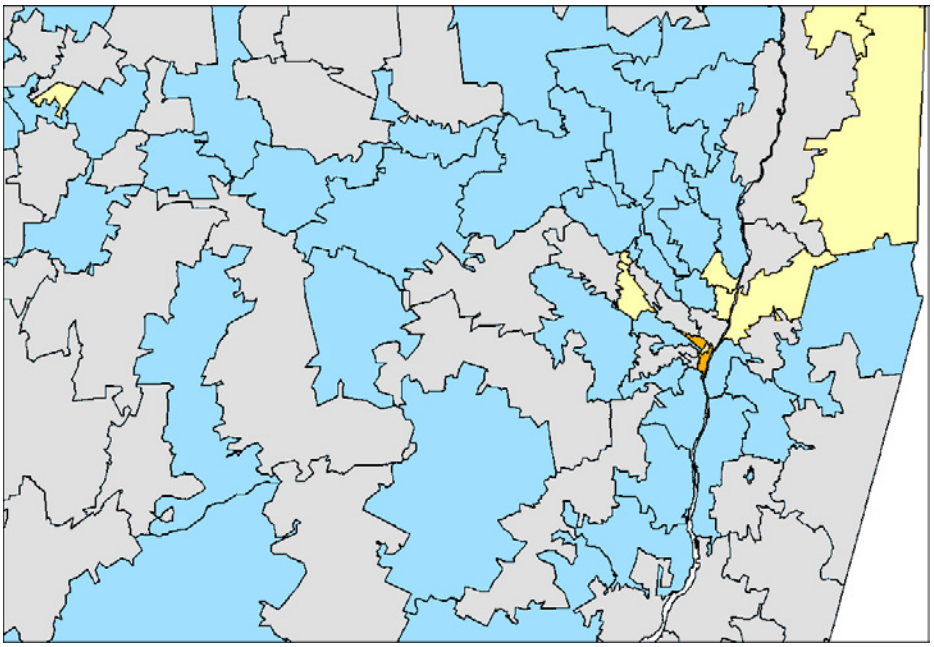
The tool is useful in producing health-outcome rate maps. In areas with small populations few cases are expected, causing the rates of adverse health outcomes to vary widely due to chance. For example, relatively few babies are born each year in many rural ZIP codes and so we would expect very few low birth weight babies. In Figure 19.7a, we mapped low birth weight by ZIP code for a three-year period in upstate New York. The areas in red and brown have more than twice the number of observed low birth weight babies compared to what we expect based on the New York State rate. These areas are all in rural ZIP codes which have very few births each year. If we aggregate the ZIP codes into larger zones so each of the zones contains at least 250 births, we would expect on average at least 15 low birth weight babies in each of these newly created zones. The rates in these zones would no longer vary widely due to chance. The second map (Figure 19.7b) shows such an aggregation. Note that high rates in rural areas are no longer apparent. We are still able to identify elevated rates in inner city minority neighborhoods, which have high poverty rates. For example, two areas in the city of Albany, New York, where no aggregation was needed, show high rates in Figure 19.7b.

Figure 19.7. (a) Low birth weight-**incidence**–ratios over a three-year period by ZIP code. (b) Low birth weight-incidence–ratios over a three-year period by aggregated ZIP-code zones. Each ZIP-code zone has at least 250 births.

(a)



(b)



The New York State Department of Health used the tool to release cancer-incidence data to the public at the census block-group level. Block groups with fewer than six cases of cancer in men and six cases of cancer in women were merged with their neighbors. See: **http://www.health.ny.gov/statistics/cancer/environmental_facilities/mapping/**.

As part of the Centers for Disease Control and Prevention's **National Environmental Public Health Tracking Program** (Centers for Disease Control and Prevention, 2004), several state health departments are investigating tools such as the GAT to release health indicators at finer geographic scales. These tools will help the public, public health professionals, and policy makers learn more about the health status of their communities.

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CHAPTER 20

Redevelopment: What Happens Over the Long Term

Christopher De Sousa and Lily-Ann D'Souza

Throughout this book, authors have provided examples of how to integrate health in redevelopment, engage the community, plan wisely for healthier communities, and implement sustainable development practices. There are many best practices and success stories of healthy land reuse and redevelopment, but what happens over the long term? In this chapter, the authors present some exciting case examples of how communities have developed land reuse sites into vibrant, sustainable community assets.

AMPLIFYING THE CATALYTIC EFFECT OF REDEVELOPMENT

A primary objective of government officials involved in redevelopment of sites like brownfields, particularly at the local level, has been to support projects that have a so-called catalytic effect that triggers additional development projects throughout the neighborhood. The traditional focus has been on funding projects that generate direct and indirect economic benefits like employment and taxes; quantifying these benefits allows taxpayers to gauge whether public support is paying off. While economic factors are important, this chapter argues that government efforts that incorporate broader sustainability objectives not only boost economic activity but also amplify the catalytic effect by creating environmental and social benefits that proliferate over the longer term. I have been involved with two long-standing projects through research and teaching over the last decades that demonstrate this amplified catalytic effect: The Chicago Center for Green Technology in Chicago, Illinois, and the Menomonee Valley Redevelopment in Milwaukee, Wisconsin.

The Chicago Center for Green Technology

For more than a decade, the Chicago Center for Green Technology (CCGT) (Figure 20.1) was renowned as an integrated model of energy efficiency and sustainable design. It functions as a demonstration facility for renewable energy technologies while promoting sustainable community development through a combination of educational programming, resources, and research. The CCGT was one of the first municipal redevelopment projects to receive **Leadership in Energy and Environmental Design (LEED) Platinum certification** by the U.S. Green Building Council (U.S. Environmental Protection Agency, 2006). While the CCGT lost funding from the City of Chicago in 2014 and is no longer referred to as the CCGT, to this day it still serves as an exemplary case study of brownfield redevelopment not only because of the tremendous effort put into redeveloping the site, but also because of the green initiatives that continue to live on within the building and surrounding employment zone.

Figure 20.1. Chicago Center for Green Technology (Source: Chris DeSousa, June 2009).

The CCGT provided education and job training skills in sustainability and green technology. The CCGT was located in the Kinzie Industrial Corridor, at 445 N. Sacramento Boulevard, within the East Garfield Park neighborhood, in Chicago, Illinois. The original CCGT building was a former foundry that opened in 1896. In 1952, it was developed as a crushing facility by Sacramento Crushing Corporation (Figure 20.2), which recycled construction and demolition debris. However, the facility had violated its recycling permit by taking in more waste than allowed. The City of Chicago had received complaints about particulate emissions and dust from the site. By 1997, the crushing facility filed for bankruptcy and the City obtained ownership of the site (Brecheisen and Thomas, 2013).

Figure 20.2. Sacramento Crushing Debris Pile (Courtesy of the City of Chicago, Undated).

The Chicago Department of Environment (DOE) cleared the site of construction and demolition (C and D) debris, which took 18 months and cost $9 million (City of Chicago, 2003) (U.S. Green Building Council, 2008). The Chicago DOE offset the clean-up costs with financial assistance from several sources obtained through the Chicago Brownfields Initiative, including funds from the U.S. Department of Housing and Urban Development (HUD) and the U.S. Environmental Protection Agency (EPA) (City of Chicago, 2003). The Chicago DOE also sold salvageable waste material to other recycling facilities and to city departments that used them as inputs in their own infrastructure projects. Meanwhile, the two-story, 28,000-square-foot building on the property was deconstructed to its basic structure (Henderson, 2002). While the Chicago DOE originally thought the building would be developed for private commercial use, a confluence of factors contributed to the final project vision as a mixed-use industrial and commercial facility with public education and programming services. With funding from a settlement between the city and the Commonwealth Edison Company earmarked for "renewable energy and energy conservation projects," Chicago's environmental commissioner at the time, William Abolt, initiated a public-private partnership that would see the city contribute $5 million toward redeveloping the building. A design team of environmentally conscious architects from the American Institute of Architects' (AIA) Chicago chapter provided technical guidance for the redevelopment (Durbaugh, 2009). By 1999, the city of Chicago had acquired the property, cleared the debris left by the Sacramento Crushing Company, and prepared the property for redevelopment. A project vision and ultimate development included the following.

Site Planning—A combination of design strategies was used to offset the urban heat-island effect, including the use of high albedo (light-colored) material (used in the parking lot construction), extensive tree planting, and landscaping.

Energy Efficiency—The CCGT building was designed to maximize energy efficiency and was predicted to use 40% less energy than a minimally code-compliant building of the same size (U.S. Green Building Council, 2008). On the supply side, solar panels located on the roof, the south side of the building, and adjacent to the parking lot are designed to supply nearly 25% of the CCGT's electricity (City of Chicago [b] and Chicago Center for Green Technology, 2003). A geothermal system uses the relatively consistent ground temperature to heat and cool the building. On the demand side, 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.

Building Materials—The design team limited the environmental cost of construction by using 100% of the original building's structural shell, sourcing materials with recycled content wherever possible, and purchasing from local suppliers. Moreover, 84% of the waste produced through construction was diverted from the landfill (U.S. Green Building Council, 2008).

Indoor Environmental Quality—Non-toxic building materials were used to minimize indoor air pollution, effectively limiting the emission of volatile organic compounds (VOCs) (U.S. Green Building Council, 2008). The building is also equipped with a displacement ventilation system that feeds fresh air near floor level and removes stale air at ceiling level, providing occupants with high-quality, clean air (City of Chicago [b] and Chicago Center for Green Technology, 2003).

Water Efficiency—A 2,500-square-foot green roof absorbs rainfall, and has a cooling effect on the building during the summer months (Figure 20.3) (City of Chicago, 2003) (Chicago Department of Environment, 2009). Four cisterns collect and store as much as 12,000 gallons of rainwater that drains from the building's roof. The recovered water is used to irrigate plants, reducing both the need to use fresh water sources and building operation costs associated with water consumption (City of Chicago, 2003). Bioswales (ditches planted heavily with vegetation) funnel rainwater from the parking lot to a reconstructed wetland (City of Chicago, 2003). Three different examples of permeable paving on the site illustrated how rainwater can percolate into the ground rather than become forced into the municipal sewer system. A retention pond functions as a reservoir for rainwater not collected or absorbed by other on-site water-conservation strategies (Figure 20.4). The retention pond also serves as a habitat for wildlife. These water efficiency strategies effectively address stormwater management on site by reducing the amount of rainwater runoff entering the sewer system by 50% (City of Chicago [b] and Chicago Center for Green Technology, 2003).

Transit-Oriented Development—The CCGT is near the Sacramento, Grand, Chicago, and Kedzie bus routes, the CTA (Chicago Transit Authority) Green-Line elevated rail line, as well as Metra's Union Pacific West Line station.

Figure 20.3. Image: CCGT Green Roof (Source: DeSousa, 2002 and 2006).

Figure 20.4. Image: CCGT Rain Garden (Source: De Sousa, 2002 and 2009).

In addition to its environmental features, the project also paid close attention to its socioeconomic sustainability mission. A key way that the CCGT contributed to Chicago's economic and social development was through its collaborative relationship with Greencorps Chicago (2009), a career development program that is a public/private partnership between the city of Chicago (Department of Transportation) and WRD Environmental (Figure 20.5). Greencorps links environmental stewardship and restoration activities with job training and public engagement to create natural spaces that are "safe, healthy and sustainable" (Greencorps, Undated, accessed 2009, 2017). On the career development side, Greencorps Chicago offers Chicago-area residents with barriers to employment a nine-month paid position in an environmental job training program. Recruits benefit from field and classroom instruction in urban agriculture, tree care, landscaping, carpentry, ecological restoration, integrated pest management, and many other topics (Greencorps, Undated-b, accessed 2009, 2017). Among program recruits, 90% are ex-offenders searching for opportunities to upgrade their skills and employment prospects to achieve self-sufficiency (City of Chicago [c], 2009).

The job training and work experience provided through the program is invaluable and addressed the systemic barriers to employment experienced by ex-offenders that may lead them to relapse into criminal behavior (City of Chicago [c], 2009). The native gardens and landscaping on the CCGT

property offers on-site demonstrations and learning opportunities for both components of the Greencorps Chicago program. In turn, recruits of the job-training program maintained CCGT's gardens, thereby reducing the operating costs of the center. The collaborative relationship between the CCGT and Greencorps Chicago contributed to community development through job training, capacity building, and community-greening initiatives.

Figure 20.5. CCGT Green Resource Room (DeSousa, 2009)

The total cost to clean and redevelop the brownfield property and vacant building was $14.4 million, and construction was completed in 2002 (U.S. Green Building Council, 2008). Subsequently, the U.S. Green Building Council Certified the property and building as LEED Platinum in 2003. Although a standard building could have been constructed on the site, a green building was developed to showcase Chicago's emerging green technology and social innovation sectors.

While approximately 30,000 visitors accessed the CCGT each year for educational programming, job training, tours, and green-building resources prior to the loss of city funding in 2014 and the closure of the program soon after, the legacy of the CCGT still lives on through the training and professional services offered by current tenants. The CCGT also helped spark the creation of a "green" cluster in the surrounding area with the addition of landscape-oriented businesses. Located next door, for instance, is Christy Webber Landscapes, a full-service landscape company that works throughout the Chicago area. Their LEED Platinum headquarters building known as Rancho Verde has won numerous awards for its innovative, environmentally sensitive approach to redeveloping a brownfield site. For more information, see: **https://www.christywebber.com**.

Milwaukee's Menomonee Valley

Over the past decade, the Menomonee Valley in Milwaukee, Wisconsin, has been transformed from one of the most blighted industrial districts in the Midwest into a vibrant green employment center. The 1,400-acre Valley lies in the heart of the city, and the Menomonee River flows through it. The Valley's accessibility to water and rail made it a prime location for the industrial activity that started arriving in the late 1800s after vast quantities of material were used to fill the marsh (Gurda, 1999). While the industrial engine of the Valley roared for over half a century, it began to sputter after the Second World War. Its economic decline brought on a host of problems including unemployment, a reduced tax base, and soil contamination.

Interest in revitalizing the Valley intensified in the late 1980s. While several long-standing manufacturers operated in the Valley, a new desire emerged for regeneration of its natural heritage and for amenities to reconnect it with the surrounding community. In 1998, the city of Milwaukee devised a plan for the Valley entitled *Market Study, Engineering, and Land Use Plan for the Menomonee Valley.* The plan was a vital step in the evolution of the area's vision. The plan recommended that the Valley upgrade and revitalize to retain and strengthen viable and existing industries; attract new industry to the western and central areas of the Valley; promote "compatible" mixed-use development, largely in the eastern Valley; and maintain and protect adjacent neighborhoods and business areas. In 1999, the EPA's Sustainable Development Challenge Grant Program awarded a $250,000 grant to the Sixteenth Street Community Health Center, a local non-profit, EPA's to investigate ways to incorporate sustainability into the Valley's redevelopment. The Sixteenth Street Community Health Center (2000) organized a two-day charrette (a visioning session) in which design professionals, nonprofits, government agencies, local universities, students, and community members were charged with the task of "*raising the bar on redevelopment and restoration activities for Milwaukee's Menomonee River Valley*" (Sixteenth Street Community Health Center, 2000). The charrette resulted in the production of a comprehensive report entitled *Vision for Smart Growth* that outlines ideas for the eastern, central, and western portions of the Valley.

Several major projects were initiated in the 1990s and 2000s, including the Hank Aaron State Trail, Miller Park, the Sixth Street Viaduct, and Canal Street, to improve access and mobility within the Menomonee Valley. While each individual project was important, more significant was that the group of infrastructure projects, some of them green, brought the attention and resources of various stakeholders and government agencies to the Valley. The Hank Aaron State Trail, Wisconsin's first trail in an urban area, officially opened in 2000 on the Valley's west side and was connected to Sixth Street in the Valley's east end (and hence the Lake Michigan lakefront) in 2007.

Although many projects in the Valley have integrated sustainability aspects, the one that has set a very high bar for the Valley's long-term trajectory is the Menomonee Valley Industrial Center and Community Park. Redevelopment of the 140-acre Milwaukee Railroad Shops property located in the western end of the Valley into an industrial center provided an exciting opportunity for stakeholders to convert sustainable visions, designs, and guidelines, into a reality. In 2002, the Sixteenth Street Community Health Center, with the city of Milwaukee and other sponsors, organized a national design competition referred to as *Natural Landscapes for Living Communities* to plan the redevelopment and greening of the site, even before the city acquired it via eminent domain action. The land use, infrastructure, and sustainability visions that evolved from the charrette became entrenched as criteria presented to design teams competing to develop a final site plan. The winning design submitted in 2002 provided for 70 acres of light industrial development, a mile segment of the Hank Aaron State Trail, and 70 acres of streets, parks, and natural areas along the banks of the river. From this design, the city generated the *Menomonee Valley Industrial Center and Community Park Land Use Plan* in 2006 to guide redevelopment.

Menomonee Valley Industrial Center and Stormwater Park (Charter Wire building and Derse building, under development) (DeSousa, 2009)

To ensure that new development in the Valley met sustainability-oriented objectives, the Menomonee Valley Partners (MVP) (a non-profit guiding redevelopment in the Valley), the Sixteenth Street Community Health Center, and the City of Milwaukee initiated consultation in 2002. The stakeholders wanted to develop guidelines that were more concrete for green building and family-sustaining wages. In response, MVP created the *Menomonee Valley Sustainable Design Guidelines* to provide guidance and lessons learned from other projects to help simplify sustainable design, enhance building performance, improve aesthetic quality, and expedite the municipal and state permitting and approvals process (Menomonee Valley Partners, 2006). The first iteration of the guidelines, completed in 2004, was in line with the U.S. Green Building Council's LEED rating system. In 2002, MVP also convened a workgroup of business and community representatives to establish a family-sustaining–living-wage target for the Valley; in 2005, the city formally adopted this recommendation as policy for land sales. Employers were also encouraged to provide health insurance to their workers.

Since preparing the Industrial Center site in 2006, despite severe economic downturn, more than half a dozen buildings have been constructed, and no more land parcels remain. The city has also reached its jobs goal for the property, and properties have sold for slightly more than initially expected. The Menomonee Valley Community Park portion of the site provides an amenity for businesses located in the Valley and green space for local residents. The stormwater portion of the park provides essential infrastructure by conveying, storing, and treating stormwater for the adjacent land parcels in the industrial site, Canal Street, and other internal roads.

The success of the project has created extensive economic and real estate development activity throughout the Valley, even spilling outside of the Valley's boundaries. In addition to recent expansions by private interests, the sustainability approach of its redevelopment has been said to "tip the scales" in favor of locating more eco-minded companies to the area. Such companies include the $150-million hotel constructed by Potawatomi Bingo Casino, the Global Water Center housing water-based industries, and the local Lakefront Brewery that built a second facility in the Valley. The more sustainable redevelopment model has made it attractive to nonprofits as well. The Urban Ecology Center, a popular Milwaukee environmental education and stewardship group that recharges urban parks through daily education and community programs, built a new center adjacent to the Valley and is using the Valley's new Three Bridges Park for its programming. In addition, the Wisconsin Bicycle Federation moved its Milwaukee offices into the Pedal Milwaukee Building, which is just off the newly constructed Valley Passage Bridge on the Hank Aaron State Trail.

CONCLUDING REMARKS

Although stakeholders involved in the early visioning of both the Chicago Center for Green Technology and the Menomonee Valley initially struggled to convince many existing businesses, city agencies, and developers to both understand and buy into sustainability, the award-winning and long-term success of these projects has caused many municipal managers, businesses, planners, and residents throughout the country to take note. The MVP annual report illustrates a host of broad-based economic and community impacts that employers, employees, and local residents have come to see as standard to life in the Valley, despite the fact that these impacts go well beyond the typical jobs and tax benefits that this type of economic development initiative typically delivers. Studies like the **Menomonee Valley Benchmarking Initiative** are seeking to track the broader outcomes of this initiative using more than 50 alternative metrics related to community, environment, and economy. The results are proving that overall progress is being made across the board. What is required now is to figure out how to get more communities throughout the country to buy into a sustainability approach that will lead us to better long-term outcomes in all aspects of socio-economic and environmental health and well-being.

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CHAPTER 21

Long-term Results: The "Highway to Healthcare" Model Works as a Brownfields Redevelopment Project

Edward (Ed) Johnson

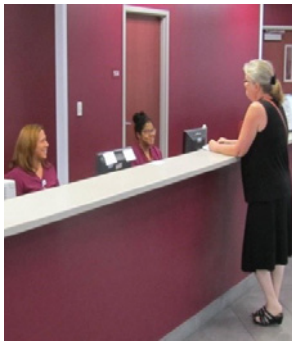
CREATING A FAMILY HEALTH CENTER IN TAMPA, FLORIDA

According to the National Association of Community Health Centers, more than 28 million people in 11,000 communities rely on community health centers for health care (National Association of Community Health Centers, 2019). The 2010 Affordable Care Act allocated $11 billion to expand these centers to meet this need with $1.5 billion of that allotted to construction (Health Resources Services Administration, n.d.).

The Tampa Family Health Center is a contemporary health center model. The 15,000-square-foot health center was completed in November of 2010 and serves as an excellent example of how to turn abandoned and underutilized properties into community health centers to fill the growing need for them. The Tampa Family Health Center currently employs 58 staff members and treats approximately 16,500 patients per year in a severely **medically underserved area** of the city of Tampa. It also helped spur nearly $20 million in public improvements and private developments in and around the Tampa area and created approximately 300 new jobs.

The success of the Tampa Family Health Center became a driving force for Miles Ballogg, the Director of Brownfields and Economic Development with Cardno, a private consulting firm and long-time environmental health advocate, to rally the brownfield and redevelopment agencies and organizations to galvanize the concept of Healthfields. Ballogg introduced Healthfields through several presentations and print media, including a summary overview (Cardno, 2015). Chapter 15 of this book, Brownfields to Healthfields, of which Ballogg is a co-author, is dedicated to describing Healthfields. Ballogg's work helped catapult the Healthfields concept and the Tampa Family Health Center into the national limelight. Since then, national and regional workshops on the topic using the Tampa Family Health Center as a model, among others, have been proliferating to help educate people around the country so they too can improve their communities with a health-focused end use.

Tampa Family Health Center Lobby Entrance and Exterior Building. Source: City of Tampa, June 2013.



Steps to Create the Tampa Family Health Center

In 2007, as the Urban Development Manager for East Tampa, I worked with consultant Ballogg to lead the city's effort to secure a $400,000 brownfields assessment grant to investigate approximately 15 sites throughout Tampa for potential end use as healthcare centers.

Our goal was to clean up a brownfield site in an underserved community and provide comprehensive, high quality, accessible, and affordable preventative health care, treatment, and education to all residents of the east Tampa area, regardless of their ability to pay, or social or economic status. The following information provides an overview of how we started with brownfields funding and ended with the creation of the Tampa Family Health Center.

Site Location. The city secured eight parcels of land, including two vacant brownfield parcels and two residential properties (one of which was also classified as a brownfield property) on the east side of Tampa at 4620 North 22nd Street. The sites occupied just over two acres.

Primary Funding Sources. The primary funding sources for the brownfield services, construction, and operation of the Tampa Family Health Center were, and in some cases still are, many and varied. These funding sources included Medicaid, Local Indigent Care Plan, Section 330 funding (for uninsured persons living at least 200% below the Florida poverty level), Medicare, fee-for-service patients, a $1.5 million American Recovery and Reinvestment Act (ARRA) grant, and a $400,000 EPA Brownfields Assessment Grant.

The Brownfields Assessment Grant partially funded the new Tampa Family Health Center and related development in the area. A portion of the $400,000 was used to help with predevelopment expenses and to complete a demolition asbestos survey. Kathy Castor, U.S. Representative for District 14 in Tampa, got involved and helped secure two additional ARRA grants valued at $4.9 million through a community engagement session.

Due in part to the success of the Tampa Family Health Center Brownfield Project, the city of Tampa received one of the 10 multipurpose grants given on a national basis to assess and clean up other areas around Tampa in 2012.

Addressing Contamination. Removing the environmental stigma of the site was the first major hurdle to overcome to begin reinvigorating the community. Site investigations revealed very little environmental concern for the properties under consideration for reuse. Cleanup was relatively simple, requiring the removal of lead and asbestos from an old, abandoned 1950s-era residence to be demolished to make room for the new health care facility.

End Use of the Site. The site was redeveloped into the $3.4 million Tampa Family Heath Center, which opened in November 2010. The Center is a 15,000-square-foot facility that provides basic preventative medical care and treatment through family practice, pediatrics, obstetrics/gynecology, social work, dental care, and pharmacy services. The Center serves an area with 37,000 residents and treats approximately 16,500 patients annually in a severely underserved community of East Tampa. A disproportionate number of the population lives at least 200% below the poverty level.

Increased Job Opportunities. The new larger, more efficient Tampa Family Health Center replaced two older and smaller facilities. These two older facilities could not fulfill the fast-growing need

for affordable and accessible health care to this severely underserved population, nor could these facilities adequately house new health care equipment and technology. All 54 employees from the two separate facilities transferred to the new facility, and four more staff members were added. U.S. Health Resources and Services Administration (HRSA) funding was used to hire physicians to work at the new Center. With the added efficiency of the new facility, the Tampa Family Health Center serves a growing number of patients in the area.

Economic Development. As a direct result of the new health center, the surrounding areas have enjoyed renewed economic investment and increased employment opportunities. Fifth Third Bank built a new $3 million commercial bank branch, which now employs eight full-time staff. Recently, two new sit-down restaurants opened in the area. This economic expansion allowed the Tampa Family Health Center to add 70 new positions and gain an additional $2.5 million in service revenue. Most recently, Walmart has committed to build a new 120,000-square-foot super center in the area, investing approximately $15 million and creating 230–300 new job openings. In addition, property values in the area increased 8% from previous years.[8]

Successes and Outcomes of the Tampa Family Health Center Brownfields Project

The Tampa Family Health Center is a documented modern-day success story of the groundbreaking national "Brownfields to Healthfields" movement. With several years of operation under its belt, the Tampa Family Health Center demonstrates the measurable benefits of cleaning up and redeveloping a brownfield site with a healthcare-related end use. The health center has been the topic of various community development and brownfield workshops around Florida and on regional and national levels. The Tampa Family Health Center Healthfields project was featured at the Florida Brownfield Association's Environmental Health Workshop, the EPA Region IV new Grantees Workshop, the 2012 Summit on the Science of Eliminating Health Disparities for HRSA organizations in Maryland, and the 2012 National Underground Storage Tank Conference in Boston, Massachusetts. The Tampa Family Health Center project and the "Brownfields to Healthfields" concept were presented at the 2013 Southwest Florida Regional Brownfield Symposium and Workshop and at three workshops at the 2013 National Brownfields Conference. The Tampa Family Health Center also is featured in an ATSDR video called ***The Dream is Possible: Access to Health and Healthcare—Mulberry and East Tampa***.

National EPA and local community development staff in Mississippi and Georgia are included in discussions about the health center at the 2013 Healthy Mississippi Conference. Most recently, the leadership for the Tampa Family Health Center Brownfield Project has been asked to serve as the nation's first-ever Community Brownfields Mentor to another community, the city of McComb, Mississippi. Based on the success of the Tampa Family Health Center, McComb's EPA Project Officer introduced the McComb community leaders to the Tampa Family Health Center Brownfield Project leadership (Ed Johnson and Miles Ballogg). Together the group formalized the nation's first-ever Brownfield Mentor Pilot Program.

The city of McComb has made substantial progress towards seeing its "Brownfield to Healthfields" dream become reality. In May 2012, the EPA awarded a Brownfields Assessment Grant to the city

8 Information obtained from Hillsborough County Property Appraisers Office by Ed Johnson, 2014.

of McComb, Mississippi. Progress would not have been possible without many key partnerships that developed as the result of this pilot mentor program. Partners included the Agency for Toxic Substances and Disease Registry (ATSDR) Region 4, HRSA Region IV, Amite County Medical Services, the McComb Main Street program, and the Mississippi Primary Health Care Association.

Although well-known now, the leadership for the Tampa Family Health Center Brownfield Project on North 22nd Street never lost sight of its roots. It is a role model and driving force for yet another health care center located on North Dale Mabry Highway, which assists an additional underserved population in another section of Tampa. The $6.7 million North Dale Mabry health center, located on the site of a former car dealership, employs 67 medical and office staff and serves 10,000 patients per year.

The unique, holistic approach to community development and community involvement proved to be the pivotal turning point for the Tampa Family Health Center and various related developments in the area. The foundation of the Tampa Family Health Center and related developments was clearly a homegrown community effort. The efforts culminated in a strategic, comprehensive community plan that met the area's specific needs. Two of the key strategic initiatives were providing quality, affordable health care and reducing crime in the area.

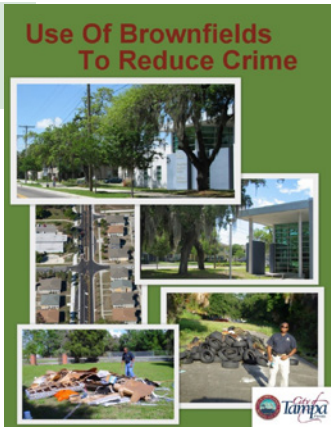
I credit the success of this project to the many dedicated stakeholders in the 7.5-square-mile East Tampa community. They include 17 different registered neighborhood associations, the University of South Florida, the port and aviation authorities, and chambers of commerce. This stakeholder group led to the formation of a permanent East Tampa Community Revitalization Partnership. The revitalization partnership has formed seven subcommittees and meets monthly. The revitalization partnership continues to take a 5-year outlook on the community and incorporates the ideas from community residents into a published Strategic Community Development plan. This plan serves as a working document that empowers the community and its citizens to work for developments that meet their specific needs, rather than those of outside private interests.

The success of the Tampa Family Health Center Brownfield Project led to other developments in the area including a future grocery store on North 22nd Street, the Robert L. Cole Community Lake and Park built on a former landfill site, a $9.2 million police station built on another former landfill site, a pharmacy, and financial centers. According to the private sector developer, these projects will create nearly 200 jobs.

Brownfields to Healthfields FQHC Images of Tampa Family Health Center.
Source: City of Tampa, June 2013.

According to the 2013 County Health Rankings published by the University of Wisconsin Population Health Institute, Hillsborough County (which includes Tampa) ranked 22 out of 67 counties in Florida for health factors; this ranking improved from 31 out of 67 in 2010. Health factors are those that influence the health of the county such as health behaviors, clinical care, social and economic factors, and physical environment. With the Tampa Family Health Center, other renewed investments in the area, and public safety initiatives, Tampa has reported double-digit decreases in crime every year for eight consecutive years (a total of 62.8% reduction), and this trend continues.

Use of Brownfields to Reduce Crime Neighborhood Images.
Source: City of Tampa, June 2013.



Challenges and Obstacles

The most challenging aspect of building the Tampa Family Health Center was procuring the land. Over the course of five years, the Tampa Family Health Center, in collaboration with the city of Tampa and the Mayor of Tampa, worked to assemble a parcel of land sufficient in size for the clinic's construction. Due to the position of some land owners (mostly investors), the project was not moving forward. This challenge helped the community support the project during the community engagement workshop. With the help of the East Side Association and multiple community residents, the Tampa Family Health Center purchased eight lots and combined them into a large enough lot to build upon. Once the Center purchased the lots, construction of the health center was made possible with the support of the Capital Investment Program of American Recovery and Reinvestment Grant funds. The construction began in early 2010, and the new center began operation on November 8, 2010.

Collaboration Led to Success

The Tampa Family Health Center likely would not be open today if not for the unified efforts by the city of Tampa administration, the East Tampa Association, several community activists, and local politicians who took an active interest in the completion of the health center.

A community planning workshop was pivotal to this project. The workshop helped identify particular needs and wants of the community. The group, as part of the solution, helped plan the revitalization based on the community's specific needs rather than those of outsiders. It engaged, energized, and empowered the citizens to work together to resolve numerous issues that had to be overcome. This approach has proved repeatedly that people can have a huge, positive impact on their community, neighborhood, and families.

GLOSSARY

Adverse Outcome (Adverse Health Effect). A change in body function or cell structure that might lead to disease or health problems.

Source: **https://www.atsdr.cdc.gov/glossary.html**

Alternative Energy (renewable energy). Alternative or renewable energy sources are unlike fossil fuels, which are finite. Alternative energy sources regenerate.

Commonly used renewable energy sources include:

- **Biomass**—includes:
  - **Wood and wood waste**
  - **Municipal solid waste**
  - **Landfill gas and biogas**
  - **Ethanol**
  - **Biodiesel**
- **Hydropower**

Source: **http://www.eia.gov/energyexplained/index.cfm?page=renewable_home**

Arsenic. Arsenic is a naturally occurring element widely distributed in the earth's crust. In the environment, arsenic is combined with oxygen, chlorine, and sulfur to form inorganic arsenic compounds. Arsenic in animals and plants combines with carbon and hydrogen to form organic arsenic compounds. Inorganic arsenic compounds are mainly used to preserve wood. Copper chromated arsenic (CCA) is used to make "pressure-treated" lumber. CCA is no longer used in the U.S. for residential uses; it is still used in industrial applications. Organic arsenic compounds are used as pesticides, primarily on cotton plants.

Source: ATSDR Toxic Substances Portal:
https://www.atsdr.cdc.gov/substances/toxsubstance.asp?toxid=3

Behavioral Change. The emerging field of behavioral science—which gathers insights from disciplines like behavioral economics, cognitive psychology, and social psychology—illustrates that while individuals retain "free choice," their environment significantly influences the choices they make, and in some instances, may lead them to act in ways that are counter to their true preferences. A growing body of research has demonstrated the strong influence of physical and social surroundings on individuals' actions. The context in which options are presented can shape the decision-making processes that impact health. Altogether, the research suggests that altering environments may be an effective driver of behavior change. [1] Intentionally designing environments to promote healthy behaviors holds promise to reverse the increase of lifestyle diseases.

Source: **http://harvardpublichealthreview.org/the-key-to-changing-individual-health-behaviors-change-the-environments-that-give-rise-to-them/**

Benzene, toluene, ethylbenzene, and xylene (BTEX). BTEX is the abbreviation used for four compounds, often found together, in petroleum products: benzene, toluene, ethylbenzene and xylene. BTEX is found in petroleum products such as diesel fuel, home heating oil and gasoline. Individually Benzene is used in the production of consumer products, such as synthetic rubber, plastics, nylon, insecticides and paints and is also found in cigarettes. Toluene is used as a solvent for paints, coatings, gums, oils, and resins. Ethylbenzene may be present in consumer products such as paints, inks, plastics, and pesticides. Xylenes are used as a solvent in printing, rubber and leather industries.

Source: **https://mde.maryland.gov/programs/LAND/OilControl/Documents/BTEX%20Fact%20Sheet%202.12.07%202%20pgs.pdf**

Bioavailability. The percent of dose reaching the systemic circulation after exposure (swallowing, touching, or inhaling) to contaminated environmental media (soil, fish, plants, etc.).

Additional information:
https://www.sciencedirect.com/topics/earth-and-planetary-sciences/bio-availability

Biomass. Biomass is organic materials that comes from plants and animals, and it is a renewable source of energy.

Source: **http://www.eia.gov/energyexplained/?page=biomass_home**

Biorefineries. A biorefinery is similar to an oil refinery. It converts biomass into fuel and power. The ultimate biomass facility would in many ways resemble an oil refinery. A largely homogenous product goes in one end and many different products come out of the other. Substitute biomass for petroleum, and you have a biorefinery.

Source: **http://biomassmagazine.com/articles/1231/the-elusive-biorefinery**

Built Environment. The built environment touches all aspects of our lives, encompassing the buildings we live in, the distribution systems that provide us with water and electricity, and the roads, bridges, and transportation systems we use to get from place to place. It can generally be described as the man-made or modified structures that provide people with living, working, and recreational spaces.

Source: **https://www.epa.gov/smm/basic-information-about-built-environment**

Carbon Emissions (Greenhouse Gas Emission). Carbon dioxide (CO2) is a carbon emission. It is the primary greenhouse gas emitted through human activities. In 2013, CO2 accounted for about 82% of all U.S. greenhouse gas emissions from human activities. Carbon dioxide is naturally present in the atmosphere as part of the Earth's carbon cycle (the natural circulation of carbon among the atmosphere, oceans, soil, plants, and animals). Human activities are altering the carbon cycle—both by adding more CO2 to the atmosphere and by influencing the ability of natural sinks, like forests, to remove CO2 from the atmosphere. While CO2 emissions come

from a variety of natural sources, human-related emissions are responsible for the increase that has occurred in the atmosphere since the industrial revolution.

Source: **http://www3.epa.gov/climatechange/ghgemissions/gases/co2.html**

Carcinogen. A carcinogen is a substance that causes cancer.

Source: **http://www.atsdr.cdc.gov/glossary.html**

Case Definition. Case definitions are a set of uniform criteria used to define a disease for public health surveillance. Case definitions enable public health to classify and count cases consistently across reporting jurisdictions.

Source: **http://wwwn.cdc.gov/nndss/case-definitions.html**

Children's Environmental Health. Children's environmental health is used as a term because the environment affects children differently than adults. Because their bodies are still growing, children usually are at greater risk if they are exposed to environmental contaminants. Factors such as the specific chemical, the metabolism of a chemical contaminant to more active or less active forms, and the age of a child may determine a child's susceptibility to toxic effects.

Source: **https://ephtracking.cdc.gov/showChildEHMain.action**

Chronic Diseases. Chronic diseases and conditions—such as heart disease, stroke, cancer, diabetes, obesity, and arthritis—are among the most common, costly, and preventable of all health problems.

Source: **https://www.cdc.gov/chronicdisease/index.htm**

Coal Gasification. Coal gasification converts carbon materials (e.g. coal, petroleum, petroleum coke, or biomass) into carbon monoxide and hydrogen.

Source: **https://www.sciencedirect.com/topics/earth-and-planetary-sciences/coal-gasification**

Community Development Corporations (CDCs). Community Development Corporations (CDCs) are nonprofit, community-based organizations focused on revitalizing the areas in which they are located, typically low-income, underserved neighborhoods that have experienced significant disinvestment. While they are most commonly celebrated for developing affordable housing, they are usually involved in a range of initiatives critical to community health such as economic development, sanitation, streetscaping, and neighborhood planning projects, and oftentimes even provide education and social services to neighborhood residents.

Source: **http://community-wealth.org/strategies/panel/cdcs/index.html**

Community Health Needs Assessments. A *community health assessment*, also known as community health needs assessment, refers to a state, tribal, local, or territorial health assessment that identifies key health needs and issues through systematic, comprehensive data collection and analysis.

Source: **https://www.cdc.gov/publichealthgateway/cha/index.html**

Community Health Status. Community health status is a description and/or measurement of the health of a population at a particular point in time against identifiable standards, usually by reference to health indicators.

Source: **http://www.who.int/healthpromotion/about/HPR%20Glossary%201998.pdf?ua=1**

Complete Streets. Complete streets are designed and operated to enable safe and efficient access for pedestrians, bicyclists, motorists and transit riders of all ages and abilities. Complete Street networks provide connections and choice. Street networks are the building blocks of a community. Compact, interconnected street networks are safer and more convenient than the "cul-de-sac and collector roads" approach.

Source: **http://www.fhwa.dot.gov/livability/fact_sheets/transandsafety.pdf**

Cooperative Agreement. A cooperative agreement uses federal funds awarded to a partner for services, such as a state health agency that provides health assessment services, with participation and oversight by the federal agency.

Source: **http://www.grants.gov/web/grants/learn-grants/grant-policies/federal-grant-cooperative-agreement-act-1977.html**

Copper. Copper is a metal that occurs naturally throughout the environment, in rocks, soil, water, and air. Copper is an essential element in plants and animals (including humans), which means it is necessary for us to live. Therefore, plants and animals must absorb some copper from eating, drinking, and breathing. Copper is used to make many different kinds of products like wire, plumbing pipes, and sheet metal. U.S. pennies made before 1982 are made of copper, while those made after 1982 are only coated with copper. Copper is also combined with other metals to make brass and bronze pipes and faucets. Copper compounds are commonly used in agriculture to treat plant diseases like mildew, for water treatment and, as preservatives for wood, leather, and fabrics.

Source: ATSDR Toxic Substances Portal:
https://www.atsdr.cdc.gov/substances/toxsubstance.asp?toxid=37

Culturally Sensitive. Cultural sensitivity is a set of skills that enables us to learn about and understand people who are different from ourselves, thereby becoming better able to serve them within their own communities.

Source: **https://extension.psu.edu/cultural-sensitivity-in-the-workplace**

Cumulative Impact. Cumulative impact is the combined risk from aggregate exposures to multiple agents (i.e. environmental contaminants) or stressors. The cumulative effect may be less than, equal to, or greater than the sum of individual contributors. A more detailed explanation can be found in EPA's Framework for Cumulative Risk Assessment:
https://www.epa.gov/risk/framework-cumulative-risk-assessment

Deed Restrictions. Deed restrictions are one form of institutional controls related to how land is used or reused. Institutional controls are a form of land use controls that provide protection

from exposure to contaminants on a site. While institutional controls consist of administrative or legal restrictions on a site, land use controls can also use physical measures, which are called engineering controls. In contrast to engineering controls, institutional controls are primarily government controls, proprietary controls, enforcement or permit mechanisms, and informational devices.

Source: **https://institutionalcontrols.itrcweb.org/**

Demographics. Demographics are the statistical characteristics of human populations (e.g. age or income).

Source: **https://www.merriam-webster.com/dictionary/demographic**

Determinants of Health (or Health Determinants). The determinants of health are the range of personal, social, economic and environmental factors which determine the health status of individuals or populations. The factors which influence health are multiple and interactive. Health promotion is fundamentally concerned with action and advocacy to address the full range of potentially modifiable determinants of health—not only those which are related to the actions of individuals, such as health behaviors and lifestyles, but also factors such as income and social status, education, employment and working conditions, access to appropriate health services, and the physical environments.

Source: **http://www.who.int/healthpromotion/about/HPR%20Glossary%201998.pdf?ua=1**

Dioxins. Dioxins (chlorinated dipenzo-p-dioxins (CDDs)) are a family of 75 chemically related compounds commonly known as chlorinated dioxins. One of these compounds is called 2,3,7,8-TCDD. It is one of the most toxic of the CDDs and is the one most studied. In the pure form, CDDs are crystals or colorless solids. CDDs enter the environment as mixtures containing a number of individual components. 2,3,7,8-TCDD is odorless and the odors of the other CDDs are not known. CDDs are not intentionally manufactured by industry except for research purposes. They (mainly 2,3,7,8-TCDD) may be formed during the chlorine bleaching process at pulp and paper mills. CDDs are also formed during chlorination by waste and drinking water treatment plants. They can occur as contaminants in the manufacture of certain organic chemicals. CDDs are released into the air in emissions from municipal solid waste and industrial incinerators.

Source: **http://www.atsdr.cdc.gov/substances/toxsubstance.asp?toxid=63**

Disease Registry. A disease registry is a system of ongoing registration of all cases of a particular disease or health condition in a defined population.

Source: **http://www.atsdr.cdc.gov/glossary.html#G-D-**

Elemental Mercury. Mercury is a naturally occurring element. Its distribution in the environment is the result of both natural and man-made processes. Elemental mercury vapor (Hg0) from metallic mercury or liquid mercury. This is the elemental or pure form of mercury; i.e., it is not combined with other elements. It is the primary form of mercury released into the air by natural processes, such as volcanic activity.

Source: **http://www.atsdr.cdc.gov/mercury/background.html**

Eminent Domain. Eminent domain is the exercise of governmental power in the United States to acquire privately owned lands for congressionally authorized public uses while ensuring that landowners are compensate for these lands.

Source: **https://www.justice.gov/enrd/anatomy-condemnation-case**

Energy Audits. An energy audit (sometimes called an "energy assessment" or "energy study") is to determine where, when, why and how energy is used in a facility, and to identify opportunities to improve efficiency. Energy auditing services are offered by energy services companies (ESCOs), energy consultants and engineering firms. The energy auditor leads the audit process but works closely with building owners, staff and other key participants throughout to ensure accuracy of data collection and appropriateness of energy efficiency recommendation. Source: *A Guide to Energy Audits*, Pacific Northwest National Laboratory, 2011.

Source: **http://www.pnnl.gov/main/publications/external/technical_reports/pnnl-20956.pdf**

See also: **http://www.eia.gov/tools/glossary/index.cfm?id=E**

Energy Grid Transmission (electricity grid). Energy grid transmission is how electricity is distributed. The electricity grid transmits power generated at a variety of facilities (e.g. power plants) and distributes it to end users, often over long distances.

Source: **https://www.ucsusa.org/clean-energy/how-electricity-grid-works**

Energy Sprawl. Energy sprawl is the product of the total amount of energy produced annually and the land-use concentration of production. Basically, this means the amount of energy that can be produced in a given amount of space.

Source: **https://www.altenergymag.com/article/2018/11/what-is-energy-sprawl/29890**

Engineering Controls (Physical Controls). Engineering controls eliminate or reduce exposure to a chemical or physical hazard through the use or substitution of engineered machinery or equipment. Examples include self-capping syringe needles, ventilation systems such as a fume hood, sound-dampening materials to reduce noise levels, safety interlocks, and radiation shielding.

Source: **http://www.ilpi.com/msds/ref/engineeringcontrols.html**

Environmental Health. Environmental health comprises those aspects of human health, disease, and injury that are determined or influenced by factors in the environment. This includes not only the study of the direct pathological effects of various chemical, physical, and biological agents, but also the effects on health of the broad physical and social environment, which includes housing, urban development, land-use and transportation, industry, and agriculture. World Health Organization (WHO). Indicators for Policy and Decision Making in Environmental Health. (Draft). Geneva, Switzerland: WHO, 1997.

Environmental Health. Environmental Health is the fair treatment and meaningful involvement of all people regardless of color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

EPA Food Recovery Hierarchy. The EPA Food Recovery Hierarchy prioritizes actions organizations can take to prevent and divert wasted food. Each tier of the Food Recovery Hierarchy focuses on different management strategies for your wasted food.

Source: **http://www2.epa.gov/sustainable-management-food/food-recovery-hierarchy**

Epidemologic (Epidemiological) Research. Epidemiological research helps us to understand how many people have a disease or disorder, if those numbers are changing, and how the disorder affects our society and our economy.

Source: **http://www.nidcd.nih.gov/health/statistics/Pages/epidemiology.aspx**

Epidemiology. The word epidemiology comes from the Greek words epi, meaning on or upon, demos, meaning people, and logos, meaning the study of. In other words, the word epidemiology has its roots in the study of what befalls a population. Many definitions have been proposed, but the following definition captures the underlying principles and public health spirit of epidemiology:

Epidemiology is the study of the distribution and determinants of health-related states or events in specified populations, and the application of this study to the control of health problems.

Source: **http://www.cdc.gov/ophss/csels/dsepd/ss1978/lesson1/section1.html**

Excess Mortality Rate. Excess Mortality Rate is mortality above what would be expected based on the non-crisis mortality rate in the population of interest.

http://www.who.int/hac/about/definitions/en/

Exposure. Exposure is contact with a substance by swallowing, breathing, or touching the skin or eyes. Exposure may be short-term (**acute exposure**), of intermediate duration, or long-term (**chronic exposure**).

Source: **https://www.atsdr.cdc.gov/glossary.html#G-D-**

Exposure Indicator. An exposure indicator is a characteristic of the environment measured to provide evidence of the occurrence or magnitude of a response indicator's exposure to a chemical or biological stress.

Source:
http://water.epa.gov/scitech/swguidance/standards/criteria/health/microbial/T513.cfm

Exposure Pathway. Exposure pathway is the route a substance takes from its source (where it began) to its end point (where it ends), and how people can come into contact with (or get exposed to) it. An exposure pathway has five parts: a source of contamination (such as an

abandoned business); an environmental media and transport mechanism (such as movement through groundwater); a point of exposure (such as a private well); a route of exposure (eating, drinking, breathing, or touching), and a receptor population (people potentially or actually exposed). When all five parts are present, the exposure pathway is termed a completed exposure pathway.

Source: **http://www.atsdr.cdc.gov/glossary.html**

Farmland Protection (Farmland Protection Policy Act, FPPA). The FPPA is intended to minimize the impact Federal programs have on the unnecessary and irreversible conversion of farmland to non-agricultural uses. It assures that to the extent possible federal programs are administered to be compatible with state, local units of government, and private programs and policies to protect farmland. Federal agencies are required to develop and review their policies and procedures to implement the FPPA every two years.

Source: **http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/fppa/?cid=nrcs143_008275**

Food Desert. A food desert is a neighborhood that lacks healthy food sources. Most measures of food access take into account indicators such as accessibility to sources of healthy food as measured by distance to a store or the number of stores in an area; individual resources, such as family income or vehicle availability; and neighborhood-level indicators of resources, such as average income and availability of public transportation.

Source: **https://www.ers.usda.gov/data-products/food-access-research-atlas/documentation/**

Food Hubs. A food hub is a centrally located facility with a business management structure facilitating the aggregation, storage, processing, distribution, and/or marketing of locally/regionally produced food products." By actively coordinating these activities along the value chain, food hubs are providing wider access to institutional and retail markets for small to mid-sized producers, and increasing access of fresh healthy food for consumers, including underserved areas and **food deserts**.

Source: **http://blogs.usda.gov/2010/12/14/getting-to-scale-with-regional-food-hubs/**

Food Policy Councils. Food Policy consists of the actions and in-actions by government that influence the supply, quality, price, production, distribution, and consumption of food. The central aim of most Food Policy Councils is to identify and propose innovative solutions to improve local or state food systems, spurring local economic development and making food systems more environmentally sustainable and socially just. Source: **https://foodfirst.org/publication/food-policy-councils-lessons-learned/**

Food Security. Food security means access by all people at all times to enough food for an active, healthy life.

Source:
http://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us.aspx

Gentrification. Gentrification is the process of renewal and rebuilding accompanying the influx of middle-class or affluent people into deteriorating areas that often displaces poorer residents.

Source: **https://www.merriam-webster.com/dictionary/gentrification**

Geocoding. Geocoding is the first step in using locational data with geographic information system software. Examples of public health studies utilizing geocoded data include tracking the spread of infectious and environmentally caused diseases, identifying factors related to low birth weight, and linking client populations to provider locations. Geocoding is the process of assigning coordinates, most commonly latitude and longitude, to a street address. The coordinates represent the approximate location of the street address, but when it is not possible to locate the street address, the coordinates can represent the center of an area, commonly a ZIP code. Geocoding relies on two data sets, a reference street data set, which can include not only streets but also ZIP code boundaries, and the data containing the street addresses to be geocoded.

Source: **http://www.dshs.state.tx.us/chs/gis/GuidelineGeocoding.shtm**

Geographical Information System (GIS). GIS, or geographic information systems, are computer-based tools used to store, visualize, analyze, and interpret geographic data. Geographic data (also called spatial, or geospatial data) identifies the geographic location of features.These data include anything that can be associated with a location on the globe, or more simply anything that can be mapped. For example, roads, country boundaries, and address are all types of spatial data.

Source: **https://www.cdc.gov/gis/what-is-gis.htm**

Geometric Mean. Geometric means can be used in instances when the data are highly skewed. The geometric mean is the mean or average of a set of data measured on a logarithmic scale. A geometric mean, unlike an arithmetic mean, minimizes the effect of very high or low values, which could bias the mean if a straight average (arithmetic mean) were calculated. The geometric mean is expressed as the N-th root of the product of N numbers.

Source:
http://www.cdc.gov/nchs/tutorials/environmental/analyses/descriptive/Info3.htm
and **http://www.cdc.gov/ophss/csels/dsepd/ss1978/lesson2/section6.html**

Gini Index. Gini index measures the extent to which the distribution of income (or, in some cases, consumption expenditure) among individuals or households within an economy deviates from a perfectly equal distribution. A Lorenz curve plots the cumulative percentages of total income received against the cumulative number of recipients, starting with the poorest individual or household. The Gini index measures the area between the Lorenz curve and a hypothetical line of absolute equality, expressed as a percentage of the maximum area under the line. Thus a Gini index of 0 represents perfect equality, while an index of 100 implies perfect inequality.

Source: **http://data.worldbank.org/indicator/SI.POV.GINI**

Green Space. Green space is land that is partly or completely covered with grass, trees, shrubs, or other vegetation.

Source: **http://www.epa.gov/region1/eco/uep/openspace.html**

Gross Domestic Product. GDP stands for "Gross Domestic Product" and represents the total monetary value of all final goods and services produced (and sold on the market) within a country during a period of time (typically 1 year).

Source: **https://www.worldometers.info/gdp/what-is-gdp/**

Health Assessment (Public Health Assessment). A public health assessment (PHA) evaluates a hazardous waste site for hazardous substances, health outcomes, and community concerns. A PHA also looks at whether people could be harmed by coming into contact with site-related substances. Public health assessments are often the evaluation tool of choice when a site contains multiple contaminants and multiple, potential pathways of chemical exposure. ATSDR and other agencies use PHAs to identify whether a health study is appropriate or whether some other public health action is warranted, such as community health education. Public health assessments evaluate:

- Levels (or concentrations) of hazardous substances
- Whether people might be exposed to contamination and how they may come in contact with it (that is, through "exposure pathways" such as breathing, eating, or skin contact with contaminated air or soils)
- What levels of a toxic substance might cause harm to people
- Whether working or living near a hazardous waste site might affect people's health
- Other dangers to people, such as unsafe buildings, abandoned mine shafts, or other physical hazards.

Source: **http://www.atsdr.cdc.gov/hac/products/pha.html**

Health Disparity. A health disparity is a particular type of health difference that is closely linked with social, economic, and/or environmental disadvantage. Health disparities adversely affect groups of people who have systematically experienced greater obstacles to health based on their racial or ethnic group; religion; socioeconomic status; sex; age; mental health; cognitive, sensory, or physical disability; sexual orientation; geographic location; or other characteristics historically linked to discrimination or exclusion.

Source: **http://www.healthypeople.gov/2020/about/foundation-health-measures/Disparities**

Health Education. Health education consists of programs designed with a community to help it know about health risks and how to reduce these risks.

Source: **http://www.atsdr.cdc.gov/glossary.html**

Health Indicator. A health indicator is a way of measuring specified health characteristics in a given population. Health indicators are defined as summary measures that capture relevant information on different attributes and dimensions of health status and performance of a health system. Health indicators attempt to describe and monitor a population's health status. The attributes relate to health characteristics or qualities, while the concept of health itself encompasses physical, emotional, spiritual, environmental, mental, and social well-being.

Source: **https://www.paho.org/hq/index.php?option=com_content&view=article&id=14401&limitstart=1&lang=en&Itemid=72362**

Health Services. Health service delivery systems are responsible for providing health services for patients, persons, families, communities and populations in general, and not only care for patients.

Source: **https://www.who.int/topics/health_services/en/**

Health Surveillance System. A health surveillance system is a system that involves the continuous, systematic collection, analysis and interpretation of health-related data needed for the planning, implementation, and evaluation of public health practice. Such a system can: (1) serve as an early warning system for impending public health emergencies; (2) document the impact of an intervention, or track progress towards specified goals; and (3) monitor and clarify the epidemiology of health problems, to allow priorities to be set and to inform public health policy and strategies.

Source: **http://www.who.int/topics/public_health_surveillance/en/**

Housing Stock. Housing stock is the number of existing housing units based on data compiled by the United States Bureau of the Census and referable to the same point or period in time.

Source: **https://archives.huduser.gov/portal/glossary/glossary_all.html#h**

Incidence. Incidence is the measure of the frequency with which new cases of illness, injury, or other health condition occurs among a population during a specified period.

Source: **http://www.cdc.gov/OPHSS/CSELS/DSEPD/SS1978/Glossary.html#G**

Individual Behavior. Individual behavior is one of the determinants of health made up of those areas of individual choice such as: diet; physical activity; alcohol, cigarette, and other drug use; and hand washing.

Source: **http://www.healthypeople.gov/2020/about/foundation-health-measures/Determinants-of-Health**

Informed Consent. Informed consent is based on the principle of respect for persons and requires that individuals be treated as autonomous agents and that the rights and welfare of persons with diminished autonomy be appropriately protected. The Belmont Report states that an autonomous agent is "an individual capable of deliberation about personal goals and of acting under the direction of such deliberation." Respect for persons requires that prospective research subjects "be given the opportunity to choose what shall or shall not happen to them" and thus necessitates adequate standards for informed consent. The informed consent process involves three key features: (1) disclosing to potential research subjects information needed to make an informed decision; (2) facilitating the understanding of what has been disclosed; and (3) promoting the voluntariness of the decision about whether or not to participate in the research. Informed consent must be legally effective and prospectively obtained.

Source: **https://www.hhs.gov/ohrp/regulations-and-policy/guidance/faq/informed-consent/index.html**

Institutional Controls (ICs). Institutional controls (ICs) are non-engineered instruments, such as administrative and legal controls, that help to minimize the potential for exposure to contamination and/or protect the integrity of a response action. ICs typically are designed to work by limiting land and/or resource use or by providing information that helps modify or guide human behavior at a site.

Source: **http://www2.epa.gov/sites/production/files/documents/final_pime_guidance_december_2012.pdf**

Institutional Review Board. The Food and Drug Administration (FDA) defines an institutional review board (IRB) as an appropriately constituted group that has been formally designated to review and monitor biomedical research involving human subjects. In accordance with FDA regulations, an IRB has the authority to approve, require modifications in (to secure approval), or disapprove research. This group review serves an important role in the protection of the rights and welfare of human research subjects.

Source: **https://www.fda.gov/regulatory-information/search-fda-guidance-documents/institutional-review-boards-frequently-asked-questions#IRBOrg**

International Classification of Diseases (ICD). The ICD is the foundation for the identification of health trends and statistics globally, and the international standard for reporting diseases and health conditions. It is the diagnostic classification standard for all clinical and research purposes. ICD defines the universe of diseases, disorders, injuries and other related health conditions, listed in a comprehensive, hierarchical fashion that allows for:

- easy storage, retrieval and analysis of health information for evidenced-based decision-making;
- sharing and comparing health information between hospitals, regions, settings and countries; and
- data comparisons in the same location across different time periods.

Uses include monitoring of the incidence and prevalence of diseases, observing reimbursements and resource allocation trends, and keeping track of safety and quality guidelines. They also include the counting of deaths as well as diseases, injuries, symptoms, reasons for encounter, factors that influence health status, and external causes of disease.

Source: **http://www.who.int/classifications/icd/en/**

Lead. Lead is a naturally occurring bluish-gray metal found in small amounts in the earth's crust. Lead can be found in all parts of our environment. Much of it comes from human activities including burning fossil fuels, mining, and manufacturing. Lead has many different uses. It is used in the production of batteries, ammunition, metal products (solder and pipes), and devices to shield X-rays. Because of health concerns, lead from gasoline, paints and ceramic products, caulking, and pipe solder has been dramatically reduced in recent years.

Source: ATSDR Toxic Substances Portal:
https://www.atsdr.cdc.gov/substances/toxsubstance.asp?toxid=22

Lead Screening. The Centers for Disease Control and Prevention (CDC) applies nationally consistent standard definitions for blood lead surveillance, including screening tests (lead screening). A lead screening test is a blood lead test for a child age <72 months who previously did not have a confirmed elevated blood lead level (BLL). CDC defines and elevated BLL as a single blood lead test (capillary or venous) at or above the CDC blood lead reference value of 5 µg/dL established in 2012.

Source: **https://www.cdc.gov/nceh/lead/data/case-definitions-classifications.htm**

Leadership in Energy and Environmental Design (LEED). LEED was first conceived in April 1993, when the US Green Building Council (USGBC) (Rick Fedrizzi, David Gottfried and Mike Italiano) convened representatives from 60 firms and several nonprofits in the American Institute of Architects' boardroom for the founding meeting. It was then that ideas were shared for an open and balanced coalition spanning the entire building industry and for a green building rating system, which would later become LEED. USGBC created LEED to measure and define what green building meant, and to provide a roadmap for developing sustainable buildings.

Source: **https://www.usgbc.org/about/brand**

Local Food Network. A local food network is part of a local food system. See the USDA report **Local Food Systems: Concepts, Impacts, and Issues**: This comprehensive overview of local food systems explores alternative definitions of local food, estimates market size and reach, describes the characteristics of local consumers and producers, and examines early indications of the economic and health impacts of local food systems. There is no consensus on a definition of "local" or "local food systems" in terms of the geographic distance between production and consumption. But defining "local" based on marketing arrangements, such as farmers selling directly to consumers at regional farmers' markets or to schools, is well recognized.

Source: **https://www.ers.usda.gov/webdocs/publications/46393/7053_err97_reportsummary_1_.pdf?v=42265**

Manufactured Gas Plant (coal gasification plant). Manufactured gas plants (MGPs) operated to provide gas from coal or oil. MGPs were constructed with similar facilities and generated similar wastes using defined manufacturing processes. The gas manufacturing and purification processes produced by-products and residues that may include tars, sludges, and light oils. These residues may contain Polycyclic Aromatic Hydrocarbons (PAHs), petroleum hydrocarbons, benzene, cyanide, metals and phenols. Residues often occur at the same locations at former MGP sites. Typically, soil, ground water, and nearby sediment can be contaminated. The wastes contain a number of known and suspected cancer-causing agents and other potentially hazardous chemicals.

Source: **http://www.eia.gov/tools/glossary/index.cfm?id=M**

Medically Underserved Areas. A Medically Underserved Area is a community or county that does not have enough medical care facilities to meet the needs of the population. The Health Resources and Services Administration has created criteria to define these areas.

Source: **https://data.hrsa.gov/tools/shortage-area/mua-find**

Mercury. Mercury is a metal that combines with other elements, such as chlorine, sulfur, or oxygen, to form inorganic mercury compounds or "salts", which are usually white powders or crystals. Mercury also combines with carbon to make organic mercury compounds. The most common one, **methylmercury**, is produced mainly by microscopic organisms in the water and soil. More mercury in the environment can increase the amounts of methylmercury that these small organisms make. **Metallic Mercury** is a dense liquid that vaporizes easily at room temperature. Metallic mercury is not easily absorbed into unbroken skin. However, it vaporizes, even at room temperature. The higher the temperature, the more vapors are released. Mercury vapors are colorless and odorless, though they can be seen with the aid of an ultraviolet light. Metallic mercury is used to produce chlorine gas and caustic soda, and is also used in thermometers, dental fillings, and batteries. Mercury salts are sometimes used in skin lightening creams and as antiseptic creams and ointments.

Source: **http://www.atsdr.cdc.gov/substances/toxsubstance.asp?toxid=24**

Metabolites. A metabolite is any substance produced during **metabolism** (digestion or other bodily chemical processes). The term metabolite may also refer to the product that remains after a drug is broken down (metabolized) by the body.

Source: **https://www.nlm.nih.gov/medlineplus/ency/article/002258.htm**

Metalloid. A metalloid is a chemical element with properties intermediate between those of typical metals and nonmetals. Many metalloids are used to make transistors and other semiconductor devices, ceramics, solar batteries, and certain polymers.

Source: **https://www.britannica.com/science/metalloid**

Microflora. Microflora are plants too small to be clearly seen without using a microscope; includes actinomycetes, algae, bacteria, and fungus.

Source: **http://ohioline.osu.edu/sag-fact/pdf/0019.pdf**

Mortality Rate. A mortality rate is a measure of the frequency of occurrence of death in a defined population during a specified interval.

Source: **https://www.cdc.gov/csels/dsepd/ss1978/lesson3/section3.html**

National Priorities List (NPL). The US Environmental Protection Agency's (EPA's) Superfund program is responsible for cleaning up some of the nation's most contaminated land and responding to environmental emergencies, oil spills and natural disasters. To protect public health and the environment, the Superfund program focuses on making a visible and lasting difference in communities, ensuring that people can live and work in healthy, vibrant places. One aspect of the Superfund program is the National Priorities List (NPL). The National Priorities List (NPL) is the list of sites of national priority among the known releases or threatened releases of hazardous substances, pollutants, or contaminants throughout the United States and its territories. The NPL is intended primarily to guide the EPA in determining which sites warrant further investigation.

Source: **https://www.epa.gov/superfund/superfund-national-priorities-list-npl**.

See also: **https://www.epa.gov/superfund**

Neurodegenerative (Neurodegeneration). Etymologically, the word is composed of the prefix "neuro-," which designates nerve cells (i.e., neurons), and "degeneration," which refers to, in the case of tissues or organs, a process of losing structure or function. Thus, in the strict sense of the word, neurodegeneration corresponds to any pathological condition primarily affecting neurons. In practice, neurodegenerative diseases represent a large group of neurological disorders with heterogeneous clinical and pathological expressions affecting specific subsets of neurons in specific functional anatomic systems; they arise for unknown reasons and progress in a relentless manner.

Source: **http://www.ncbi.nlm.nih.gov/pmc/articles/PMC151843/**

No Public Health Hazard. The analyses conducted throughout the public health assessment process provide the basis for conclusions regarding the level of public health hazard a site or hazardous substance release might pose. The conclusions are dependent on the characteristics and circumstances of exposure (i.e., route, extent, magnitude, and duration). These five categories are:

- Category 1 Urgent public health hazard
- Category 2 Public health hazard
- Category 3 Indeterminate public health hazard
- Category 4 No apparent public health hazard
- Category 5 No public health hazard

In cases where completed or potential exposure pathways are identified, conclusions should be based on the result of the health effects screening and public health implications analyses. The category of No Public Health Hazard applies to sites where *no exposure* to site-related hazardous substances exists.

Source: **https://www.atsdr.cdc.gov/hac/phamanual/ch9.html#9.1.1**

Parcel. A parcel is any legally described piece of land designated by the owner or developer as land to be used or developed as a unit, or that has been developed as a unit. Source: Davidson, M., and Dolnick, F. (Eds.). (2004). A planners dictionary. American Planning Association, Planning Advisory Service.

Particulate Matter. Particulate matter, also known as particle pollution or PM, is a complex mixture of extremely small particles and liquid droplets. Particle pollution is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles.

Source: **https://www3.epa.gov/region1/eco/uep/particulatematter.html**

Peer Review. Peer review has been a formal part of scientific communication since the first scientific journals appeared more than 300 years ago. Reviewers play a central role in scholarly publishing.

Peer review helps validate research, establish a method by which it can be evaluated, and increase networking possibilities within research communities.

Source: **http://www.elsevier.com/reviewers/what-is-peer-review**

Phase-I Environmental Site Assessment. A Phase I environmental assessment is an initial environmental investigation that is limited to a historical records search to determine ownership of a site and to identify the kinds of chemical processes that were carried out at the site. A Phase I assessment includes a site visit but does not include any sampling. If such an assessment identifies no significant concerns, Phase II and III audits are not necessary. Phase I assessments also are commonly referred to as site assessments.

Source: **https://www.epa.gov/sites/production/files/2014-08/documents/aai-reporting-fact-sheet-and-checklist-062111-final.pdf**.

See also: **https://dnr.wi.gov/files/pdf/pubs/am/am465.pdf**

Phase II Site Assessment. A Phase II environmental assessment is an investigation that includes tests performed at the site to confirm the location and identity of environmental hazards. The assessment includes preparation of a report that includes recommendations for cleanup alternatives. Phase II assessments also are commonly referred to as site investigations.

Source: **https://dnr.wi.gov/files/pdf/pubs/am/am465.pdf**

Photovoice. Photovoice is a process by which people can identify, represent, and enhance their community through a specific photographic technique. As a practice based in the production of knowledge, Photovoice has three main goals: (1) to enable people to record and reflect their community's strengths and concerns, (2) to promote critical dialogue and knowledge about important issues through large and small group discussion of photographs, and (3) to reach policymakers. Source: Wang, C., and Burris, M. A. (1997). Photovoice: Concept, methodology, and use for participatory needs assessment. Health education and behavior, 24(3), 369-387.

Plume. A plume is the volume of a substance that moves from its source to places farther away from the source. Plumes can be described by the volume of air or water they occupy and the direction they move. For example, a plume can be a column of smoke from a chimney or a substance moving with groundwater.

Source: **http://www.atsdr.cdc.gov/glossary.html**

Polychlorinated Biphenyls (PCBs). Polychlorinated biphenyls are mixtures of up to 209 individual chlorinated compounds (known as congeners). There are no known natural sources of PCBs. PCBs are either oily liquids or solids that are colorless to light yellow. Some PCBs can exist as a vapor in air. PCBs have no known smell or taste. Many commercial PCB mixtures are known in the U.S. by the trade name Aroclor. PCBs have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment because they don't burn easily and are good insulators. The manufacture of PCBs was stopped in the U.S. in 1977 because of evidence they build up in the environment and can cause harmful health effects. Products made before 1977 that may contain PCBs include old fluorescent lighting fixtures and electrical devices containing PCB capacitors, and old microscope and hydraulic oils.

Source: ATSDR Toxic Substances Portal:
https://www.atsdr.cdc.gov/substances/toxsubstance.asp?toxid=26

Perchloroethylene (PCE). PCE is another name for tetrachloroethylene (see glossary definition below).

Physical Environment. They physical environment is the physical world people experience through their senses. It includes air, animals, built environment, climate, land, plants, sounds, and structures around an individual.

Source: **https://sociologydictionary.org/physical-environment/**

Polycyclic aromatic Hydrocarbons. PAHs are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot. Some PAHs are manufactured. These pure PAHs usually exist as colorless, white, or pale yellow-green solids. PAHs are found in coal tar, crude oil, creosote, and roofing tar, but a few are used in medicines or to make dyes, plastics, and pesticides.

Source: ATSDR Toxic Substances Portal:
https://www.atsdr.cdc.gov/substances/toxsubstance.asp?toxid=25

Potentially Vulnerable Populations. Potentially vulnerable populations may be made vulnerable by their financial circumstances, place of residence, health, age, or functional/developmental status; ability to communicate effectively; presence of chronic or terminal illness or disability; or personal characteristics. Source: Agency for Health Care Policy and Research. 1998. Measures of Quality of Care for Vulnerable Populations. RFA: HS-99-001. Rockville, MD: Agency for Health Care Policy and Research.

Prevalence. Prevalence is the proportion of a population who have (or had) a specific characteristic in a given time period (e.g., in medicine, typically an illness, a condition, or a risk factor). Prevalence is estimated by selecting a sample (smaller group) from the entire population they want to describe. For a representative sample, prevalence is the number of people in the sample with the characteristic of interest, divided by the total number of people in the sample.

Source: **http://www.nimh.nih.gov/health/statistics/prevalence/index.shtml**

Preventive Services. Preventive services are clinical and population health services such as screenings, counseling services, or preventive medications on the clinical side and community education programs, environment and behavior change programs, organizational and legislative policies, and health systems interventions on the population health side.

Source: **http://www.phf.org/programs/communityguide/Pages/default.aspx**

Primary Prevention. Primary prevention aims to prevent disease or injury before it ever occurs. This is done by preventing exposures to hazards that cause disease or injury, altering unhealthy or unsafe behaviors that can lead to disease or injury, and increasing resistance to disease or injury should exposure occur. Examples include:

- legislation and enforcement to ban or control the use of hazardous products (e.g. asbestos) or to mandate safe and healthy practices (e.g. use of seatbelts and bike helmets)
- education about healthy and safe habits (e.g. eating well, exercising regularly, not smoking)
- immunization against infectious diseases

Source: **http://www.iwh.on.ca/wrmb/primary-secondary-and-tertiary-prevention**

Promotores (Promotoras, female). Promotores are Latino lay health advisors who generally have attributes of leadership, compassion, and familiarity with the community. Interpersonal communication via promotores addresses the weaknesses of impersonal mass media, which by itself may not result in sufficient exposure, attention, or comprehension. Promotores are often asked to communicate on a face-to-face basis with Latino patients, reducing the likelihood of misunderstanding of treatment or health-promotion communication while increasing the acceptability of the communication.

Source: Elder, J. P., Ayala, G. X., Parra-Medina, D., and Talavera, G. A. (2009). Health communication in the Latino community: issues and approaches. Annual review of public health, 30, 227-251.

Public Health. Public health is a social and political concept aimed at the improving health, prolonging life and improving the *quality of life* among whole populations through *health promotion, disease prevention* and other forms of health intervention. A distinction has been made in the *health promotion* literature between *public health* and a new public health for the purposes of emphasizing significantly different approaches to the description and analysis of the *determinants of health,* and the methods of solving public health problems. This **new public health** is distinguished by its basis in a comprehensive understanding of the ways in which *lifestyles* and *living conditions* determine health status, and a recognition of the need to mobilize resources and make sound investments in policies, programmes and services which create, maintain and protect health by supporting healthy *lifestyles* and creating *supportive environments for health.* Such a distinction between the "old" and the "new" may not be necessary in the future as the mainstream concept of public health develops and expand.

Source: **http://www.who.int/healthpromotion/about/HPR%20Glossary%201998.pdf?ua=1**

Qualitative and Quantitative Data. Good data collection plans often integrate **qualitative** methods (those that produce descriptive information) with **quantitative** methods (those that generate numerical data such as frequencies, percentages or rates).

Source: **https://www.cdc.gov/healthcommunication/cdcynergy/evaluation.html**

See also: **http://www.orau.gov/cdcynergy/soc2web/content/phase05/phase05_step03_deeper_qualitative_and_quantitative.htm**

Rates of Disease. Rates of disease are measures of the frequency of occurrence of disease.

Source: A Dictionary of Epidemiology, 3rd Ed. JM Last, Editor.

Radium-226. Radium is a naturally occurring silvery-white radioactive metal that can exist in several forms called isotopes. Radium is formed when uranium and thorium break down in the environment. Uranium and thorium are found in small amounts in most rocks and soil. Two of the main radium isotopes found in the environment are radium-226 and radium-228.

Source: **http://www.atsdr.cdc.gov/substances/toxsubstance.asp?toxid=154**

Remediation. Remediation is the cleanup of hazardous material release or threat of a release that could affect human health and/or the environment. It involves the removal of pollution or contaminants from environmental media, such as ground water or sediment.

Source: **https://www.encyclopedia.com/environment/encyclopedias-almanacs-transcripts-and-maps/hazardous-waste-site-remediation**

Research Translation. Research translation is turning basic research findings into intervention and prevention methods to enhance awareness among communities, health care professionals, and policy makers of environmentally related diseases and health conditions.

Source: **http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1480515/**

Risk Assessment. Risk is defined as the probability that an event will occur. It can also be defined as the probability that a health effect will occur after an individual has been exposed to a specified amount of a hazard. Risk assessment is the process of gathering all available information on the toxic effects of a chemical and evaluating it to determine the possible risks associated with exposure.

Source: **http://www.atsdr.cdc.gov/training/toxmanual/pdf/module-3.pdf**

Risk Communication. Risk communication is the exchange of information to increase understanding of health risks.

Source: **http://www.atsdr.cdc.gov/glossary.html**

Risk Factor. Risk factor is an aspect of personal behavior or life-style (e.g. tobacco use or obesity), an environmental exposure (e.g. hazardous waste exposure), or a genetic (inherited) characteristic that may be associated with adverse health effects or poor health outcomes.

Source: **https://ephtracking.cdc.gov/showLifestyleRiskFactorsAbout**

School Siting. A well located school enhances the educational process by providing a safe and healthy environment for children, teachers and other staff. Before siting a school, it is important to determine whether a potential school site is contaminated or could be impacted by contaminants from nearby sources. EPA recommends that all properties or structures proposed for use as a school, as well as surrounding properties, be carefully evaluated for potential environmental hazards before making final decisions to use a site or structure for a school.

Source: **https://19january2017snapshot.epa.gov/schools/basic-information-about-school-siting-guidelines_.html#important**

Secondary Prevention. Secondary prevention aims to reduce the impact of a disease or injury that has already occurred. This is done by detecting and treating disease or injury as soon as possible to halt or slow its progress, encouraging personal strategies to prevent reinjury or recurrence, and implementing programs to return people to their original health and function to prevent long-term problems. Examples include:

- regular exams and screening tests to detect disease in its earliest stages (e.g. mammograms to detect breast cancer)
- daily, low-dose aspirins and/or diet and exercise programs to prevent further heart attacks or strokes
- suitably modified work so injured or ill workers can return safely to their jobs

Source: **https://www.iwh.on.ca/what-researchers-mean-by/primary-secondary-and-tertiary-prevention**

Sensitive Populations. Some people cannot tolerate chemical exposure as well as others. We call these groups of people sensitive populations. They can include pregnant and nursing women, children, and older adults. People whose immune systems are weak are also a sensitive population and should speak to their doctors about special precautions.

Source: **https://www.atsdr.cdc.gov/emes/public/docs/Sensitive%20Populations%20FS.pdf**

Slag. Slag is stony waste matter separated from metals during the smelting or refining of ore. Oxford Dictionary.

Source: **http://www.oxforddictionaries.com/us/definition/american_english/slag**

Social Capital. Social capital refers to the links, shared values and understandings in society that enable individuals and groups to trust each other and so work together.

Source: **https://www.oecd.org/insights/37966934.pdf**

Social Determinants of Health. Social determinants of health are the conditions in the places where people live, learn, work, and play affect a wide range of health risks and outcomes.

Source: **https://www.cdc.gov/socialdeterminants/index.htm**

Social Environment. The social environment includes the groups to which we belong, the neighborhoods in which we live, the organization of our workplaces, and the policies we create to order our lives. Yen, I. H., and Syme, S. L. (1999). The social environment and health: a discussion of the epidemiologic literature. Annual review of public health, 20(1), 287-308.

Social Media. Social Media are forms of electronic communication (as Web sites for social networking and microblogging) through which users create online communities to share information, ideas, personal messages, and other content (as videos).

Source: **http://www.merriam-webster.com/dictionary/social%20media**

Soil Profile. Layers in soil are called soil horizons. The arrangement of these horizons in a soil is known as a **soil profile**. Soil scientists, who are also called pedologists, observe and describe soil profiles and soil horizons to classify and interpret the soil for various uses.

Source: **http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/?cid=nrcs142p2_054308**

Solar (Photovoltaic (PV)) Systems. Photovoltaic (PV) materials and devices convert sunlight into electrical energy. A single PV device is known as a cell. An individual PV cell is usually small, typically producing about 1 or 2 watts of power. To boost the power output of PV cells, they are connected together in chains to form larger units known as modules or panels. Individual PV cells are electricity-producing devices made of different semiconductor materials. PV cells come in many sizes and shapes, from smaller than a postage stamp to several inches across.

Source: **https://www.energy.gov/eere/solar/articles/solar-photovoltaic-technology-basics**

Stakeholders. Stakeholders are individuals and organizations that have an interest in or are affected by your evaluation and/or its results. Stakeholders provide a reality check on the appropriateness and feasibility of your evaluation questions, offer insight on and suggest methods to access the target populations, provide ongoing feedback and recommendations, and help make evaluation results actionable.

Source: **http://www.cdc.gov/std/Program/pupestd/Identifying%20and%20Determining%20Stakeholders.pdf**

Statistically Significant. Statistical significance refers to whether any differences observed between groups being studied are "real" or whether they are simply due to chance. These can be groups of workers who took part in a workplace health and safety intervention or groups of patients participating in a clinical trial.

Source: **https://www.iwh.on.ca/what-researchers-mean-by/statistical-significance**

Superfund. Superfund is the federal law that concerns the removal or clean-up of hazardous substances in the environment and at hazardous waste sites. ATSDR, which was created by CERCLA, is responsible for assessing health issues and supporting public health activities related to hazardous waste sites or other environmental releases of hazardous substances.

Source: **http://www.atsdr.cdc.gov/glossary.html**

Surveillance (Public Health Surveillance). Public health surveillance is the ongoing, systematic collection, analysis, and interpretation of health data. This activity also involves timely dissemination of the data and use for public health programs.

Source: **https://www.atsdr.cdc.gov/glossary.html** (#Public Health Surveillance)

Tax Allocation District. Tax allocation financing (also called tax increment financing) is a redevelopment and financing tool by which governments can provide financial assistance to eligible public and private redevelopment efforts within an officially designated area or tax allocation district (TAD). Increases in property tax revenues, which are generated primarily

from new investment in the district, are allocated to pay infrastructure costs or certain private development costs within the TAD. This is primarily done through the issuance of tax allocation district bonds.

Source: **https://www.atlantaga.gov/government/departments/city-planning/office-of-zoning-development/plans-and-studies/tax-allocation-district-tad**

Tetrachloroethylene (PERC). Tetrachloroethylene is a manufactured chemical that is widely used for dry cleaning of fabrics and for metal-degreasing. It is also used to make other chemicals and is used in some consumer products.

Source: ATSDR Toxic Substances Portal:
http://www.atsdr.cdc.gov/substances/toxsubstance.asp?toxid=48

Toxicology. Toxicology is the study of the harmful effects of substances on humans or animals.

Source: **http://www.atsdr.cdc.gov/glossary.html**

Toxins. Toxins are substances created by living organisms (bacteria, fungi, plants, animals, etc.) that are poisonous to humans. Toxins are a different concept than toxics.

Source: **https://www.atsdr.cdc.gov/training/toxmanual/modules/1/lecturenotes.html**

Trichloroethylene (TCE). TCE is a nonflammable, colorless liquid with a somewhat sweet odor and a sweet, burning taste. It is used mainly as a solvent to remove grease from metal parts, but it is also an ingredient in adhesives, paint removers, typewriter correction fluids, and spot removers. Trichloroethylene is not thought to occur naturally in the environment. However, it has been found in underground water sources and many surface waters as a result of the manufacture, use, and disposal of the chemical.

Source: ATSDR Toxic Substances Portal:
http://www.atsdr.cdc.gov/substances/toxsubstance.asp?toxid=30

Urban and Rural Classification. Urban and rural classification is made by the Census Bureau. The classification is fundamentally a delineation of geographical areas, identifying both individual urban areas and the rural areas of the nation. The Census Bureau's urban areas represent densely developed territory, and encompass residential, commercial, and other non-residential urban land uses. The Census Bureau delineates urban areas after each decennial census by applying specified criteria to decennial census and other data.

The Census Bureau identifies two types of urban areas:

- Urbanized Areas (UAs) of 50,000 or more people;
- Urban Clusters (UCs) of at least 2,500 and less than 50,000 people.

"Rural" encompasses all population, housing, and territory not included within an urban area.

Source:
https://www.census.gov/programs-surveys/geography/guidance/geo-areas/urban-rural.html

Vapor Intrusion. Vapor intrusion is the migration of chemical vapors from contaminated soil and groundwater into buildings.

Source: **https://www.epa.gov/vaporintrusion/what-vapor-intrusion**

Vital Statistics. In most countries, a civil registration system is used to record statistics on vital events, such as births, deaths, marriages, divorces and fetal deaths. This government administrative system creates a permanent record of each event.

Source: **http://www.emro.who.int/civil-registration-statistics/about/what-are-civil-registration-and-vital-statistics-crvs-systems.html**

Volatile Organic Compounds (VOCs). VOCs are a class of chemicals that are volatile (evaporate easily) and are organic compounds (contain carbon atoms). Some common VOCs include acetone and automotive gasoline.

Source: ATSDR Toxic Substances Portal:
https://www.atsdr.cdc.gov/substances/toxchemicallisting.asp?sysid=7

Voluntary Cleanup Program. State voluntary cleanup programs (VCPs) play a significant role in cleaning up brownfields. State cleanup programs typically are programs authorized by state statutes to address brownfields and other lower-risk sites that are not of federal interest.

Source: **http://www2.epa.gov/enforcement/state-voluntary-cleanup-programs**

Zoning. Zoning is the process of classifying land into areas and districts, such areas and districts being generally referred to as "zones" and the prescribing and application in each area and district of regulations concerning building and structure designs, building and structure placement, and uses to which land, buildings, and structures within such designated areas and districts may be put. Davidson, M., and Dolnick, F. (Eds.). (2004). A planner's dictionary. American Planning Association, Planning Advisory Service.