



American Planning Association  
Creating Great Communities for All

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# *Planning for Early Care and Education:* **Siting Considerations to Promote Environmental Health**



In collaboration with:

## REGION II



HEAD START ASSOCIATION



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## INTRODUCTION

Many children spend a significant part of their day in early care and education (ECE) programs. Hence, it is of utmost importance that ECE programs are in areas where the natural environment (e.g., air, water, soil) do not harm children's health. However, in the United States, the regulations and strategies that guide ECE siting are not adequate. Planners, because of their training in site planning and plan making, are critical to this process, but they need a better understanding about their role in creating healthy childcare environments. They need more knowledge about environmental health (EH) and EH factors that may influence siting decisions, along with more guidance on cross-sector collaboration, especially with EH professionals. This educational module focuses on this gap since there is a lack of educational resources to help planners site ECE facilities in safe areas.

During every step in the planning process, planners can take action to ensure that ECE programs are clean, safe, and free of contaminants. Understanding important environmental health concepts, working collaboratively with affiliated professionals, and having the necessary resources to site ECE programs would allow planners to plan for environmental health. This module provides strategies, resources, and other information to promote safer ECE siting.

Environmental health considerations are becoming increasingly important in communities impacted by disasters, such as hurricanes, earthquakes, or fires, because of the impact these disasters have on the natural environment. Disasters can cause immense physical devastation, which in turn produces environmental threats when contaminants from industrial sites, farms, and even homes are released into the environment. It is the duty of professionals from a variety of fields, including planning, public health, policy, and education, to protect children from adverse environmental conditions that may be exacerbated by disasters.

This education module consists of four sections:

### **Section 1:** Planning and Environmental Health With Focus on Early Care and Education

This section gives foundational information about the intersection of planning and environmental health for siting ECE programs. It describes the nexus between both the disciplines and provides information about regulations that impact ECE siting.

### **Section 2:** Environmental Health Considerations for Siting ECE programs

This section describes the desirable and undesirable site attributes that planners should consider for locating ECE programs, so that children are safe from harmful exposure. After describing site attributes that can impact environmental health, it delineates the planning strategies for siting ECE programs.

### **Section 3:** Land Suitability Analysis

This section explains the site selection process to identify safe sites for ECE facilities. It describes the use of geospatial analysis through a geographic information system (GIS), and outlines data sources, indicators, and threshold criteria that can be used for site selection.

### **Section 4:** Safe Siting in Hurricane-Affected Areas

This section introduces the concept of resilience planning, including the resilience planning process and the importance of creating resilient communities in areas affected by natural disasters. It also discusses how resilience strategies for ECE programs can be incorporated into planning processes before and after a hurricane.

The term “early care and education” (ECE) applies to all of the places where young children may be cared for outside of their homes (Agency for Toxic Substances and Disease Registry (ATSDR) 2017)

## SECTION 1. PLANNING AND ENVIRONMENTAL HEALTH WITH FOCUS ON EARLY CARE AND EDUCATION

In this section, participants will learn about:

- The relationship between planning and environmental health
- The information about ECE programs that is necessary for safe siting
- The local, state, and federal regulations influencing ECE siting

Creating healthy communities requires collaboration among a wide range of affiliated practices. Of these practices, planning and public health are two professions with significant overlap, originating from a shared history and inherent ethical standards that encourage healthy places for all people. Environmental health, a branch of public health that focuses on the connection between the natural environment and human health, has a direct connection with planning. For instance, planners can plan for environmental health by making sure that people have access to clean air, water, and soil. Community decisions related to the built environment have significant impacts on environmental health and vice versa; therefore, planners need to learn more about how these aspects are interconnected.

Children are one of the most vulnerable population groups in our society, and since they are easily affected by the environmental contaminants, it is important to protect them from these chemicals. One way in which planners can do this is by siting Early Care and Education programs, where children spend a large portion of their day, in safe locations. Moreover, they can also use plans and policies, including zoning regulations, long-range plans, functional plans, or subarea plans, to plan for environmental health. Beyond planning, communities can also adopt a variety of regulatory and funding strategies to ensure that plans for ECE programs include considerations about environmental exposure.

### Overview of Planning and Environmental Health

#### 1.1.1 What is Environmental Health?

Environmental health protects people by promoting policies and programs that encourage public and private spaces that are safe, clean, and free of contaminants; supporting access to nutritious and affordable food; providing opportunities for multimodal transportation; ensuring air quality that makes it safe to breathe; and addressing disaster resilience (Centers for Disease Control and Prevention, American Public Health Association (APHA) n.d.).

The study of public health consists of three parts which determine health: the host (susceptible humans), the agent (an external factor to the host, such as a contaminant), and the environment (extrinsic factors that influence the agent and/or the host's chance for exposure) (Figure 1). This concept is known as the Epidemiologic Model. Environmental health focuses on the environment and its influence on agents and hosts.

#### EPIDEMIOLOGIC TRIANGLE

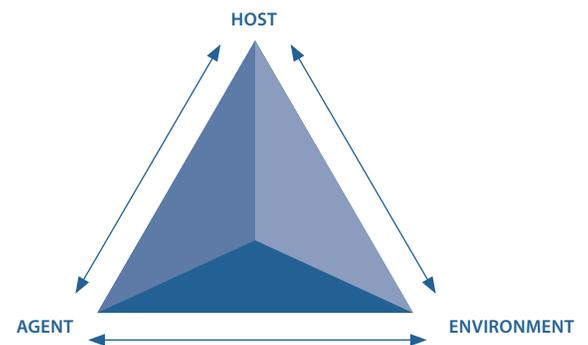


Figure 1. The Epidemiologic Triangle.

“Environmental health is the science and practice of preventing human injury and illness and promoting well-being 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” (National Environmental Health Association 2013).

# HOW THE ENVIRONMENT IMPACTS OUR HEALTH

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**  
ultraviolet and ionizing



**COMMUNITY NOISE**



**OCCUPATIONAL RISKS**



**AGRICULTURAL PRACTICES**  
including pesticide-use, waste-water reuse



**CLIMATE CHANGE**



**BUILT ENVIRONMENTS**  
including housing and roads



 **World Health Organization**  
#EnvironmentalHealth

Figure 2. This image illustrates environmental risk factors that impact health. Source: [World Health Organization](#)

The Epidemiologic Model illustrates the relationship between host, agent, and environmental factors. Host factors, or conditions that impact susceptibility to agents, include physiological factors, such as age, ethnicity, and genetic predispositions, and behavioral factors, such as diet, activity level, and occupation. Agents factors can be categorized as biological, such as bacteria and mold; chemical, such as heavy metals and pesticides; and physical, such as objects, noise, and radiation. Environmental factors include geochemical factors, such as water, air, and climate; biological factors, such as habitats and organisms; and the built environment. Figure 2 presents environmental risk factors that influence human health. When combined, these factors illustrate the range of conditions that can influence human health.

Protecting public health focuses on preventing exposure to ensure that a population is healthy. Exposure occurs when hosts encounter agents. Agents can be transmitted to hosts through direct and indirect routes. Direct routes include physical contact or through air. Indirect routes can be through a vehicle such as food or water, or through vector route, such as mosquitos or rats. Agents can enter a host through inhalation, ingestion, and absorption. Hosts exposed to an agent through direct or indirect contact can experience harmful impacts. Environments can exacerbate exposure to agents. People in urban environments may have increased exposure to traffic pollutants, such as carbon monoxide. In rural communities, people may have increased exposure to other agents, such as pesticides, because of agricultural practice.

Though the environment may contribute to increased exposure, it may also protect people from exposure to agents. In environmental health, the goal is to create and enhance environments that protect people from exposure to hazards. Decisions when planning for placement of buildings, transportation developments, and green infrastructure can focus on environmental health to reduce adverse impacts on human health. Environmental health can be promoted through planning processes by mitigating adverse environmental conditions to decrease people's exposure to contaminants. This concept theme is emphasized throughout the remainder of this module.

### 1.1.2 Historic Nexus: Planning and Environmental Health

The historic intersection of planning and environmental health begins with urbanization. During the Industrial Revolution, shifts from agrarian land use to denser settlements led to public health issues, including outbreaks of disease,

greater exposure to contaminants from factory work, and a lack of sanitation infrastructure (Atlanta Regional Health Forum, Atlanta Regional Commission 2006). At the beginning of the 20th century, planning strategies such as demolition of tenement housing and creation of Euclidian zoning to separate residences from industries were used to address these public health problems. Later in the 20th century and since the beginning of the 21st century, planners and health officials have started working together because it has become clear that the built environment has direct implications on community health (Rosenthal

#### Example: Love Canal, Niagara Falls, New York



The Love Canal, located in Niagara Falls, New York, originally was intended to be a canal used for hydroelectric power in the 1800s and

early 1900s. The developer decided to cease operations and the canal was filled with water. Between 1942 and 1953, the nearby Hooker Electrochemical Company dumped 21,000 tons of hazardous waste into the canal, which contaminated surrounding soil and groundwater. The canal was filled with soil in 1953 and the land was leased to the Niagara Falls Board of Education. The site was developed into an elementary school and residential properties.

Complaints of odors and residues were reported throughout the 1960s and increased through the 1970s. Studies conducted by New York State and the U.S. EPA indicated various contaminants, including dioxin, arsenic, and benzene, were present. In both 1978 and 1980, President Jimmy Carter issued emergency declarations, which resulted in remediation work to begin and families to be evacuated from their homes. In 1980, Comprehensive Environmental Response, Compensation, and Liability Act was enacted because of the Love Canal disaster. Since then, the site has been removed from the Superfund site list due to remedial activities and residences are now permitted. *Source: U.S. EPA*

and Brandt-Rauf 2006). Recently, the integration of environmental health in planning has expanded to include other health-related considerations, including access to services and public utilities, walkable communities, nonmotorized transportation, and climate resiliency.

### 1.1.3 Land Use and Environmental Health

Land use has a direct impact on environmental health. Environmental health is threatened when contaminants from the previous land use, proximal anthropogenic hazardous waste, or naturally occurring sources affect locations where people live or spend most of their time.

Some areas may contain legacy contaminants that adversely impact residents. Legacy contaminants are those that persist in the environment long after the specific polluting land use has ceased. To address legacy contamination, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also known as Superfund, was enacted by Congress in 1980. The purpose of this act is to collect federal dollars, through taxation of chemical industries, that can be used to remediate land that has been previously contaminated (also called Superfund sites), “when no responsible party could be identified” (U.S. Environmental Protection Agency (EPA) n.d.).

Proximity to nearby sources of pollution (including hazardous waste sites), as well as naturally occurring contaminants in the site, should also be considered. Hazardous sites have the potential to release chemicals and biological agents into the air, water, and soil, which can be transported to surrounding sites. Thus, incompatible land uses should be avoided. Contaminants can also be present naturally in water or soil, and appropriate tests should be conducted to identify them and remediate their impact on health.

There are various mechanisms available to local planners for regulating the built environment and land use. These tools include enforcing existing zoning policies and ensuring that proposed developments align with community plans. To successfully create, update, and enforce such rules and regulations, planners must also collaborate with environmental health professionals. Environmental health professionals who work in local governments possess the knowledge, data, and working relationships necessary to advise safe siting. They can also be an essential source of information and can assist planners in ensuring that the development aligns with the community plan.

### 1.2 Planning and Environmental Health for ECE Programs

Around 8.3 million children are enrolled in ECE programs where they may spend up to 50 hours a week, a majority of awake hours for most children (ATSDR 2017). ECE programs that provide a healthy environment can support children in reaching major developmental milestones and provide them with a foundation for educational achievement. A healthy environment includes access to clean water, air, and soil; protection from physical hazards; and easy access to community systems and services that support healthy living.

Not only do children require a safe environment for child care due to the long hours they spend in ECE programs, but they are also an especially vulnerable population. There are various factors that make children vulnerable. Children’s biological systems, including their nervous, immune, reproductive, and digestive systems, are still developing, and it is important to prevent exposure during these critical developmental stages. Smaller concentrations of contaminants can produce significantly more damage to a child’s developing system than it would an adult, and this damage is often irreversible. Additionally, children are small in stature and many in ECE programs still crawl, making them inevitably closer to the ground. Being closer to the ground, children can have higher exposure to agents on the ground. Children also tend to put objects in their mouths, including objects that may not be sanitized (World Health Organization n.d.).

The demand for ECE programs is increasing with time. Between 1995 and 2016, the number of children who attended a child care center rose from 55 percent to 58 percent (Rathbun and Zhang 2016). Additionally, suburban and small metropolitan areas have grown more quickly than cities and rural areas (Parker et al. 2018). These trends indicate that there may be areas where child care demand exceeds the current supply (Dobbins et al. 2016). For communities experiencing population growth, a lack of ECE programs can impact community well-being. Also, increased demand for childcare facilities can mean locations are chosen without considering environmental health. By incorporating ECE and environmental health considerations into the planning process, planners can proactively work toward identifying safe sites for ECE development.

It is clear from the above discussion that it is important that ECE programs are sited in safe areas that will prevent exposure. The American Planning Association (APA) has long promoted inclusion of child care policies as part of local

ECE programs can be in privately owned buildings, leased buildings, or government-owned buildings. Some ECEs operate as single land use in residential areas. They may also operate in residential spaces, or in conjunction with institutional land uses, such as churches or universities. This document addresses considerations for siting child care centers, which can be in stand-alone buildings, in shopping centers, or as part of other businesses and organizations.

planning policies. In 1997, APA adopted a policy guide on the **Provision of Child Care**. As the policy guide states, APA “[...] supports national and state legislation which moves toward the goal of providing adequate funding for safe, convenient and affordable child care opportunities for all children.” Additionally, “procedures to locate child care facilities should not be overly burdensome and should be related to size and land use impacts of the facility.”

Planners are in a unique position to integrate environmental health considerations when making ECE permitting and siting decisions. Moreover, they can use plans (comprehensive, subarea, functional), community visioning and goal-setting processes, zoning regulations, building codes, and public investments to integrate environmental health considerations in ECE planning. Section 2.3, Planning Strategies to Site ECE Programs, offers more information about planning interventions that can shape ECE facility siting. However, ECEs have historically been not considered in planning processes.

Child care is an area where cross-sector collaboration is needed to develop strategies that would support environmental health. Multiple programs, including ATSDR and the Early Childhood Systems Working Group, have developed models for collaboration among stakeholders (ATSDR 2017; Early Childhood Systems Working Group 2013). ATSDR recommends bringing together multiple disciplines and sectors, including members of the public health sector, inspectors, housing experts, economic developers, permitting professionals, and planners to protect children from adverse impacts of contaminants near ECEs (ATSDR 2017). The **Early Childhood Systems Working Group model** focuses on planning and managing an ECE system that supports thriving children and families through six strategies, including building partnerships between programs related to health, early learning and development, family support, and leadership (Early Childhood Systems Working Group 2013). These programs illustrate opportunities to improve ECE options through cross-sector collaboration.

### 1.2.1 Regulations and Program for ECEs

Funding sources and location influence ECE program requirements. In general, ECE providers select locations for programs; however, federal, state, and local mechanisms provide incentives, funding, and rules. ECEs can also adopt certain standards voluntarily, such as accreditation programs.

#### Example of States with Regulations and Programs for ECEs

- California has identified facility requirements, such as access to noncontaminated drinking water and avoiding toxic substances on materials and surfaces accessible to children, for potential ECE operators to follow.
- The Pennsylvania Department of Welfare and the Department of Health has launched an initiative called Healthy and Green Child Care Siting. This program encourages site evaluation early in the development process to identify conditions, including the presence of contaminants, that could result in health risks.
- Indiana has a Protect Children at Child Care program that provides resources and training related to safe environments for children. This program includes limited recommendations related to siting. The program does offer guidance in the form of a Childcare Environmental Self Assessment, which discusses proximal land uses for existing ECE programs, such as manufacturing plants that use lead (Indiana Department of Environmental Management 2014).
- New York and New Jersey have established processes to identify environmental hazards during the licensing process.

ECE programs need sites that support environmental health— that is, ECE sites should minimize environmental hazards and maximize environmental health benefits. Planning interventions, such as plans, standards and policies, and development work, can support this goal.

**Federal.** Federally funded programs, like Head Start and Early Head Start, may need to meet additional environmental health requirements (The Administration for Children and Families, Head Start Program 45 C.F.R. §1302.47 2019; Child Care and Development Fund 45 C.F.R §98.41 2016). The Administration of Children and Families created a voluntary set of national standards, called [Caring for Our Children Basics](#), which identifies minimum requirements to protect children in ECE programs, including environmental health standards. These standards recommend conducting a site audit to identify contamination in the air, soil, and water at the ECE site, as well as other safety hazards (Administration for Children and Families 2015).

**State.** Every state has different licensing rules and regulations governing early child care. In 2011, 13 states required environmental tests and 41 required environmental inspections (National Center on Early Childhood Quality Assurance 2015). Other states have developed voluntary programs for ECEs interested in meeting higher standards. Adopting standards, through mandatory requirements or optional programs, can be appropriate tools to encourage site selection standards depending on local interest and political will. Regulatory strategies are often connected to licensing requirements.

The Environmental Law Institute (2018) identifies state-level initiatives and proposed additional mechanisms to address site environmental conditions through state policies in their report, [Addressing Environmental Site Hazards at Child Care Facilities](#). In some states, ECE operators must meet criteria to ensure that they are in a space that does not conflict with environmental health requirements. As of 2015, these states include Washington, West Virginia, Missouri, North Carolina, Oklahoma, Virginia, North Dakota, Indiana, and Minnesota (Environmental Law Institute, Children’s Environmental Health Network 2015).

**Local.** At the local level, counties, cities, and towns can use planning tools including zoning and land-use policies that outline requirements, such as inspections, permit review, and the approval process, to identify environmental health hazards when siting an ECE program. Some municipalities permit ECEs in commercial or residential zones, and in such cases, they may require the ECE provider to apply for a special use permit, which could trigger an environmental review process. ECE programs may have to comply with site standards, such as indoor and outdoor space requirements and building code and fire code regulations. Local interventions can supplement state licensing regulation by incorporating land use considerations, such as incompatible uses. In some municipalities, ECE programs must consider proximity to land uses that negatively impact environmental health, such as gas stations.

[The Role of Local Health Departments in Promoting Children’s Environmental Health at Early Care and Education Centers](#), a study conducted by the National Association of County & City Health Officials, identified multiple jurisdictions that consider environmental health factors when siting ECE programs. These considerations are implemented through state-level requirements, licensing requirements, local planning and zoning offices, fire departments, and health departments. Examples include Chicago; Johnson County and Lawrence-Douglas County, Kansas; Manchester, New Hampshire; and Grand Forks, North Dakota (National Association of County & City Health Officials 2018).

### Example of Municipalities with Regulations and Programs for ECEs

- Hamilton, Virginia, includes special regulations for ECE facilities as part of their zoning code. Their code specifies that “No such use shall be permitted unless it is determined by the Loudoun County Department of Environmental Health that the location and design does not pose any hazard to the health, safety and welfare of the children” (Hamilton, Virginia, Code of Ordinances, Article 8 §4.2.9). ECE facilities are also subject to special use permit and commission permit procedures.
- San Jose, California, adopted a policy that provides guidelines for child care. The policy aims to create safe environments for children, support compatible uses between ECE facilities and surrounding land uses, to guide ECE operators as they propose facilities, and to centralize materials related to the location, design, and operations of ECE programs (City of San Jose 2003). This policy discusses desirable surrounding uses, such as proximity to church uses and employment centers, as well as undesirable characteristics, including proximity to hazardous materials. The policy provides additional recommendations related to site design, noise standards, and conditional use permitting. The document is discussed in a planning commission staff report reviewing a request for a conditional use permit for an existing facility to build a sound barrier fence and an outdoor play area (City of San Jose 2018).
- Santa Monica, California, developed a planning guide that specifically addresses city planning, environmental conditions, and site selection. The city also provides a free presubmittal process, which allows potential ECE operators to receive feedback from different city departments early in the planning process. In addition, the city waives permit fees for ECE centers, offers information about rent control, and provides sample documents needed to be approved for a conditional use permit. When combined, these factors not only support ECE facility development but also provide opportunities to identify potentially harmful environmental health conditions before an ECE facility opens.

#### 1.2.2 School versus ECE Siting

State, tribal, or local agencies can adopt policies that influence school site selection. It is important to have those in place for ECE programs as well. ECEs could build on guidance developed for school siting, but before using those considerations, planners must be mindful that ECEs and schools differ in how they operate, receive funding, and are regulated.

Schools and ECE programs serve different age groups—ECE facilities serve younger children before kindergarten, while schools generally serve children age five and up. Younger children who are in ECE facilities can be more vulnerable to the impacts of contaminants. ECE programs may also require specialized equipment and have different programming requirements. Moreover, funding mechanisms for schools and ECE programs vary, resulting in different criteria for community engagement, facility development, programming, and service requirements. In many land-use plans, schools are classified as institutional land use, while ECE programs may open in retail or commercial land

uses. Since ECEs often do not have a designated land use, planning for ECEs is difficult and requires special attention. ECE programs can also have different operating hours than schools; some ECE programs offer extended services in evenings and over the weekend.

Schools and ECE programs share some similarities. They may have similar impacts on the community, including trips generated during drop-off and pickup hours, parking requirements, noise generation, and utility needs. Like schools, these factors may limit where ECE programs can be opened, particularly larger facilities that may impact the surrounding community character. In some municipalities, these impacts to the built environment may be restricted through zoning regulations. Because of these impacts, ECE programs may need to apply for conditional use permits when developing new ECE programs in residential areas. Like schools, they may have to take additional precautions, such as providing noise control buffers, to negate the impacts on the surrounding built environment.

## In Summary

Environmental health and planning can work together to ensure child care programs are healthy and safe for children to occupy. Children's health and safety in child care programs are important because many children spend most of their awake hours in these programs. Children are a vulnerable population; they are more susceptible to exposure to harmful agents and the negative health impacts of those agents.

Understanding how environmental health can be applied to planning practices is critical in attaining a healthy child care environment. The first section of this module

provided foundational information about the nexus between environmental health and planning. There is an opportunity for collaboration among planners and environmental health professionals through the engagement of the concept of the built environment. It also provides the necessary background of ECE programs that planners should know to site them in safe places. Moreover, it explains with case examples, the rules, regulations, and programs that are used at federal, state, and local level to influence ECE siting. While there are states that regulate siting of ECE programs, planners should go beyond those regulations to protect children from harmful chemicals.

## SECTION 2. ENVIRONMENTAL HEALTH CONSIDERATIONS FOR SITING ECE PROGRAMS

In this section, participants will learn about:

- Desirable and undesirable site attributes to consider when siting ECE programs
- Role of planners in siting ECE programs
- Equity considerations related to siting ECE programs

Careful siting of ECE programs is important to protect children from contaminants that could be harmful to their health. As discussed in Section 1, children are particularly susceptible to impacts based on environmental conditions because of their behaviors, smaller size, and the fact that they are actively growing. Planners can play a role in encouraging the ECE program to operate in places that are safe and promote health. This section describes site attributes and other aspects that planners should consider while siting ECE programs.

There is no single way to open an ECE program, but regardless of the approach, there are opportunities to incorporate environmental health considerations before starting its operation. In some cases, developers may already have a site, and based on market analysis, decide to open an ECE program on that site. In other cases, ECE operators may open the program in an existing building with either single or multiple uses in it (e.g., shopping center, church). There are also cases where an ECE provider may want to open an ECE program but has not selected a site. In those cases, they may compare multiple sites against a set of criteria to find the right fit.

In all the above circumstances, there are opportunities for planners to consider the contamination-related site characteristics. For instance, when constructing a new ECE facility or using an existing building that requires significant modification, municipalities may allow planners to request site information from developers or ECE operators as part of the permit approval process. During the approval process, local planners can compare site conditions with environmental health guidance to identify if a site is appropriate for an ECE program. Planners can also identify safer sites for ECE programs through site analysis processes. During a site analysis, planners can work with allied professionals to identify site assets and liabilities to determine whether environmental remediation is needed to reduce potential exposure to contaminants. Section 2.3 describes additional planning interventions to encourage safer siting of ECE programs.

Planners and elected officials can ask questions about how a site was used in the past as part of the permit approval process—and get the health department involved if needed (ATSDR n.d.)

### 2.1 Undesirable Site Attributes

Undesirable site attributes refer to conditions that negatively impact the perception of land. These attributes include negative environmental conditions, such as sites that have been exposed to contamination. In the case of ECE programs, these conditions can increase children's exposure to contaminants. Sites may be contaminated due to previous site uses, migration of contaminants from nearby sites, or because of naturally occurring processes. Regardless of how a site becomes contaminated, it is important to proactively identify contaminants and other undesirable site attributes before beginning an ECE program. This section will discuss undesirable site attributes related to contamination.

#### 2.1.1. Methods of Contamination

There are three ways in which a site can be contaminated: former uses, migrating contaminants, and naturally occurring contaminants. Contaminants can impact soil, air, and

#### Case Examples:

- **City of Chesapeake, Virginia**  
Chesapeake requires an **environmental site assessment** for day care and other land uses where land disturbance may occur.
- **Walworth County, Wisconsin**  
Walworth County requires a site analysis map as part of a **development review process**. The map includes a review of site characteristics, including identification of potential environmental hazards such as dumps, waste disposal areas, and storage tanks.

water. Manufacturing processes, waste disposal, and pesticide/fertilizer application are examples of human activities that can contaminate the soil. Air contamination can occur because of industrial or transportation activities. Water systems can become contaminated if water sources or water delivery systems introduce contaminants to drinking water. Public water systems may have routine testing; however, private well systems that are not regularly tested can introduce contaminants into drinking water. In collaboration with environmental health professionals and additional partners, planners should consider these methods of contamination when assessing the site's suitability for ECE programs.

### Former Uses

Human activity can have long-lasting impacts on the natural environment. Past uses can leave behind contaminants that can cause adverse health impacts on people, in some instances for an extended period. Thus, a community interested in encouraging infill development should investigate if the site was previously used for industrial or commercial land uses. Some sites are readily identifiable as brownfields—they may feature physical characteristics that indicate previous use. Other sites may appear clean and unused but may contain contaminants. In the case of redevelopments or changes in building use, a site assessment can help identify incompatible former uses and potential hazards. These are referred to as site liabilities and include conditions like soil contamination, groundwater contamination, and contamination due to hazardous building materials (ATSDR 2017; LaGro 2013).

ECE programs may open in buildings that had previous uses, on a brownfield, in a building with other uses, or a site that has not had previous construction; it is important to consider how former uses may have impacted the environmental quality. Neglect of harmful environmental

conditions can have adverse effects on ECE and its users. One ECE program in Indiana was located on a site that was previously used for manufacturing purposes and contained detectable levels of volatile organic chemicals (or VOCs). This program was relocated after air quality conditions raised concerns. Chapter 4 of the [Choose Safe Places for Early Care and Education Guidance Manual](#) has similar examples that show the effect of the previous land uses on ECE programs and health. Thus, when determining ECE program locations, the following factors should be given special attention to identify potential contamination:

- Prior activities at the site that could have contaminated the inside of the building
- Outdoor contamination, including soil, surface water, or groundwater
- Prior use, storage, or disposal of potentially hazardous substances on site, such as a dump site or underground storage tank
- Potentially hazardous substances on-site, including prior use, disposal, or storage
- Structures that may have contained harmful substances, such as underground storage tanks or a storage shed
- Physical hazards that could be evidence of contamination
- Potentially hazardous materials in structures on-site, such as asbestos insulation or lead-based paint
- Use of contaminated fill on the site
- Vapor intrusions of contaminant (ATSDR 2017)

Planners can work with environmental health professionals to compile environmental, social, and economic data from multiple sources to identify sites that are safe for ECE programs. See Section 3, Land Suitability Analysis, for more information about information sources and site analysis guidance.

### Case Example: Health and Green Initiative in Pennsylvania

In Pennsylvania, the **Healthy and Green Initiative** aims to identify areas that are more likely to be sources of contamination before a building is occupied and children are potentially exposed to contaminants.

While it does not restrict building on sites that may be impacted by risky uses, the program does identify circumstances where further investigation is needed to rule out site contamination. The program identified multiple land uses that could be sources of contaminants, including:

- Major highways, rail yards, port facilities, truck traffic exceeding 100 trucks per day, airports
- Factories, power plants, refineries, propane or other storage tank areas, high pressure pipelines
- Auto body shops, dry cleaners, large gas stations, large animal feeding operations, nail or hair salons, and print shops

In addition to identifying land uses that can lead to site contaminations, the Health and Green Initiative advises child care inspectors to report the following surrounding land uses or businesses within a block of an ECE program:

- Dry cleaners
- High pressure pipelines (1500')
- Nail or hair salons
- Heavy traffic (>100 trucks per day)
- Auto body repair shops
- Airport, port, or train stations
- Print or copy shops
- Industries or factories
- Large gas stations
- Power plants
- Landfills
- Incinerators
- Propane or other storage tanks
- Smelters
- Cement plants
- Large agriculture operations
- Chemical plants
- Refineries

### Migrating Contaminants

Chemical contaminants may migrate to neighboring sites through groundwater, surface water, or air (ATSDR 2017). For this reason, it is important to consider neighboring land uses for potential sources of contamination. According to the American Academy of Pediatrics (AAP), American Public Health Association (APHA), National Resource Center for Health and Safety (NRC) (2019), ATSDR (2017), and Rhode Island Legal Services (2006), surrounding land uses that may pose a hazard include:

- Designated hazardous site, such as National Priorities List or Superfund sites, brownfield properties, and state-listed sites
- Sites that may release hazardous materials or contain potential contaminants, such as factories, gas stations, and auto repair businesses
- Transportation infrastructure that may release contaminants, such as local automobile traffic, major roadways, airports, railroads, trucking facilities, and transportation transfer points

- Sites that may release chemical contaminants to nearby sites in the form of runoff, flooding, wind erosion, or vapor intrusion
- Utility uses, such as drinking water reservoirs or storage tanks, electrical substations, high-voltage power transmission lines, pressurized gas transmission lines
- Proximity to explosive or flammable products, such as propane tanks
- Sites that use industrial pesticides
- Toxics Release Inventory sites, which tracks some chemical releases and waste management in sites that generate chemical waste.
- Resource Conservation and Recovery Act Large Quantity Generators
- Air Emitter Sites
- Leaking Underground Storage Tanks

Air and water quality can significantly impact children's health. Three types of air pollutants (criteria pollutants, toxic chemicals, and greenhouse gasses) can contribute to adverse health impact in children and adults. Air

quality can be impacted by surrounding land uses such as industrial land use, traffic pollution, regional pollution sources, and activities like fracking. Like clean air, access to a clean water supply should also be considered for ECE development. Contaminants present in one site can be transferred to the adjacent sites through the water. For instance, a clean site located next to a Superfund site is more likely to become contaminated through the transfer of contaminants through stormwater runoff. To limit such cross-contamination, planners can use green infrastructure techniques, such as using pervious materials to trap contaminants that may be present in stormwater runoff. Planners should consider the potential impacts of surrounding land uses on a site during the permit review process and, if possible while making plans and policies. The latter can help identify areas more suitable for growth,

as well as areas requiring environmental remediation. Section 2.3, Planning Strategies to Site ECE Programs, provides safer siting recommendations to protect ECE programs from potential contaminants.

### Naturally Occurring Contaminants

Many contaminants are naturally present in water, air, and soil. These contaminants are often contained and do not pose a threat to human health. While contaminants can present themselves naturally at any time, some activities, such as redevelopment, mining, and even geologic changes, can disturb naturally occurring contaminants and release them into the environment. ATSDR provides information about naturally occurring contamination including asbestos, lead, and radon, as well as information about **identifying sites** that are more likely to have naturally occurring contaminants (ATSDR 2017).

**TABLE 1. NATURALLY OCCURRING CONTAMINANTS**

Naturally occurring contaminant	Places contaminants are found
<b>Arsenic</b>	In water. Some parts of the United States have high naturally occurring levels of inorganic arsenic.
<b>Asbestos</b>	In soil. Natural weathering and human activities can disturb naturally occurring asbestos-bearing rock or soil and release mineral fibers into the air.
<b>Fluoride</b>	In water. High levels of fluoride occur naturally in some areas.
<b>Lead</b>	In water. Most lead in water comes from the pipes or materials that help supply the water. Lead can sometimes be found naturally in groundwater.
<b>Manganese</b>	In water. Manganese is a mineral that is found naturally in rocks and soil. It can get into drinking water. It can also give water an odd taste, smell or color.
<b>Nitrates and nitrites</b>	In water. Nitrates and nitrites come from the breakdown of nitrogen compounds in the soil. Flowing groundwater picks them up from the soil.
<b>Radon</b>	In air. Radon is a gas that is a natural product of the breakdown of uranium in the soil. Radon is most dangerous when inhaled.
<b>Radionuclides</b>	In water. Radionuclides are radioactive elements, such as uranium and radium, that might be in groundwater.
<b>Selenium</b>	In water. Occasionally, drinking water contains high levels of selenium, usually in areas where high levels of selenium in soil contribute to the content of the water.
<b>Uranium</b>	In water. Uranium is naturally present in bedrock in many locations throughout the United States. When a drinking water well is drilled through bedrock containing uranium, the uranium can get into the drinking water.

Table 1. This table, from the Choose Safe Places for Early Care and Education Guidance Manual, lists naturally occurring contaminants and locations where the contaminant can be found. Adapted from: ATSDR 2017

Table 1 (on page 16) shows the list of naturally occurring contaminants that were listed in ATSDR's *Choose Safe Places for Early Care and Education Guidance Manual*.

Naturally occurring contaminants are less likely to be identified using historic site information. Some contaminants are more easily detected than others; for example, radon. The EPA recommends testing for radon when a property is sold or purchased (U.S. EPA 2018). If contaminant information is not readily available, a site review or postconstruction inspections can give more information about their occurrence.

Contaminants can be naturally present in water. Children consume more water by body weight than adults, and they can be exposed to contaminants in it through ingestion, skin contact, and inhalation (Council of Environmental Health and AAP 2019). Water sources should be tested periodically to detect contaminants that could cause adverse health impacts. Additionally, pipes and water infrastructure should be inspected as potential sources of contamination; these components can introduce contaminants, such as lead, copper, and other chemicals, into otherwise safe drinking water (ATSDR 2017).

Access to a public water system is desirable, as municipalities conduct regular testing to identify contaminants in public water systems. Hence, to promote health, planners should steer ECE development in areas that are serviced by public utilities. If the water is from private sources such as private wells then testing for pH level (corrosivity of drinking water) and other agents is even more vital for ECE programs. Local public health departments may have information about naturally occurring contaminants that affect private wells. Planners can thus coordinate with environmental health or public health professionals to make sure a site is tested for water quality before an ECE program is approved. Additionally, the U.S. Geological Survey **provides information** about water quality risks present in aquifers across the country.

Planners can integrate these criteria into the development review process, as part of an infrastructure investment plan, or when working on plans that identify community areas suitable for growth.

### 2.1.2 Identification of Contaminants

While some former uses such as storage sheds or loading dock doors are easy to classify as an incompatible land use because they are visible, others may be less visible during a physical site assessment. Incompatible site uses, such as nail salons or funeral homes, may not leave visible clues about possible contamination. In such cases, questionnaires,

licensing records, zoning maps, and tax files are reliable sources of data to identify potential contaminants (ATSDR 2017). Planners can ask for historic site information as part of the development review process. Section 3, Land Suitability Analysis, provides further guidance on collecting site-specific data.

Environmental site assessments (ESAs) can be used to identify site contamination. Some municipalities may require ESAs under certain conditions, such as in rezoning and permit approval processes. ESAs may be required by lenders to reduce liability for the new owner. Local and state entities can include requirements for development projects to conduct ESAs and present them as part of a development plan. For instance, some states require ESAs on projects that fall under specific parameters, such as those that are publicly funded. Phase I ESAs focus on identifying potential sources of contamination. If there is sufficient evidence that a site may be contaminated, potential buyers may conduct a Phase II ESA, which confirms the presence of contaminants by testing samples from the site (Wisconsin Department of Natural Resources 2014).

A variation of an ESA is an environmental audit. According to a report published by the AAP, APHA, and NRC, “[a]n environmental audit should be conducted before construction of a new building; renovation or occupation of an older building; or after a natural disaster, to properly evaluate and, where necessary, remediate or avoid sites where children’s health could be compromised” (AAP, APHA, and NRC 2019). Remediation may be necessary for circumstances when a site is contaminated.

Methods used to identify the contaminants may vary depending on the community type. Sites in rural areas exhibit different potential sources of contamination (chemicals applied to fields and runoff from animal pastures) than urban areas (Child Care Planning Associates 2010). Residents and stakeholders may be able to provide more information on chemical use in these communities. In urban areas, potential ECE program sites may have a long history of land-use change, a greater number of children who are impacted, and a greater exposure from various urban issues such as traffic congestion. It may be simpler to obtain historic site information about sites in urban areas because of their higher capacity to store and retrieve the records.

### 2.2 Desirable Site Attributes

Siting ECE programs such that they are accessible to all community members, including those that are most in

need, create inclusive communities that support growth for youngest residents and complement local economic processes by providing a necessary service to working families. In addition to being inclusive, integrating ECE programs into the fabric of a neighborhood maximizes health benefits for children and community members. Thus, the community planning principles (beyond siting) that encourage community well-being support such practice.

Opening new ECE programs on sites that have certain desirable attributes (such as access to transit, open spaces, and libraries) can not only reduce exposure to contaminants but may also positively influence other social determinants of health. *Health in the Development Review Process*, a guide created by APA, provides health considerations that can be applied to new developments. Based on that guide and other resources, planners should consider the following desirable attributes during site analysis, including for ECE programs:

- Absence of unacceptable environmental or public health risks
- Access to public water and sewer systems
- Access to infrastructure such as telecommunication systems
- Convenient location in the community, near facilities like schools, libraries, and parks, but away from land uses like highways, industrial areas, and high aircraft noise areas.
- Safe and secured
- Compliant with zoning code
- Provide opportunities to incorporate universal design principles
- Promote accessibility and congruency with surrounding developments. (Environmental Protection Agency 2015; City of Richmond 2019)
- Multimodal connectivity

In addition to the site characteristics listed above, if an ECE program can collaborate with another nearby existing program, that can also be considered a desirable attribute. For instance, a retirement community in Ithaca, New York shares their facility with a Head Start program, resulting in shared programming and benefited the youngest and eldest community members (Ghazaleh et al. 2011). While the role of planners is minimal in these cases, creatively approaching multigenerational planning can help improve children's physical and mental health.

It is important to consider how ECE programs connect to surrounding systems, services, and populations. According to the EPA (2015), ECE programs with these desirable site attributes can have positive impacts on the following community goals:

- improving public health
- supporting revitalization effort
- strengthening fiscal responsibility
- increasing transportation choices
- providing opportunities to live, work, play, and attend school in convenient locations
- limiting emissions of greenhouse gases, and toxic air pollutants

This approach ensures that developments are serving community health interests. While these desirable attributes are many times considered for schools, they are not considered as often for ECE programs. Considering that the children going to the ECE programs are more vulnerable to the impacts of chemical contaminants, it is imperative that planners and ECE operators consider these desirable factors while making ECE siting decisions.

### Case Study: Tualatin, Oregon, Development Code

The city of Tualatin, Oregon, includes desirable and undesirable conditions in the *Tualatin Community Plan*, which also serves as the city's comprehensive plan and development code. The section that addresses day care facilities highlights the importance of locating ECE programs near jobs and homes and avoiding industrial uses. The plan encourages day care centers to be located near arterial streets, park areas, and Institutional Planning Districts, which include schools, churches, and parks (Tualatin, Oregon, Development Code §8.070). Additional information about state regulations can be found at the [City of Tualatin Child Care and Day Care Facilities page](#).

<b>TABLE 2. PLANNING ROLES</b>		
<b>Planning Role</b>	<b>Description</b>	<b>Application to Environmental Health in ECE programs</b>
Technician	Planners can provide information that impact decisions. They can, and often do, take information from various sources to help a community understand context-sensitive opportunities, challenges, and solutions.	<p>Planners can play a role in collecting information related to environmental health, especially for conditions that can impact safe siting of ECE programs.</p> <p>Planners, especially those working in private practice, are responsible for addressing the site’s environmental contaminants during the site analysis process.</p> <p>Planners can look for environmental health concerns before permitting a project.</p>
Facilitator	Planners can shape planning processes to include greater representation of public values and perspectives, and to create opportunities to have stakeholders weigh in on changes that can significantly impact their communities.	Planners can bring together stakeholders and experts including environmental health professionals, community members, and ECE providers, to discuss and identify solutions for ECE siting.
Regulator	Planners can enforce existing regulations such as zoning codes during permitting, proposal reviews, and approvals.	Planners can review proposals for ECE programs to enforce existing regulations and identify if additional information is needed to determine if the project would negatively impact children’s health.
Negotiator	Planners can take positions when interacting with developers and in some instances, serve as mediators when conflict arises.	Planners can create opportunities to support environmental health when working with developers or ECE operators to identify solutions before an ECE program opens. A compromise between the needs of different parties, without accepting environmental risks, can help ensure that children have access to quality ECE programs.
Political advisor	Planners can advise politicians as they make decisions that impact communities. Planners can adapt planning interventions to fit in with political contexts.	Planners can advise elected officials who are responsible for making decisions that impact environmental health. This can be on a project basis, or through regulations that encourage safe ECE program siting.
Designer/ Visionary	Planners can guide a community through a plan development process to help it identify a vision of the future and collectively identify strategies to achieve the self-identified goals.	Planners can incorporate environmental health considerations for ECE programs as part of a plan development process. This process provides the opportunity to develop “sticks and carrots” that will move a community closer to its vision for the future.
Advocate	Planners can advocate for community changes to varying degrees, in addition to the ways in which they can influence change in other roles. This flexibility is typically dependent on a planner’s position and specialty.	Planners can encourage healthier communities by supporting environmental health considerations throughout their practices. They can work with community organizations to identify ECE challenges and opportunities to address them.

*Table 2. Planners can engage in a variety of roles. This table illustrates how planners can use their expertise to support safer siting for ECE programs (Randolph 2012).*

### 2.3 Planning Strategies to Site ECE Programs

Planners have opportunities to positively influence environmental health. In the briefing paper titled “Child Care and Sustainable Community Development,” Anderson and Dektar (2010) identify key points for planning ECE facilities, including meeting the needs of parents and children, supporting community development, aligning smart growth goals with childcare services, and developing funding mechanisms to reduce the cost of childcare. In another study, Randolph (2012) explains the variety of roles that planners play in influencing environmental health (see Table 2), many of which can be transferred to planning for ECE programs.

As seen in Table 2, planners can work with communities, developers, and ECE operators to identify sites and integrate environmental health consideration into development processes. Child care facility considerations that prioritize environmental health can be applied through planning interventions, including through comprehensive planning processes, zoning, and developer agreements. Below are five strategic points of intervention for planners (Klein 2011), as they apply to ECE siting.

- **Long-range community visioning and goal setting:** Planners can help communities identify values and goals for how members would like to see their communities grow. Education is usually a priority among the residents of many communities and planners can make sure to include ECEs in those discussions.
  - Visioning activities are opportunities for community engagement. These activities can result in a set of values, which can include quality and healthy ECE programs, that inform other interventions, such as plan making and public investments.
- **Plan making:** Planners can guide community members to create plans or incorporate safe ECE program siting policies into comprehensive plans. Depending on the needs of the community, planners are also involved in creating functional plans or subarea plans that address environmental health. They can include ECE and the ECE siting process as component of those plans.
  - Comprehensive plans can guide development to grow in a way that supports a community vision.
  - Functional or subarea plans can also address safe ECE program siting. These plans can focus on narrower topics than comprehensive plans (such as a transportation plan) or smaller geographies (such as a neighborhood plan).
- **Standards, policies, and incentives:** Planners can identify areas that are better suited for ECE programs (Klein 2011; LaGro 2013). Drafting a policy can help communities outline next steps for implementation, including providing standards for ECE operators and creating incentives for adopting environmental health considerations.
  - Zoning regulations play an important role in identifying permitted uses and in identifying circumstances that require discretionary review. Proposed ECE programs can be assessed for both desired and undesired characteristics when ensuring that the use is appropriate for an area.
  - Ordinances or standards can protect environmental health and reduce exposure to contaminants by outlining precautions to avoid contamination.
- **Development work:** Planners can work with developers to review and make recommendations on private plans. This ensures that proposed projects are in line with community needs and goals.
  - Planners can guide a development review process to encourage ECE operators or developers to select safer sites.
  - During the development review period, planners can identify if additional information is required to determine if a site is safe for children.
- **Public investments:** Planners can play a role in shaping public investments that encourage future development in spaces that are safer for ECE programs. Desirable characteristics such as access to community services and multimodal transportation options are impacted by decisions about community investments.
  - Communities can also develop programs that provide financial support for ECE programs who are looking to select a safe site.

Planners can use these interventions to support environmental health considerations at a broader scale beyond just during development process. Planners can integrate health considerations in community planning processes such as making corrective/selective amendments to comprehensive planning documents and revising implementation tools like zoning ordinances and design standards (University of Minnesota 2007). Some of these interventions can benefit from cross-disciplinary collaboration and support.

### Case Study: Riverside County, California

The Riverside County Children and Families Commission published [Child Care Design and Siting Guidelines](#) for ECE program development that includes information about facility development, siting considerations, and the permitting process (Child Care Planning Associates 2010).

#### 2.3.1 Cross-Sector Collaboration

Creating an environment that promotes healthy ECE program development requires cross-sector collaboration. In *Creating Healthy Neighborhoods*, Forsyth, Salomon, and Smead (2017) mention that “not all environmental toxins are related to issues that are controllable by the planning and environmental design fields at the local scale.” Planners are equipped to bring siting considerations to the table and to support collaboration among a wide range of specialists who share an interest in the built environment. With a unified approach from stakeholders, including health professionals, childcare inspectors, and community members, planners can help communities identify sites that support healthy ECE programs and address environmental health challenges.

Planners can collaborate with experts in the following ways:

- Environmental health officials—Identify environmental health measures that fit community context; propose/support ordinances that support health, safety, and welfare of community; and assist with interpreting identified environmental health concerns.
- Child care inspectors—Collaborate to establish uniform standards for health and safety facility assessments related to permitting and licensing requirements.

### Case Study: Redwood, California

The city of Redwood, California, maintains a [page](#) for potential ECE operators to connect with resources needed to start an ECE. It includes introductory information about the types of ECEs (family child care homes or child care centers), information about state licensing processes, and local permit requirements. It also identifies zoning laws that apply to ECE facilities and provides a document outlining [site selection guidance](#) and a guide outlining permitted use by [zone](#).

- Fire marshals—Support developing building and fire code inspection processes that address site conditions and environmental health.
- Community councils or task forces related to ECE—Identify opportunities to integrate land use and environmental health considerations in local groups focused on ECE programs.
- Community members—Work with community members to identify priorities for future developments and collect information about where ECE services are needed.
- Developers—Provide recommendations to avoid hazards on permit applications and promote environmental health by identifying the data and data sources needed to perform the site selection process.
- Architects—Encourage review of information and additional considerations outside of a site-specific analysis.

Planners and affiliated professionals can use a variety of resources to identify sources of contamination in an existing site. During the site review process, planners can identify activities that could have disturbed naturally occurring harmful substances, such as mining or groundwater spills. Also, depending on project funding and developer protocols, environmental professionals may be brought on to conduct environmental site assessments. Environmental site assessments can identify possible environmental contamination and incorporate remediation strategies (Russ 2009). It may be challenging to identify all former uses, but planners can work with other professionals to collect publicly available information (such as previous zoning and land-use maps, building and permit department records), conduct resident interviews, and do site visits to identify if a site previously contained any incompatible land use and more specifically, potential sources of contamination.

Additionally, planners can use tools like health impact assessments (HIAs) and environmental impact assessments to understand how community changes can impact the health of those around a proposed development site. Since HIAs are not limited to a specific discipline, but rather benefits from cross-sector collaboration, planners should work with public health departments to conduct these assessments, especially those related to environmental health. (National Research Council 2011). The Planning and Community Health program at APA has developed [resources](#) to help planners understand, conduct, and collaborate on HIAs.

Planners can coordinate with health departments and environmental professionals to collect information about potential sources of contamination. Multiple entities can

provide and help interpret environmental data about a site. These include local environmental health departments, pediatric environmental health specialty units, and resources from ATSDR. ATSDR collects and publishes information related to toxic substances and exposure. One measure used to understand the relationship to hazardous materials and health are minimal risk levels (MRLs). This measure identifies condition that could lead to adverse health effects. For more information about MRLs, including lists of contaminants, frequently asked questions, and toxicological profiles, visit ATSDR's [site](#).

### 2.3.2 Equity Consideration

Healthy ECE programs can provide opportunities for all children to thrive by providing educational experiences in spaces that are safe and free of contaminants. Residents of communities that face social inequities and poor environmental quality can experience health challenges that negatively impact their quality of life and life expectancy (Council of Environmental Health and AAP 2019). Underserved communities are also often located closer to activities that are hazardous to health and have a greater propensity to release contaminants into the soil, air, and water (Maantay 2001). Ensuring that children have access to safe and healthy places is one way in which ECE programs and communities can work towards reducing health disparities.

Access to high-quality ECEs is one factor that can contribute to improved opportunities and enhance child development (Barnett and Lamy 2013). There are, however, gaps in quality preschool program access. In 2013, 90 percent of children from high-income families attended a center-based preschool program, compared to only 65 percent of children from low-income families (cited in Barnett & Lamy 2013). These conditions contribute to an achievement gap that begins before students are enrolled in kindergarten.

Children who do have access to ECE programs can still experience an achievement gap depending on their exposure to contaminants. Studies have shown that after controlling for programmatic quality, environmental conditions were found to be the contributing factor behind the achievement gap. For example, a 2009 study found that lower scores on a test among students of lower socioeconomic status were associated with their exposure to lead (Miranda et al. 2009). Exposure to contaminants, in

combination with social determinants of health and other factors, can lead to decreased quality of life —contaminants can contribute to chronic health issues that impact a child well beyond their time in the ECE program.

While many of the recommendations related to ECE programs can focus broadly on issues related to access and equity, connecting recommendations to specific geographies can encourage changes in the built environment that support all members of the community. Planners can play a role in helping communities plan for goals similar to those identified by the [Human Impact Project](#), where the connection between planning interventions, ECE permitting processes, and environmental health considerations shaped the opportunities students had to access quality ECE programs.

Disparities in exposure to environmental contaminants have led to environmental justice initiatives to support healthier home environments (Council of Environmental Health and AAP 2019). The disproportional impact of historic siting decisions can have significant health impacts on children in some communities. While many of the environmental health impacts can be attributed to housing conditions, it is important to emphasize that without adequate siting regulations, ECE programs can expose children to contaminants as well. Children spend a significant portion of their time in ECE facilities—exposure to contaminants in this setting can have just as much of an impact on health as exposure to contaminants at home.

Planners have a responsibility to address equity considerations as part of their practice, including considerations related to environmental justice, health, and education (Ross et al. 2019). Approaching planning processes with an equity and environmental health lens enables planners to help communities identify opportunities to reduce exposure to contaminants within ECE programs.

#### Case Study: Human Impact Partners

In 2016, Human Impact Partners released a report that provides recommendations for how to improve preschools throughout Cincinnati. Report recommendations include strategies for increasing access to high-quality preschool programs for all children in Cincinnati (Avey et al. 2016).

## In Summary

Environmental health conditions should influence where communities place ECE programs. When a new ECE program is proposed, making informed decisions about site selection can encourage safer site selection. Undesirable site attributes, including the presence of contaminants, can have a negative health impact and are potential deterrents for development. Desirable site attributes benefit an ECE

program and a community by supporting community goals like connectivity to services, density, and reduced exposure to contaminants. Planners, in collaboration with environmental health professionals and community stakeholders, have a variety of tools at their disposal to encourage safer site selection. By following inclusive processes, it is possible to develop communities with access to quality ECE programs for all.

## SECTION 3. LAND SUITABILITY ANALYSIS

In this section, participants will learn about:

- Site selection criteria
- Resources for site identification
- The relationship between site planning processes and collected information
- Opportunities to engage in a systematic site review process

Planners have opportunities to identify land suitable for redevelopment and ECE facilities. When a community is undertaking a plan-making process, planners can share information to identify locations best suited for development and ECE programs. As part of development work, planners can provide recommendations to developers or ECE operators to select a site that meets the needs of the community and the project team. Further, planners can collaborate with stakeholders, including environmental health professionals, to provide guidelines for site suitability and implement criteria that address environmental health through planning strategies, permitting processes, and voluntary programs.

One approach that can be used to compare options for redevelopment is a site selection process. This multistep process analyzes site information, community context, and environmental conditions to inform development decisions. Planners can engage in the site selection process for public infrastructure development or in conjunction with developers focusing on projects that are privately funded. In some communities, planners can also engage in a site selection process during plan making, particularly when it comes to developing functional or subarea plans.

This section will focus on the site selection process, including data collection and analysis. These methods of analysis can be applied during a site review process, at a selected site, or through community-wide initiatives, such as planning processes, local ordinances, or programmatic strategies. Analyzing potential site locations is key for selecting sites that are safer for development.

### 3.1 Site Selection Process

The primary purpose of a site selection process is to assess how potential ECE sites can meet the community's and project owner's criteria so that the site contributes to a

well-functioning ECE program and community. Site selection processes will vary depending on local conditions, project goals, and budgetary constraints. It is reasonable to include environmental health considerations during site selection and when siting ECE facilities, given the importance of environmental health to children. Poor environmental conditions can have significant impacts on ECE programs if the conditions are discovered after program is operational. Figure 3 illustrates the site selection process and highlights how data collection and analysis play a role in identifying a suitable location for ECE programming. Through a variety of planning interventions, planners can encourage developer and ECE operators to incorporate environmental health considerations that support thoughtful site selection.

The site selection process allows planners and stakeholders to systematically assess potential sites that are available. Further, planners can encourage ECE operators to take a more systematic approach to ensure that environmental health considerations are incorporated into the site selection process.

**Step 1:** At the start of a project, a project owner or ECE operator defines the purpose of the project by determining objectives and requirements for site selection, which can include environmental health requirements. This process may be different for ECE operators seeking to lease a space in an existing building. An ECE operator might look for a reasonably priced building that is located near transportation systems, has outdoor space, and is free of major environmental health hazards. These objectives and requirements are shaped by a developer or ECE operator and real estate development activities (LaGro 2013).

**Step 2:** After establishing objectives, a developer can identify site selection criteria for both the site and surrounding conditions. This can be informed by policies or programs established at the local, regional, or state level.

**Steps 3 and 4:** Data collection and analysis take place when comparing multiple sites (Step 3) and is followed by a site suitability analysis (Step 4), where site attributes are compared to the criteria identified in Step 2. Environmental health criteria can be integrated during this step of the process, especially for developments that plan to serve as ECE programs.

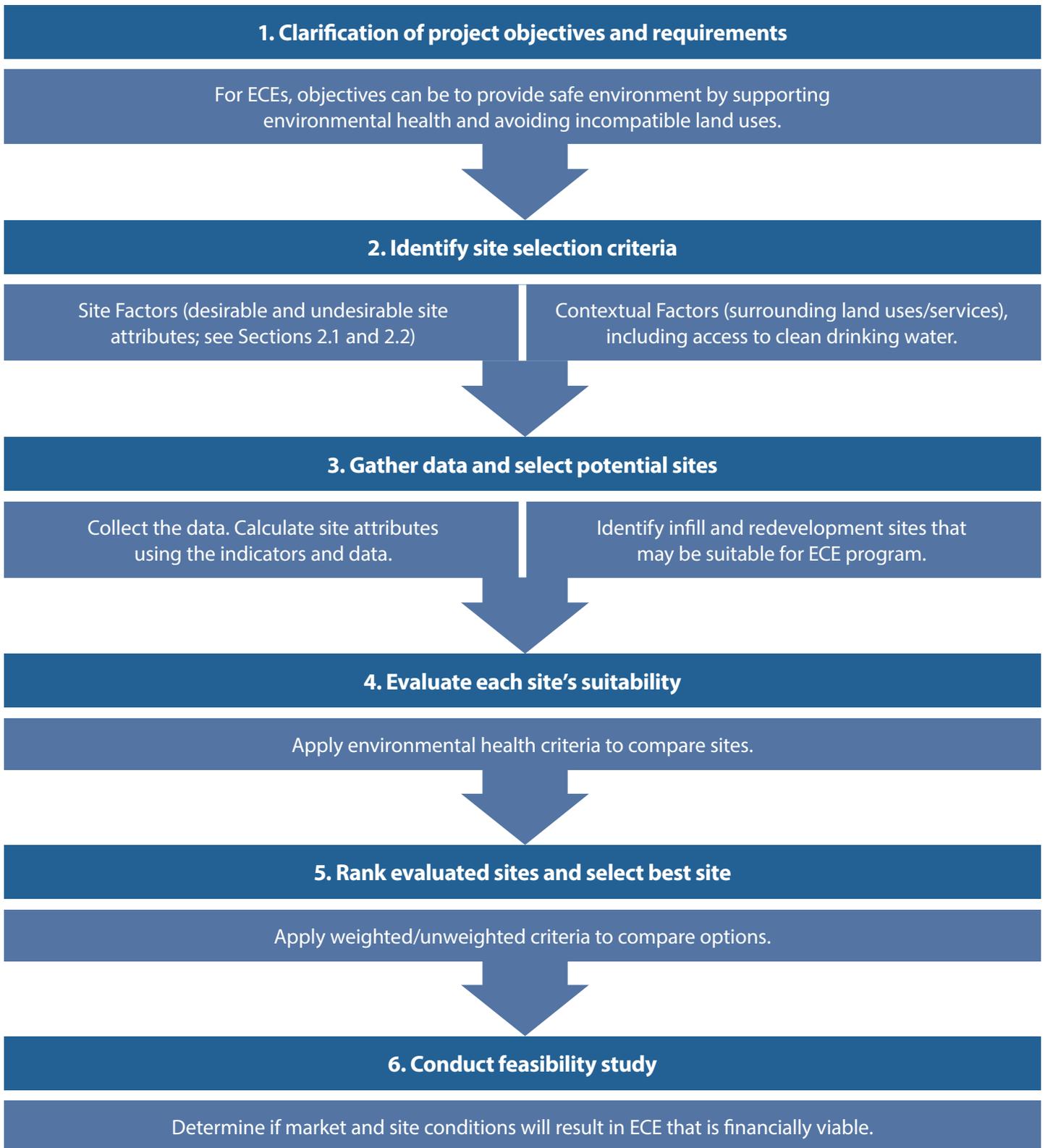


Figure 3. Site selection process, with an emphasis on environmental health and ECE program development. Adapted from LaGro (2013). Copyright © 2013 by John Wiley & Sons, Inc. All rights reserved.

**Steps 5 and 6:** After potential sites are reviewed, they are evaluated and ranked based on criteria. Finally, once a client selects a location, the site may undergo a feasibility study that includes a market analysis and understanding of site conditions.

In addition to general site selection guidance, Sussman and Larson (2006) provide a sample site assessment **checklist** for selecting an ECE site. This checklist provides a range of considerations for ECE sites, including guidance about environmental health considerations. It also discusses site characteristics, such as convenience for families (including proximity to homes, transportation options, and additional neighborhood resources), site suitability (distance from hazardous characteristics, perception of safety), and zoning. Using a site selection process or assessment checklist can help ensure that ECE operators are analyzing conditions that influence ECE program quality, including environmental health considerations.

### Case Study: Rhode Island

Considerations for school siting that can be applied to ECE programs are identified in a report by Rhode Island Legal Services, *Not In My Schoolyard: Avoiding Environmental Hazards at School Through Improved School Site Selection Policies*. This resource illustrates how siting can impact children and provides an overview of state-level policies related to school site selection. It also includes model language for a school site selection, references for construction projects, and sample maps that identify school location and contaminated sites.

### 3.2 Indicators and Data

Communities interested in implementing ECE siting criteria can develop and use indicators, such as access to a public water system, to find suitable locations. Once site criteria indicators are chosen, additional data can then be collected. The site selection process includes gathering and analyzing available data about the site and community. Data can be used for comparing possible sites and for taking a more in-depth look at a single site. This section will describe indicators that can be used in the site selection process and further outline the data collection process, including data types and useful data sources.

#### 3.2.1 Indicators for Site Selection

People conducting a site analysis may need different information depending on the types of site criteria indicators identified for the project. As outlined in Section 2, there are several guides that list the site characteristics to consider for developing an ECE program. These existing guides may lack some of the characteristics related to chemical contaminants that can have adverse effect on children’s health. ECE program site selection could incorporate indicators that would reduce exposure

**TABLE 3. ATTRIBUTES AND INDICATORS**

Attribute Type	Indicator
Desirable	Proximity to transit and active transportation options
	Number of employment centers near ECE program
	Proximity to areas with higher residential density
	Access to safe drinking water and other utilities
	Proximity to library
	Proximity to schools
	Proximity to grocery stores
Undesirable	Proximity to civic and public space
	Access to green space
	Severity of former land uses to potentially generate environmental contaminants
	Proximity to previous and current site uses that potentially generate environmental contaminants
	Proximity to roadways with high traffic volume
Undesirable	Proximity to railroad tracks
	Proximity to industrial sources of contamination
	Located within 100-year floodplain

*Table 3. ECE projects that consider indicators for environmental health can help identify sites best suited for ECE programs (APA 2015; U.S. Green Building Council (USGBC) n.d.; ATSDR 2017).*

to hazardous conditions. Table 3 identifies a few environmental health indicators that can be considered to encourage safer site selection for ECE programs. A site selection process that incorporates these considerations can encourage quality ECE programs that promote environmental health and complement community development strategies.

### Case Study: Holly Springs, North Carolina

In Holly Springs, North Carolina, the school district identified a new school site by identifying demographic conditions and community areas expected to grow. The school district used a one-mile radius to identify available sites from these areas (Salvesen, Sachs, and Engelbrecht 2006). This example suggests that there is a role for understanding community demographic information.

### 3.2.2 Data for Site Analysis

Site analysis is dependent on available data. Before planners can begin to compare site characteristics, they can collect information about a site, as well as community context. A data-informed site selection process can greatly influence the health of those using the ECE program. The site selection process is often coordinated by a variety of planning and design professionals. During this process, planners should make sure to identify potential environmental issues that can have adverse impacts on children's health.

When compiling information for GIS, it is important to note that information can come from many sources with different levels of availability. Local data can be publicly available online, while some data may have to be requested from appropriate entities, such as a municipality or county department. Typically, such data is the most cost-effective and accurate (including GIS) for local use. However, some data can be proprietary and may need to be purchased.

Planners can use various methods to collect current and historic site information including gathering information from a variety of sources that inform new or previous site uses (AAP, APHA, and NRC 2019; Rhode Island Legal Services 2006; Russ 2009; USGBC 2007). Table 4 identifies provides examples of sources of information, as well as recommendations on where to find information.

Another source of environmental data can be ESAs. In most cases of commercial and industrial land purchases, banks and real estate companies may require an environmental site assessment to understand if there are risks associated with a land purchase. A Phase I assessment, the most commonly required assessment by lenders before a development project, uses readily available information to determine if a site may be contaminated (Russ 2009). This type of assessment focuses on existing information and some new information, mostly gathering from publicly available information, site visits, and interviews. If a Phase I assessment identifies that a site is possibly contaminated, prospective buyers can proceed to a Phase II environmental assessment, which often means testing site conditions for those potential contaminants. ECE operators who own a parcel can work with previous owners to identify this information, or they may complete site assessments before purchasing land. ECE programs that rent spaces from building owners may not have this information readily available. Planners can work with environmental health professionals to identify opportunities that would allow an ECE operator to request this information from a site owner before establishing a program.

A site visit can provide context and additional site information that may not be captured in documents. Planners may need to conduct a site visit when a site plan is submitted for development review. The purpose of a site visit during a development review process is to confirm that a site application captures site conditions, to assess surrounding land uses for incompatibility, and to identify special sites that could implement policies or proposals identified in planning documents, such as spaces for stormwater retention or public art (Meck 2005). In the case of proposed ECE

At the national level, several resources are available online, including resources from the EPA about contaminated sites. The **"Set It Up Safe: Planning Tool"** identifies a set of criteria that should be considered when selecting a site (ATSDR 2017). This resource organizes sources of information by method of contamination, including former uses, nearby sites, naturally occurring contamination, and safe drinking water.

**TABLE 4. RECORD TYPE AND SOURCE**

Record type
Historic and current aerial photographs
Zoning maps
Road maps
Soil maps
Flood hazard maps
Tax assessment maps
National Priorities List of sites
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites
Historic USGS topographic maps
Tax files
Fifty-year chain of title
Fire insurance maps
Federal, state, and local regulatory agencies' databases and files
Records of current and past land uses
Privately held environmental databases
Interviews with current and previous owners and others who may be aware of site history
Source
Local data can come from a variety of sources, including municipalities and health departments.
American Community Survey, U.S. Census Bureau
American Factfinder, U.S. Census Bureau
Defense sites, U.S. Army Corps of Engineers
Department of Energy
Esri data and maps (open source)
EnviroAtlas, EPA
Envirofacts, EPA
National Environmental Public Health Tracking Network, CDC
National Priorities List, EPA
Wastes—Where You Live, EPA
Where You Live, EPA

*Table 4. This table lists examples of records that can provide information about environmental health, as well as recommendations on where to find site records. (AAP, APHA, and NRC 2019; Rhode Island Legal Services 2006; Russ 2009; USGBC 2007).*

programs, these site visits could be expanded to include environmental health considerations, such as evidence of previous incompatible land uses, surrounding site conditions, and naturally occurring contamination. Site visits can provide qualitative and quantitative information that could help determine if a site is safe for an ECE program.

Additionally, the USGBC identifies considerations for school site selection as part of their LEED for Schools Rating System. Although ECE programs serve a younger population than schools, these considerations can still be applied to ECE programs. The program requires a Phase I Environmental Site Assessment as a prerequisite to identify a sustainable site (USGBC 2007). Additional attributes focus on encouraging community sustainability, including avoiding building on prime farmland and on previously underdeveloped land near bodies of water.

**Case Study: Mecklenburg County, North Carolina**

In North Carolina, **Mecklenburg County** identified sites for voluntary, universal pre-k classrooms using a **rubric** and data visualization. The online mapping tool compares data such as low-performing elementary school location, poverty concentration, and existing public pre-k locations to identify underserved areas that would benefit from access to a pre-k classroom. A similar approach could be used to identify environmental conditions near ECE facilities.

**3.3 Analysis and Evaluation**

During the data analysis step, the data collected is used to identify the best options for potential sites. The dominant project criteria are applied progressively to identify a shortlist of potential sites, showing maximum potential for optimizing the project's requirements. At the outset, the site selection team applies a basic criterion that any site must satisfy. Further, the site suitability evaluation process applies threshold criteria to examine, compare, and rank site attributes across each potential site.

**3.3.1 Analyzing Potential Sites**

Various tools can help analyze information, including GIS and scenario planning. Once site selection criteria (see Section 2 for desirable and undesirable site attributes) have been identified, a site selection team can use data to identify

available options and to assess suitability of different sites. GIS can be used to evaluate and select ideal sites (Steps 3 and 4 in Figure 3). GIS analysis reveals patterns and relationships by integrating multiple layers and data types to help planners make informed decisions. Once the data is collected, GIS can be used to explore the collected spatial data, model different scenarios (based on selected the criteria) and analyze data layers to understand how both desirable and undesirable site characteristics relate to one another. GIS can also be used to weight those layers to emphasize features that are most important to project. Child Care Aware of America provides **examples** of ECE program and hazard information using maps. Examples of the hazards they identify include tornadoes, earthquakes, and power sources that could pose threats to children (Child Care Aware of America n.d.). Similarly, maps that depict previous and current incompatible land uses can help planners encourage ECE development in areas that are safer for children. Section 3.2 describes geospatial analysis techniques to compare potential sites with environmental health conditions.

When considering ECE program availability across a community, scenario planning can play an important role in identifying opportunities for community-wide improvements. Planners can also use the scenario planning capability of GIS in the ECE planning process. Scenario planning encourages communities to consider how different social, physical, environmental, and economic factors can result in different outcomes. Scenarios can explore what the future may look like if conditions remain the same (normative), continue on existing trends (predictive), or change in the future (exploratory) (Chakraborty and McMillan 2015). While site conditions and the surrounding environment influences ECE siting decision, a new ECE program may also have an impact on the surrounding built environment and community. Scenario planning tools can be used to model this impact. Moreover, planners can incorporate ECE considerations when developing scenarios for plans.

### 3.3.2 Threshold Criteria

Once a site selection team has selected indicators and gathered available data, an evaluation process can help determine the best fit for a development. The perfect location (i.e., one that fulfills all site selection criteria) may not be available. ECE operators and planners should strive to select sites that are the best among all candidate sites. This process provides an opportunity for communities to understand where access to ECE programs would best serve a community.

Threshold criteria refers to “critical site and contextual attributes that aid in screening potential sites” (LaGro 2013).

During the site suitability evaluation (Step 4 of Figure 3), site attributes can be assessed using threshold criteria that highlight environmental conditions for safer ECE programs. Planners can use a quantitative scale to rank potential sites. A rating scale can provide a uniform approach to recording site suitability. Applying quantitative measures allows for comparison across multiple areas and provides an opportunity to give more weight to key site selection criteria. In the case of ECE programs, more weight may be given to site attributes that prevent exposure to chemicals or to desirable attributes such as clean water. In Tennessee, the Germantown Municipal School District created a **site selection rubric** that weighs different criteria, including safety, location, and accessibility through a quantitative scale, then applies weights for criteria that are more important (Germantown Municipal School District Board of Education n.d.). Factors identified as part of safety criteria include contaminants in soil

TABLE 5. DISTANCE FROM RESIDENCES	
Distance from Residences	Site Type
At least 2 km or 1.2 miles	Landfills
	Toxic waste site
At least 3 km or 1.9 miles	Coal mining
	Oil refineries
100–500 meters or up to 0.3 miles	Busy roads and factories
3-5 km or 2–3 miles, depending on a population size, 16–48 km or 10–30 miles	Nuclear power plant

*Table 5. Acceptable distances from harmful exposure to residential areas to reduce negative health risks (Forsyth, Salomon, and Smead 2017). These recommendations could be applied to new ECE program locations.*

### Case Study: Pennsylvania

State-level agencies in Pennsylvania mapped multiple potentially contaminating land uses, including small quantity generator (SQG) facilities, brownfields, and National Priorities List (NPL) sites. By applying a 200-foot buffer from SQG facilities, a one-eighth-mile buffer from brownfields and NPL sites, and then intersecting this information with ECE program locations, they identified ECE programs that may be exposed to contaminants (ATSDR 2017). This type of analysis could be applied to sites available for redevelopment to identify safer spaces for ECE development.

and groundwater, proximity to roadways with high traffic volumes, and proximity to high-pressure lines. A similar scoring method can be used by comparing ECE program site selection criteria using quantitative methods.

Criteria for site selection can include proximity to features in the community. Spatial data, such as location of a potential source of contamination, provides some information about environmental health risks; however, whether a feature is important for a site might not always be best determined by distance. Applying local knowledge can provide information that may not be recorded in site records. Residents may be familiar with site histories that are otherwise not recorded. Table 5 identifies recommended

distances to buffer residences from pollutants (Forsyth, Salomon, and Smead 2017). Although these recommendations apply to residences, they could also serve as guides for siting ECE programs.

For a list of former or adjacent site activities that can be associated with chemical contaminants, see Section 2. It includes a list of commercial, industrial, and transportation-related land uses that may impact environmental health.

### IN SUMMARY

ECE programs can benefit from using a data-driven approach to select future sites that promote environmental health. A site selection process can ensure that sites for new ECE programs are systematically reviewed, compared, and the most suitable site is selected. Data plays a large role in making sure that ECE operators and developers are equipped to compare alternatives and make informed site selections. Planners can facilitate this process by identifying areas that are suitable for developments or meet environmental health conditions that can support healthy ECE programs. Indicators can not only point out desirable and undesirable site characteristics but can also be compared using quantitative approaches and geospatial analysis techniques. These processes can benefit from engaging multidisciplinary perspectives. In collaborative settings, planners can encourage stakeholders to apply strategies for implementing healthier ECE programs.

## SECTION 4. SAFE SITING IN HURRICANE-AFFECTED AREAS

In this section, participants will learn about:

- The connection between resilience planning and ECE programs
- Strategies for siting ECE programs to avoid contaminants in hurricane-affected areas
- The role of ECE programming in disaster recovery

Hurricanes impact the built environment through heavy rainfall, storm surge, and high winds. The strength of the storm correlates with the extent of the damage that may take place. Hazards like flooding, storm surge, and chemical contamination from hurricanes are attributes that can impact site planning (LaGro 2013). Areas impacted by extreme weather events experience environmental challenges like increased mold, contamination, and exposure to hazards such as toxic substances (Sheffield et al. 2017). In addition, environmental restoration is often not a high priority goal after a natural disaster due to more immediate needs to restore a community to a functional state. Degraded ecosystem services can impact the health, economy, quality of life, and hazard protection levels of a recovering community (Schwab 2014). Consequently, post-disaster contamination of the air, water, and soil can result in numerous issues related to public health, such as addressing life and safety concerns and ensuring that long-term reconstruction provides safe and healthy living conditions. Table 6 identifies short- and long-term public health issues that may develop after a hurricane.

Following Hurricane Harvey, flooding, winds, and storm surge contributed to chemical contamination in some Houston neighborhoods. These contaminants posed serious health hazards for residents, especially vulnerable populations such as children, who can be disproportionately affected. Children are more susceptible to environmental contamination because of their smaller size, closeness to the ground, and greater intake of water by body weight in comparison to adults, all of which can have adverse health impacts (AAP, APHA, and NRC 2019).

It is critical that communities consider how natural disasters change conditions in the built environment and impact children and other vulnerable groups. Planners, local elected officials, and ECE operators can proactively plan for the impact of hurricanes and other natural disasters on ECE programs. As extreme weather events increase in frequency

and intensity, there are opportunities to improve resiliency in hurricane-affected areas for the community's most vulnerable populations. When planning for longer-term recovery and improved health before and after a disaster event, planners should not only focus on increased safety and security, but also consider ways to improve quality of life by building local capacity and community resilience. Resilience planning, including siting considerations, can mitigate some of the impacts from storm events, including impacts to children.

**TABLE 6. SHORT- AND LONG-TERM ENVIRONMENTAL HEALTH IMPACTS**

### Short-term

In many cases, short-term public health issues are interrelated with infrastructure restoration involving interruptions to potable water and sewage treatment, which can also include issues around infectious or vector-borne diseases (Schwab 2014).

### Long-term

Longer-term public health issues may involve physical building conditions and environmental justice. Post-disaster pollutants are often related to the quality of temporary or reconstructed homes and buildings. In disaster situations involving hurricanes, flooded homes and buildings can be breeding grounds for heavy mold growth (Schwab 2014). Further, disaster impacts are not equally distributed among the different subpopulations in a community, creating environmental injustices.

*Table 6. Hurricanes have both short- and long-term environmental health impacts on communities.*

### 4.1 Introduction to Resilience Planning

Communities that are resilient are better prepared for hurricanes. Resilience is defined as “building the ability of a community to ‘bounce back’ after hazardous events such as hurricanes, coastal storms, and flooding—rather than simply reacting to impacts” (National Oceanic and Atmospheric Administration 2015). Resilience planning incorporates the following components:

- Hazard mitigation and land-use planning strategies
- Critical infrastructure environmental and cultural resource protection

- Sustainability practices to reconstruct the built environment
- Revitalization of the economic, social, and natural environments

Resilience planning also involves building the resilience capacity of communities and their residents who are affected by natural disasters. It not only allows a community to effectively respond to and recover from natural disaster events, but also helps create a more resilient community that can proactively protect itself against hazards, build self-sufficiency, and become more sustainable (Schwab 2014). Further, integrating natural hazards mitigation into land-use planning can help a community become more resilient. The goal of planners in this process is to assist communities in withstanding an extreme event without suffering devastating losses and without requiring a great deal of outside assistance (Godschalk et al. 2009). Through deliberative decision-making processes like planning, creating resilient communities plays an important role because ultimately, communities can be better at saving lives, preventing injuries and disease, and protecting property from unnecessary damage (Schwab 2014).

#### 4.1.1 Resilience Planning Strategies

A community's resiliency stems from practices that mitigate its risk to natural hazards and strengthens its ability to withstand and recover from future disasters. It is important to note that mitigation is not far removed from recovery—by taking active steps to lessen the impact of disasters before they occur, it reduces the loss of life and property in affected communities and supports more rapid recovery (Schwab 2014).

The National Disaster Recovery Framework identifies long-term planning approaches that can help ensure a successful recovery (Federal Emergency Management Agency (FEMA) 2011). Those that are most applicable to the siting of ECE facilities in hurricane-affected areas relate to resilient rebuilding. However, they can be applied before a disaster to prevent future harm or when rebuilding from a recent disaster.

- Using disaster-resilient building practices that will significantly reduce disaster impacts.
- Integrating sustainability when considering economic, ecologic, and social systems

- Engaging in purposeful decision making to reduce or eliminate risks and potential environmental harm
- Adopting stronger regulations that strengthen new developments and address vulnerabilities in existing infrastructure
- Applying a resilience lens to governance and decision-making processes

Planners can support these resiliency strategies on a variety of levels. Local level policies provide an opportunity to address resiliency down to the site level. In many communities, considering the impacts of severe weather events on specific sites can encourage local action. Planners can also introduce mitigation strategies to minimize the negative effects of site development from increased air, water, and soil pollution, such as reducing vehicle miles traveled, supporting green building strategies, and protecting natural areas. Both climate mitigation and resilience can be integrated in the long-term planning. Resiliency is not a specific “plan,” but a concept that should be incorporated into every aspect of a city. Planning communities with resilience in mind enables settlements to better plan, adapt, and thrive in the face of a changing climate. Further, ECE programs located in areas that have implemented resilience strategies may be able to return to operation and can result in communities that reestablish a sense of normalcy more efficiently after a severe weather event.

#### Benefits of Implementing Resilience Planning Strategies

Following a hurricane, community systems can be disrupted for an extended period, resulting in changes to day-to-day activities and reduced access to services, all of which can have negative health impacts (AAP, APHA, and NRC 2019) and economic and social impacts. Communities that prepare to meet the needs of all residents, including children, can be better equipped to restore a sense of normalcy after a hurricane. If done in time, this can support residents as they work to recover from hurricane impacts and, ultimately, reduce the negative effects of future climate events on children. Post-hurricane, safe ECE services can help children and their parents transition back to day-to-day activities with minimal delays. Although not a long-term planning strategy, meeting short-term ECE needs post-disaster can help meet community needs and support residents as they return to work.

## Funding Considerations

Planning for and implementing resilience strategies requires funding. In areas that are more likely to be impacted by a hurricane, support for resilience strategies before a storm event can ensure that developers and ECE operators have the incentives to make changes to new construction that result in less severe damage during a storm and encourage a quicker recovery.

- ECE programs may be eligible for funding to address environmental health expenses, including assessments and remediation through federal, state, and nongovernmental sources (Environmental Law Institute 2019)

Programs like the Child Care and Development Fund and the Community Development Block Grant, which provide funding for existing programs to address health and safety activities related to ECE programs.

Communities can also employ a variety of strategies to provide financial support for climate resiliency projects that affect ECE programs. Examples of funding tools that can be used for infrastructure include:

- Bonds (loans between two parties, a borrower and a lender), including special assessment districts and tax increment financing
- Development impact fees, where new developments are subject to fees that cover infrastructure costs
- Pay-as-you-go, where municipalities use revenue sources, like local property taxes, to fund infrastructure projects
- Privatization of infrastructure projects, where the private sector provides funding for infrastructure projects
- Funding that addresses resiliency, such as FEMA's [Hazard Mitigation Assistance grant program](#)

Further, ECE operators often face funding challenges without additional considerations related to implementing resilience strategies. In combination with fees for applications, legal costs, and required reports, these fees can amount to a significant burden on operators (Brown et al. 2007). Additional environmental testing and data collection requirements may pose barriers and delays for ECE operators. In addition, ECE operators often rent space rather than owning their own property. This makes it harder for them to implement resilience strategies on the property and have greater control over environmental health conditions. To address this challenge, it would be helpful for a municipality to develop a

strategy to support ECE operators in implementing resilience strategies through ownership and access to capital, such as securing private financing options, reducing cost barriers for local development approval, and identifying incentives for potential ECE operators (Brown et al. 2007).

### 4.1.2 Resilience Planning Process

Following a systematic approach may help communities become more resilient. It is important for communities to incorporate an awareness of their hazards into their long-term planning because they may not otherwise confront the fact that land-use choices greatly affect the outcomes with their resulting losses of lives and property (Schwab 2014). Planners and others can consider using the U.S. Climate Resilience Toolkit (National Oceanic and Atmospheric Administration Climate Program Office 2016), a useful five-step process that outlines steps that communities can take to identify, assess, and confront their climate vulnerabilities. This approach to resiliency allows communities to address climate stressors within a comprehensive planning framework:

- 1. Exploring hazards.** This preliminary step includes determining the conditions that can exacerbate hazards, investigating the community's regional climate trends and hazards, and identifying the assets the community wants to protect and the climate hazards that could impact them.
- 2. Assessing vulnerability and risks.** If there are hazards that could impact community resources, communities can gather information to identify which assets are most vulnerable and estimate the risk climate hazards pose to them.
- 3. Investigating options.** A community can take a variety of actions to protect assets that could potentially be impacted by a disaster. This step encourages communities to consider potential solutions and alternatives to reduce risk that could work with their context.
- 4. Prioritizing and planning.** By applying criteria to potential actions, communities can identify which activities are most appropriate. This requires assessing whether investments will reduce risk and evaluating trade-offs due to limited resources.
- 5. Taking action.** The final component requires communities to implement the strategies identified in previous steps and monitor the results to measure effectiveness.

This resiliency framework can be used to discover and document climate hazards, then develop workable solutions to lower climate-related risks. It can also provide a framework for ECE siting strategies in hurricane-affected areas.

ECE programs play an important role in helping a community return to normal after a hurricane and should be considered as part of a recovery strategy. Ideally, a community should be engaged in long-term recovery planning both before and after a hurricane. Following the storm, communities may have a better understanding of the areas most affected and the types of recovery strategies that are most appropriate, depending on the magnitude of the extreme weather event. In this stage, it is possible to consider where new ECE programs may be less vulnerable to storm impacts and most beneficial to communities.

### Pre-Hurricane Planning

Pre-hurricane planning provides an opportunity to identify a community's visions, goals, and values, something that may not be possible after an adverse weather event. Planning that considers potential hazards and considerations for resiliency before an extreme weather event provides multiple benefits. Before a hurricane, the community can engage in the resilience planning process to identify locations that are most susceptible to hurricane impacts, then assess what types of strategies are most appropriate for those areas to reduce risk. While these strategies are typically used broadly to apply to new development in specific areas, they can be applied to ECE programs to improve their resiliency.

Communities that consider ECE programs as part of pre-hurricane planning can protect children from adverse effects of flooding, storm surge, and chemical exposure. A community can identify outcomes for long-term recovery, including those that impact environmental, economic, and social systems (Schwab 2014), such as gaps in ECE programming or vulnerability related to nearby incompatible land uses. Additionally, communities can carry out a risk and vulnerability assessment, where site conditions and surrounding uses are considered to identify safe sites available for redevelopment.

### Post-Hurricane Planning

After a hurricane, physical community conditions can be significantly different, depending on the intensity of the storm. Following an assessment period, communities can analyze data about systems (transportation, utilities,

communications, etc.), hazards (sites that may have contributed to contamination, changes to floodplains/erosion/degradation of coastlines), and community needs. Access to safe drinking water sources is important to ensure that children are not exposed to contaminants. These changes are important to ensure that previously existing ECE programs are safe to reopen and that new ECE programs are not established in areas that are at risk for flooding or other hurricane impacts. Depending on available funding, stakeholder and elected officials can determine the preferred response to address storm impacts and begin to tackle resiliency within their communities.

Once an emergency plan has been deployed, planners can play a role during the long-term rebuilding processes. They can provide communities with opportunities to set goals and visions for development; create plans; work with developers; create standards, policies, and incentives; and shape public investments in a way that supports community goals. Planners can also assist in the identification of new hazards and, if needed, may help affected ECE facilities find suitable places to relocate. See Section 2.3 for more information on planning strategies.

### 4.2 Siting Strategies for Hurricane-Affected Areas

Within the context of hurricane-affected areas, the physical location of ECE programs can directly affect the health of young children who may be victims of environmental vulnerabilities such as exposure to lead in water, poor indoor air quality, and contaminated soil that can cause, worsen, or contribute to long-lasting health conditions. Many ECE programs may be located in, or may be considering moving to, a location where children and staff are or would be exposed to environmental contamination. For example, a new ECE program might open in an industrial building contaminated by chemicals that were never cleaned up, or next door to a business that is contaminated with mold growth from hurricane flooding. Prior to beginning the rebuilding process, it is important to identify potential hazards and remediate circumstances that can negatively impact environmental health of future occupants.

Although several agencies provide guidance related to emergency preparedness of ECE programs, there are limited resources available to guide ECE programs to choose sites in safe areas after hurricanes. Many climate resilience resources do not focus directly on ECE program siting, but rather on the construction of new schools and coastal residences. Nonetheless, the siting strategies those resources provide can be applied to ECE programs as well.

The EPA encourages a thorough site review of schools to identify potential hazards before a school is selected. ECE programs should consider a similar approach. During the site review process, site assessors can identify information such as the presence of a floodplain, chemical contamination, and other safety hazards. Development requirements set by a municipality or other governing body can set requirements for new ECE programs and include this information as part of the permit application process. The *Choose Safe Places Guidance Manual* provides concrete information on how planners and other community stakeholders can work together to identify safer ECE sites.

When building in hurricane-affected areas, it is important to consider factors such as distance to coastal areas and flood zones. These factors are in addition to the other desirable and undesirable site attributes (see Section 2) that planners should consider. Planners can use a variety of regulatory approaches or incentives in areas that are subjected to storm surge and flooding (U.S. EPA 2017).

FEMA (2011) has published general guidance for coastal construction, which can also be applied to ECE programs. Implementing safer siting strategies allows communities to reduce vulnerabilities to extreme weather events. FEMA recommends the following coastal siting considerations for new residence construction (which can be extrapolated for ECE programs):

- Building code and land-use requirements
- Local floodplain management requirements
- Other regulatory requirements
- Presence and location of infrastructure
- Previous development and/or subdivision of property
- Physical and natural characteristics of property
- Vulnerability of property to coastal hazards

Further, planners can use strategies to safely site ECE facilities in hurricane-affected areas through land use and building policies. Land-use planning and design can reduce a community's long-term vulnerability to flooding and other extreme weather events while supporting its resiliency. Such policy options bring multiple short- and long-term environmental, economic, health, and societal

benefits. The strategies outlined here can be worked into a community's regular processes and policies—for example, through regular updates to zoning and building codes. This approach allows incremental change, which might be easier for some communities because it costs little or nothing extra compared to “business as usual,” and regular code updates give communities the opportunity to adjust codes based on the most up-to-date climate observations and projections (U.S. EPA 2017). Planners can help reduce ECE program vulnerability by encouraging new developments to incorporate resilient siting and design strategies. The effort and political will to make policy and regulatory changes vary by community.

The EPA offers strategies for zoning and building code changes and related policies that adhere to smart growth and/or green building principles (U.S. EPA 2017). They outline general strategies as well as strategies categorized by the type of climate impact a community can face, including flooding and extreme precipitation related to hurricanes. Once a community has determined its vulnerabilities and priorities, these strategies can help it achieve some of its goals. Those related to ECE program sites in hurricane-affected areas include:

- Create a post-disaster redevelopment plan before disaster strikes. This plan can help communities recover faster and more efficiently and can lay out a vision to help the community build back better than before. It also helps set expectations so communities can avoid making rebuilding decisions under duress in the immediate wake of a disaster.
- Adopt the 500-year floodplain boundary as the “locally regulated floodplain” that exceeds the typical FEMA-recognized 100-year floodplain.
- Acquire properties at risk of flooding, use the land for infiltration, and help the property owners resettle in the community. Some FEMA hazard mitigation programs provide funds that communities can use to buy vulnerable properties from willing sellers. Helping property owners and businesses such as ECE programs find new locations in the community can help reduce the impact of environmental hazards on children.

## In Summary

After a hurricane, having access to safe places, including ECE programs, can support community well-being and protect vulnerable community members like children from adverse conditions. Planners can encourage safer places by engaging in resiliency planning. Not only is general environmental health pertinent in planning for ECE programs but planning in the context of disasters is also an essential field to recognize. Disasters such as hurricanes and fires have occurred throughout human history; however, studying and understanding disasters in an environmental health context is becoming more relevant. Climate change has been attributed to the increasing frequency and intensity of disasters, both natural and anthropogenic, especially hurricanes (U.S. Department of the Interior n.d.). As a result, there is an increased chance of disasters inflicting physical

damage to facilities, such as farms and industrial sites, which can release chemical and biological hazards into the environment. Planning for ECE programs from an environmental health perspective is vital to keep children safe from these potential hazards.

This section discussed the relationship between planning, environmental health, and siting ECE programs. It introduced the concept of resilience planning, including resilience planning strategies and the importance of creating resilient communities in areas affected by natural disasters. The resilience planning process is described as well as how resilience strategies can be incorporated into the pre- and post-hurricane planning processes. Lastly, guidance is given for siting ECE programs in hurricane-affected areas.

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