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Developing a Policy on Environmental Quality, Health, and Schools in Michigan

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Executive Summary

Introduction

In this report, we discuss current research on school siting and environmental health, specific school siting policies in states other than Michigan, federal school siting guidelines, and, lastly, we present a range of policy options for addressing environmental health issues as they relate to school siting in Michigan.

As children can spend upwards of seven hours per day in school, the location and condition of their school can have a significant impact on their overall exposure to toxicants in their environment. Furthermore, school location can have an effect on what proportion of children are able to walk or bike to school, and, as such, can have profound impacts on healthy lifestyle choices (Miles, Adelaja, and Wyckoff, 2011). In particular, this report focuses on the environmental pollution burdens faced by children from sources external to the school, such as air pollution from motor-vehicle traffic or industrial sources, and soil and groundwater pollution from hazardous waste sites.

Currently, there is no state regulation in Michigan that addresses school siting with respect to environmental quality considerations. At the state level, school siting policies and guidelines currently exist in twenty-six states (Fischbach, 2006). At the federal level, the Environmental Protection Agency (EPA) recently issued guidelines on school siting in October 2011 that they recommend local education agencies follow (U.S. EPA, 2011a). The EPA guidelines serve an important role as a tool for improved child health, but because the EPA did not mandate or go into specifics about school siting rules due to the vast differences occurring from state to state, the guidelines can be broad and vague. The EPA's national guidelines provide a basis for understanding key concerns and shortcomings of existing school siting policy, and how it may be used in state and local policies. So, in spite of the fact that these EPA guidelines are available, the presence of policies on school siting at the state level is still necessary to add more state-specific considerations to them.

Literature Review

We present a broad review of literature related to school siting to help frame the importance of the issue and lend context to the subjects in our Interview Synthesis and Policy Recommendations sections. This includes sections on health and environmental pollution as it relates to schools, school siting and environmental justice, the EPA school siting guidelines, school siting policies that exist in other states, and the current and historic atmosphere of school siting in Michigan.

Methodology

In addition to our review of relevant literature, we conducted a series of telephone interviews with state and federal government agency officials, public health researchers, school administrators, land-use experts, and non-governmental organization representatives. These stakeholders included informants from Michigan, other states, and at the national level. The aim of these interviews was to assess key issues with the status-quo siting process in Michigan, important benefits and drawbacks of policies and guidelines used by other states, and notable considerations to account for in crafting a set of policy recommendations for Michigan. Our interview process was approved by the University of Michigan Institutional Review Board. We used an informal, qualitative process to analyze the information we gathered in these interviews and used this information, along with information from a variety of literature sources, to craft a set of policy recommendations.

Interview Synthesis

We encountered a number of common themes throughout the course of our interviews. One such theme was the need to foster an environment of collaboration between local education agencies and local government organizations. We found that in the current siting environment, there is often disconnect and a lack of communication between local education agencies and local governments with regards to siting matters.

Additionally, informants from many states acknowledged that costs not borne directly by local education agencies at the time of land acquisition and construction were frequently neglected in siting decisions. Schools built far from community centers serve as an example of how schools neglect the true costs of siting decisions. In Michigan, the county road commission frequently bears the cost of building infrastructure to the distant school site. Another example of this type of ‘hidden cost’ is the increasing incidence of symptomatic respiratory illness among students and faculty members in areas with more air pollution.

A point of contention between informants was the relative benefits of a system of mandates as opposed to a system of guidelines to inform siting decisions. While some interviewees preferred the rigidity of mandates, expressing that school districts would likely not do much to comply with voluntary guidelines on siting, many interviewees preferred the flexibility of guidelines. Some claimed that mandates would face stiff political opposition, and might also generate resistance from local education agencies. In contrast, one superintendent exclaimed that school administrators would welcome such mandates if they made the job of siting easier, and expressed that the only difficulty in passing a mandate would be in getting it accepted by some portions of the state legislature.

Formation of Policy Recommendations

Our literature research and interviews uncovered numerous issues, hurdles, unique situations, and policy recommendations that encompassed a range of topics, as there are many interconnected factors which must be addressed in changing Michigan's status-quo of school siting. In order to create the set of policy options that would best suit the needs of the state of Michigan, we conducted interviews with out-of-state and in-state stakeholders in conjunction with research on various state policies and guidelines regarding school siting. These interviews were done with the purpose of determining which policy pieces were essential, successful, and implementable while also discussing which policy pieces were ineffective. In researching school siting policies and the Environmental Protection Agency's (EPA) recommended guidelines, our team was able to gather information to create a set of proposed policies for the state of Michigan. Policy issues are complex and multifaceted. As a starting place to create a holistic approach to school siting policy for Michigan, four overarching areas of concern were considered within all policy recommendations. These areas are: government (G), health (H), environment (E), and community (C). Each area of concern is by no means mutually exclusive and, in fact, often overlaps. Each policy option is marked according to what main area of concern is addressed within the policy.

Areas of Concern

Government (G)

Government concern addresses considerations of the bureaucratic and political processes in the state of Michigan that are involved with the school siting process. Examples of government considerations include:

- Inter-agency coordination and communication in order to assist districts in garnering information and resources on school siting policies and best practices,
- Conflict resolution for potential discussions between agencies on school siting considerations and student health issues, and
- Decision points for various stages of the school siting process to determine which groups are qualified to make decisions regarding environmental and child health of various sites.

Health (H)

Public health concern addresses the standpoint that public health is a crucial factor to preserve in the school siting process as child health and development can be severely affected by exposures to environmental toxicants over a prolonged period of time. Therefore, it is necessary to protect child health and well-being while in the state-provided school environment. Examples of health considerations include:

- Acreage requirements,
- Mitigations plans,
- Prohibited sites due to pollutant proximity,
- Air quality in the school area,
- Groundwater contamination and proximity, and
- Regional pollutants that can affect child health in the school environment.

Environment (E)

Environmental concern addresses the protection and conservation as well as environmental health perspective that considers human health as a factor in maintaining a healthy living environment. Examples of environmental considerations include:

- Considerations of topography,
- Seasonal variations in toxic and environmental exposures, and
- Variations in rural, suburban, and urban environmental siting needs and processes.

Community (C)

Community concern addresses the needs and involvement of the community in the school siting process. Schools are often times a center of community support and involvement, providing means for families and students to connect and attend various events. Examples of community considerations include:

- Preservation of historic buildings and historic sites,
- Conflict resolution processes
- Ensuring public participation opportunities in the school siting processes and discussions,
- Comment periods in which the public is openly involved in the initial phases of site considerations and development, and
- True cost estimates to best determine the long-term and short-term costs of developing various sites.

After addresses the areas of concern, our policy recommendations are divided into two categories: ***approach*** and ***evaluation*****.**

Approach address issues of how to approach the school siting process. Within ***approach***, policy options are divided into two subcategories: *authority* and *communication*. *Authority* addresses who could be involved in the process and *communication* addresses how those involved in the school siting process could communicate for a more effective policy.

Approach

Authority

Guidelines vs. Mandates
School Inclusion
Authority: The Decision Makers
School Siting Committees

Communication

Inter-agency Coordination and Communication
Public Participation
Reporting
Conflict Resolution

Evaluation addresses the various on-site and off-site health, environmental and cost factors that could weigh in on the school siting decision. Within ***evaluation***, policy options are divided into two subcategories: on-site and offsite. *On-site* refers to factors on the physical school site or directly impact the school site. *Off-site* refers to factors that are mainly off-site that either affects

the cost of the site, construction of the site, or transportation to and from the school site. Many of these policy recommendations, however, could be both on-site and off-site policies. Importantly, on-site and off-site policy category should not insinuate policies as either primary or secondary.

Evaluation

On-site

Acreage Requirements
Topography
Polluting Facilities
Hazards and Soil

Off-site

Walkability
Transportation
Roadway Traffic
True Cost Estimates

Levels of Policy Stringency

Three levels of policy stringency, stringent, moderate, and lenient, were developed for each of the policy recommendations.

Stringent:

Stringent policy recommendations may overlook political or economic barriers in an attempt to provide the most comprehensive solution.

Moderate:

Moderate policy recommendations are less comprehensive in terms of providing a solution to an issue, but they require less funding and bureaucratic oversight and are less likely to receive political and public resistance in comparison to stringent recommendations.

Lenient:

Lenient policies are the least stringent and contain no mandates. There are also some instances where lenient policies offer only small or no changes from the current state of school siting decision-making norms.

Our policy recommendations are not intended to be adopted in a single stream of stringency. In order to allow for a policy that best fits the needs of the state of Michigan, it is important to understand that various levels of policy stringency may be necessary in order to create a "best fit policy." Policy makers and stakeholders have the ability to best understand the needs of the state and local governments in the school siting decision-making process.

The policy recommendations found in our report are a synthesis of the Rhode Island Legal Institute's foundational work, the EPA guidelines, interview feedback, lessons from siting policies implemented in other states, specific considerations for the state of Michigan, and, finally, contributions of new criteria for the school siting process. Ultimately, interested readers

of this report can use the information and options that we provide to craft a well-reasoned policy based on the current climate of the state. A listing of complete policy recommendations can be found in Appendix I.

Conclusion

Michigan needs to enact a school siting policy that aims to promote the health and well-being of this state's children. Since children are mandated to attend schools for a significant portion of their day, it is imperative that we foster a healthy environment in which they can thrive. Our policy recommendations provide a variety of avenues through which legislators can achieve this goal.

Chapter 1: Introduction

School location plays a significant role in how children are exposed to potentially hazardous pollution. Exposure to certain pollutants can have detrimental and lasting health effects on bodily and cognitive functions, particularly in children. Well-planned school siting policies can also reduce antagonism between communities and school districts. This conflict has been exemplified in case studies around the country where community concerns over environmental hazards delay and disrupt school construction projects already in the works, at significant costs, and force school closures.

While twenty-six states have some level of school siting guidelines or policies that vary greatly in stringency and in their approach to environmental siting hazards, in Michigan, school construction decisions are made independently of state oversight and are subject to few official guidelines (Fischbach, 2006). There is no institutionalized coordination between schools and municipal planners, or public participation to plan school constructions or renovations. Many changes from Michigan Public Acts, World War II, tax subsidies, the Interstate Highway System, desegregation, the bussing of schoolchildren to school, sprawl, shifting property taxes, and school funding have all greatly impacted the school siting process away from local government planners and shifted the school siting and construction decision making power to local education agencies (LEAs) (Westphal and Patil, 2008; Michigan Department of Treasury, 2002; House Fiscal Agency and Senate Fiscal Agency, 1994).

The lack of a siting process that takes into account environmental quality factors creates a potential environmental justice issue within the public education system that can harm child development and lower student achievement in schools located in areas of poor environmental quality. As studies continue to find associations between environmental pollution and child

health and developmental outcomes, it has become increasingly clear that siting schools in environmentally contaminated areas facilitates a negative effect on child health and well-being.

Because education is mandated and regulated at the state level, and most students in the United States spend, a significant portion of their early lives in school facilities, we argue that there is an ethical imperative to ensure that this time is spent in a safe environment. While Michigan has statutes addressing school funding and educational requirements, there is currently no state or federal regulation that requiring the consideration of environmental hazards when siting new schools in Michigan. A responsibly crafted statewide policy on school siting can benefit communities in a number of different aspects, while helping to ensure that children in the state of Michigan are able to receive an education in a healthy environment.

In this report, we develop recommendations for a school siting policy in Michigan based on considerations from a literature review as well as a series of interviews with individuals relevant to school siting issues. In our literature review, we focus on the health impacts associated with poor environmental quality at schools, the environmental justice concerns about disproportionate pollution exposure at schools in predominantly low-income and minority communities, the recently-introduced Environmental Protection Agency (EPA) siting guidelines, school siting policies that exist in other states, and the history and current state of school siting practices in Michigan.

In addition to our extensive literature review, we gained supplemental information about potentially effective policy options in Michigan by conducting a series of 25 telephone interviews with key stakeholders at the local, state, and national level. Our goal was to identify issues involved in the development and implementation of school siting policies and guidelines in other selected states, and the current status of school siting practices in Michigan. Our

stakeholder informants included school administrators, government officials, land use experts, public health researchers, and non-governmental organization (NGO) staff, all of whom were selected due to their involvement with school siting and policy. Questions were tailored to each informant to better utilize his or her knowledge and experience. After interviews were completed, all interviews were qualitatively synthesized to highlight common themes pertaining to issues, barriers, and successes within school siting policies.

Based upon the information from our literature review and our interviews, we developed a series of policy recommendations for the State of Michigan which vary in three categories of stringency. The reason for this range of stringency levels is so that legislation based upon these recommendations may be applied in different political climates, as the feasibility of certain policy recommendations will fluctuate due to changing compositions of the Michigan legislature.

We end our report with a series of case studies from Dearborn, Charlevoix, Detroit, Westland, and Ann Arbor. These cases highlight the interplay of school siting issues with those of environmental pollution, politics, finances, and public involvement, and illustrate the importance of the school siting issue in Michigan.

Chapter 2: Literature Review

Introduction

Our literature review focused on five key areas: school siting at the federal level, school siting at the state level, school siting issues in Michigan, and environmental health and justice issues related to school siting.

This literature review endeavored to explore the key contexts that encompass state and national policy on school siting. This review outlines the recently released EPA guidelines, and it also outlines policies of several states that were also targeted for phone interviews: California, New Jersey, North Carolina, New Mexico, Minnesota, and Florida. Each state has developed a unique siting policy under a unique set of regulatory and economic conditions. These policies offer important insights into how states approach school siting issues and how Michigan might approach its own policy. To provide a contrast to the states with policies, this literature review also discusses the current conditions and trends occurring in Michigan and could dictate the direction of a future school siting policy.

Substantial research supports the risks children face when they are exposed to toxicants. Additional research suggests that marginalized populations face this exposure disproportionately. This literature review outlines the key health factors that are relevant to school siting, as well as the justice issues that disproportionate exposure creates. These sections provide the basis for the assertion that a policy intervention is needed in the state of Michigan to reduce school siting decisions that unnecessarily expose Michigan students to health risks.

Chapter 2.1: Schools and Health

Introduction

Exposure to a number of toxicants associated with environmental hazards can cause developmental, respiratory, and neurological illnesses. Furthermore, some exposure to particular toxicants can result in health outcomes that are specifically linked to lower academic achievement (Zahran, Mielke, Weiler, and Gonzales, 2009; Kim et al., 2009; Mazumdar et al. 2006; Dong and Su 2009). Although children may be more vulnerable to the effects of select toxicants at a younger age, the presence of these toxicants in schools at older ages of development can also be significant as children spend more time at school as they get older (Moya, Bearer, and Etzel, 2004). As students spend considerable time in school spaces, society has the ability to minimize childhood exposure to toxic substances and aid students in reaching their full academic potential by providing a safe school environment. Furthermore, the ethical argument surrounding the provision of an environmentally safe school is bolstered by the fact that school attendance is compulsory at the state level.

Environmental pollution, on some level, occurs everywhere, but the more we know about the sources and fates of pollutants, as well as the factors which facilitate the health effects and developmental outcomes that children experience from pollution exposures, the better we can create policies to protect against environmental health risks at schools. This section documents key areas of scientific literature concerning children's environmental health. In particular, we focus on exposures and related health outcomes that are of concern with regards to the school environment and learning. Independent of environmental exposures, a number of other factors, including socioeconomic status, mother's education level, and the home environment (Yeung and Conley, 2008; Nam and Huang, 2008; Magnuson, 2007) have also been found to be

associated with academic success. While we acknowledge that there are numerous factors that may affect a child's academic achievement and health, we aim to stress the importance of addressing the burden of environmental exposures as a key focus for improving these outcomes.

Sources of Pollution and Common Contaminants

Pollution can come from a variety of sources—both natural and anthropogenic. While certain pollutants can be emitted from natural sources, anthropogenic sources have the ability to be mitigated and manipulated, and therefore these sources are a focus of policy efforts to decrease human exposures. In terms of school siting, there is a necessary focus on urban and suburban areas where appropriate siting space may be scarce, however, rural areas also face environmental quality concerns with school siting. An understanding of sources and types of pollutants allow us to appropriately approach and evaluate risk in relation to school siting and environmental quality.

Before discussing specific chemical and pollutant information, it is important to distinguish between the confusing language of toxics, toxins, and toxicants. Toxins refer to chemicals produced by biotic systems, that is, plants, animals, or organisms (e.g., snake venom and nicotine from tobacco plants). Toxicants refer to other chemical or physical agents that are not produced from biotic systems. Most chemical toxicants are produced anthropogenically. Toxics can encompass toxins and toxicants. Toxicity is a measure of how much a chemical or agent can damage an organism or organ (Ibrahim, 2011).

There are two major categories of pollution: point and non-point sources, each of which can be from stationary or mobile pollution sources. Point sources typically emit large quantities of pollutants from a single site. These sources include coal-fired power plants, incinerators, steel mills, and paper mills, among others (Indiana Department of Environmental Management, n.d.).

Non-point source pollution is small quantities of pollution emitted from several sites. These sites may include household fires and wood-burning stoves, individual automobile emissions, and roadway motor oil runoff, among others (U.S. EPA, 2012g). Stationary sources of pollution are often, but not always, associated with industrial or energy production buildings. Typical mobile sources of pollution are automobiles, trucks, and aircrafts (U.S. EPA, 2011g).

Pollution can be primary or secondary. Primary pollutants are directly released from stationary or mobile sources and can remain unchanged in the atmosphere. Primary pollutants can be altered to form secondary pollutants by light energy, heat, or reactions with other chemicals (Kibble and Harrison, 2005). For example, volatile organic compounds (VOCs) can be released from industry as primary pollutants. Once in the atmosphere, reactions of volatile organic compounds with nitrogen dioxide and light energy (through photolysis) can form tropospheric (ground-level) ozone (Kibble and Harrison, 2005; U.S. EPA, 2010b). Another class of emissions, fugitive emissions, are pollutants that are typically not released in a specified chimney or stack, but rather are unintended and/or irregular emissions. While fugitive emissions are generally low, they may be locally significant (Kibble and Harrison, 2005; U.S. EPA, 2012l). Many industrial stationary point sources use chimneys to release pollutants at heights that allow for dilution of the pollutant(s) before it reaches ground level and poses a health risk to people. This is not, however, always effective. Certain meteorological conditions can reduce the efficacy of pollution dilution via chimneys (Kibble and Harrison, 2005). Understanding these different sources of pollution aid our understanding of how school location can play a role in how school children may be exposed to toxicants at schools.

The National Ambient Air Quality Standards (NAAQS), set by the Environmental Protection Agency (EPA), regulate six major air pollutants: ozone, particulate matter ($PM_{2.5}$ and

PM_{10}), carbon monoxide, nitrogen oxides, sulfur dioxide, and lead (U.S. EPA, 2010b). While not all of these are concerns for all schools, they are common pollutants that may pose a risk to students. Nitrogen oxides (NO_X) and volatile organic compounds, which react to form ozone, are emitted from automobiles and industry and are the major constituents of smog (U.S. EPA, 2012j). Particulate matter, or PM, is a mixture of small particles that can be acids, organic chemicals, metals, and soil or dust particles. Particulate matter is divided into two groups based on the diameter of particles, and the resulting health effects of particles of each size. Particles that are greater than 2.5 micrometers (μm) but less than 10 μm in diameter, called PM_{10} or inhalable coarse particles, have the ability to enter the lungs where damage can occur but not the deep lung, where gas-exchange occurs. Particles less than 2.5 μm in diameter, called $PM_{2.5}$ or fine particles, can penetrate to the deep lung to cause damage (U.S. EPA, 2012i). Carbon monoxide (CO) is released from the combustion process, generally from mobile sources of emissions. Nitrogen oxides (NO_X) include nitrogen dioxide (NO_2), nitrous acid, and nitric acid. Nitrogen dioxide (NO_2), a highly reactive gas, is generally used as an indicator for NO_X and forms shortly after emissions from automobiles and power plants (U.S. EPA, 2012h). Sulfur dioxide (SO_2), like NO_2, is a highly reactive gas that comes primarily (76%) from power plant combustion emissions (U.S. EPA, 2012n). Lead is a naturally occurring metal that has been widely used historically resulting in widespread contamination. Lead was commonly released from lead smelters and used in paint and automotive gasoline through the early 1980s in the United States. Currently, major sources of lead are manufacturing plants and smelters. Lead, like many other metals, is a persistent contaminant that accumulates in soil and sediments in the environment after air pollution deposition (U.S. EPA, 2012m).

Air pollution from mobile sources is highly spatially dependent. Particulate matter and other pollutants emitted from vehicles, particularly in diesel exhaust, are highest within a few hundred meters of roadways. For example, NO_2 concentrations have been found to be 30% to 100% higher within 50 meters of roadways than further away (U.S. EPA, 2012h). In a meta-analysis of many studies of roadway air pollution, Zhou and Levy (2007) found that PM_{10} concentrations tend to drop to background levels between 100 meters and 400 meters away from roadways. Similarly, they found that $PM_{2.5}$ concentrations tend to reach background levels between 100 meters and 300 meters from roadways, and, for NO_2 concentrations, between 200 meters and 500 meters (Zhou and Levy, 2007). Because there are multiple pollutants with different environmental fates to consider when assessing children's health, it is difficult to designate one "safe" distance from pollution sources for schools. Despite this difficulty, school, or any facility, location and proximity to roadways and other mobile pollution sources can have an impact on health in those facilities and should be considered in the siting process.

Pollution Hazards and Schools

Toxic exposures can originate from numerous sources, but, in considering school siting, we focus on pollution from of air pollution and soil and groundwater contamination. Given that children spend a significant portion of their day at school, the school environment demonstrates a significant role in a child's exposure to toxicants, which can have long-term consequences forchild development and health.

Air Pollution

Air pollution can come from stationary and mobile sources, and can be primary or secondary. Mobile sources, often from automotive exhaust, typically contain nitrogen oxides, sulfur oxides, carbon monoxide, carbon dioxide, and particulate matter, among other toxicants.

Industrial sources of air pollution can contain different pollutants than mobile sources. They may contain more heavy metals such as lead, mercury, or manganese, or emit volatile organic compounds (Landrigan, 1997).

Outdoor air pollution sources at schools have been found to significantly contribute to personal pollution exposure as well as indoor school air pollution (Zhao, Hopke, Gelfand, and Rabinovitch, 2007; Janssen, van Vliet, Aarts, Harssema, and Brunekreef, 2001). One important pollution source at schools is mobile-sourced pollution from roadway traffic, as mentioned earlier. Numerous studies have documented mobile pollution as an important source of both outdoor and indoor air pollution. A study examining proximity of interstate, national, and state highways to public schools in nine Metropolitan Statistical Areas in the U.S. found over 30% were within 400 meters of a major roadway, and 10% within 100 meters. Almost half of the student population surveyed attended schools within 400 meters of major roadways (Appatova, Ryan, LeMasters, and Grinshpun, 2008). A study examining classroom air exchange rates found that increasing outdoor particulate number concentrations were associated with increasing indoor particulate number concentrations (Guo, Morawska, He, and Gilbert, 2007). Janssen et al. (2001) found that air pollution concentrations, both exterior and interior, of schools near roadways are significantly associated with distance from the roadway, traffic density and composition, and the percentage of the school location's time downwind. Furthermore, fine particulates ($PM_{2.5}$) and soot (often elemental carbon) in indoor and outdoor air at schools significantly increases at closer proximities to roadways and with truck traffic density (Janssen et al., 2001). Zhao et al. (2007) found that more than 80% of elemental carbon, nitrate (NO_3^-), sulfur, and iron sampled in personal and interior school samplers were attributed to outdoor pollution sources, such as motor vehicle emissions, and secondary nitrate and sulfate emissions. Motor vehicle and secondary

sulfate emissions were found to have infiltration rates of 90.1% and 89.3%, respectively, from outdoor to indoor school sites, indicating that fine particulate matter may be able to pass through school heating, ventilation, and air conditioning (HVAC) systems and negatively affect indoor air quality (Zhao et al., 2007). Furthermore, Daisey, Hodgson, Fisk, Mendell, and Brinke (1994) identified motor vehicle emissions as a major source of volatile organic compounds in office buildings.

A study by Van Roosbroeck et al. (2007) in the Netherlands examined $PM_{2.5}$, soot (measured as reflectance of $PM_{2.5}$ as elemental carbon), NO_X, and NO_2 exposure surrounding two schools within 100 meters of a major roadway (a freeway and ring road with usually few or no stops) matched with two schools at urban background locations at greater than 250 meters from a major roadway. At each school, outdoor air monitors were implemented and schoolchildren ten to twelve years of age wore personal air monitors. Soot and NO_X are products of fuel combustion that are associated with automobiles and roadways. At the monitored school within 100 meters of a freeway, the outdoor, ambient air concentration of soot was 74% higher and NO_X was 52% higher than compared to its matched background school. Personal exposure measures taken from the children were 30% higher for soot and 37% higher for NO_X at the school within 100 meters of a freeway. There was not a significant difference between school sites for $PM_{2.5}$ and NO_2. The study validated the use of a school's proximity to freeways as a proxy for soot and NO_X exposure in children (Van Roosbroeck et al., 2007), which may pose as an indicator for detrimental child health outcomes related to these exposures. While prevailing wind patterns must also be taken into account in siting decisions, the proximity of school sites to major highways and other major roadways is an important factor to consider in reducing childhood exposure to a number of hazardous pollutants.

Large point sources, such as industrial facilities, are also important in addressing school siting. Mohai, Kweon, Lee, and Ard (2011), using data from the EPA's Toxic Release Inventory (TRI), mapped air pollution concentrations levels in the State of Michigan in deciles of pollution level and school locations. The study found that 62.5% of all schools within Michigan were located in grid areas in the ninth and tenth highest polluted deciles of air pollution concentrations, which accounts for 67.3% of all state schoolchildren. Forty-eight percent of all schools were within the tenth highest polluted decile, which accounts for 53.0% of all state schoolchildren. Furthermore, they found that schools in Michigan in the two most polluted deciles tend to be located in the most heavily air-polluted areas of their school districts (Fig 1). Ninety-five percent of the estimated TRI chemicals in the air came from only twelve chemicals: diisocynates, manganese, sulfuric acid, nickel, chlorine, chromium, trimethylbenzene, hydrochloric acid, molybendum trioxide, lead, cobalt, and glycol ethers (in order of highest to lowest estimated concentration). A number of these hazardous chemicals are released from sources within one kilometer of some school areas in potentially harmful quantities (Mohai et al., 2011).

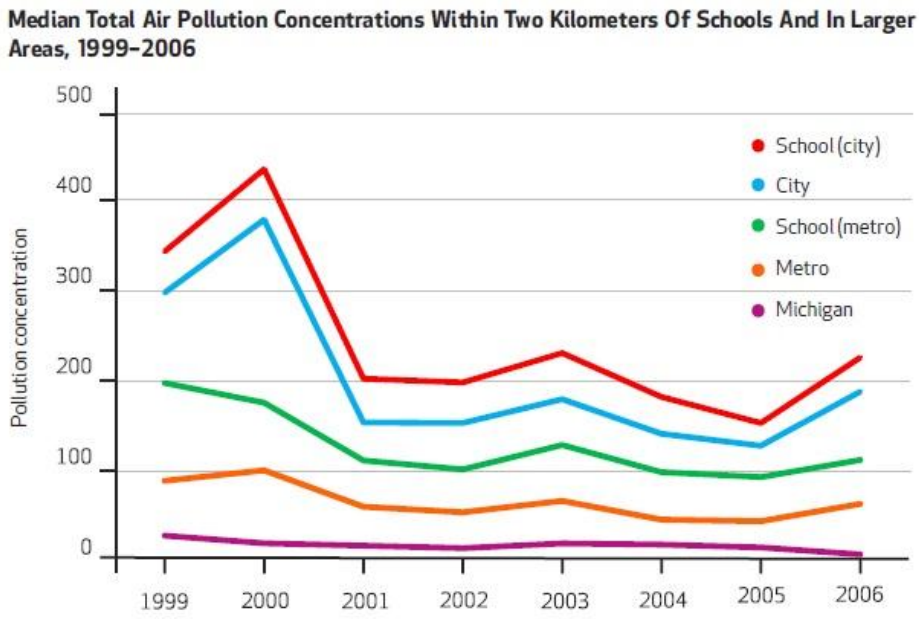


Figure 2.1.1 Metro is the Detroit metropolitan area. City is the City of Detroit. Schools (metro) are areas within two kilometers of schools in the Detroit metropolitan area. Schools (city) are areas within two kilometers of schools in the City of Detroit. Median air pollution concentration values for Michigan, the Detroit metropolitan area, and the City of Detroit are for the one-kilometer squares in the respective areas. Median air pollution concentration values for schools in the Detroit metropolitan area and the City of Detroit are for the circular areas within two kilometers of the schools in those locations. Mohai et al. (2011).

As numerous studies show, air pollution around schools is a significant factor for determining how school children may be exposed to toxicants. In addition, Salvesen and Zambito (2011) demonstrate there are important safety considerations that should be taken into account forschools sited near certain facilities, as catastrophic events and accidents at facilities storing and using harmful substances may pose imminent dangers to students nearby.

Soil and Groundwater Pollution

Soil contamination is also important to address as a portion of the school siting process, as harmful heavy metals and volatile organic compounds may be present at certain sites. Superfund sites, waste sites which potentially contain a number of toxic chemicals, are areas of particular concern with regards to school siting, as leaks from these sites can contaminate nearby groundwater sources and soils (Canter and Sabatini, 1994). Additionally, schools sited on or near

brownfield sites, typically old industrial or commercial sites that are abandoned or underused, may be areas of particular concern for soil contamination, although brownfield sites vary greatly in their degree of contamination and the specific toxicants that they may contain. Furthermore, currently active industrial sites may act as a point of concern for potential soil contamination near schools.

Many industrial sources of air pollution may deposit in soil and/or leach into groundwater, where it may pose a risk. For example, lead levels in the soil, dust, and air were found to be highest near a primary lead smelter in Idaho and decreased with distance from the smelter, and the blood lead levels of children residing nearby had a similar association to distance from the smelter (Landrigan et al., 1976). Wu, Edwards, He, Liu, and Kleinman (2010) found that total and bioavailable lead concentrations in soil were significantly higher near freeways than other locations sampled in south central Los Angeles County, CA. Similarly, a study examining soil lead concentrations surrounding child day care centers in the Cincinnati area found that soil lead concentrations were significantly higher for day care centers located within 2.5 km of the nearest interstate highway (Button, 2008).

Two types of dioxins, polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDDs and PCDFs), measured in soil surrounding a secondary aluminum smelter in Italy found that the most contaminated sites were within 500 meters of the plant (Colombo et al., 2011). Polychlorinated biphenyls (PCBs) are known to persist in the environment and bind strongly in soil and sediments, and are found in about 31% of all the EPA's designated National Priority Sites (Agency for Toxic Substances and Disease Registry, 2001). Polychlorinated biphenyls are classified by the International Agency for Cancer Registry (IARC) as a probable human carcinogen (International Agency for Cancer Registry, 2012). A

study of Native American Indian adolescents exposed to PCBs industrially found that PBC blood concentrations were associated with lower scores in long-term memory, comprehension, and knowledge from three cognitive tests (Newman et al., 2006).

Agricultural areas, both current and historical, may pose a risk due to pesticide use, residues, and drift. Lead arsenate, a common insecticide used in agriculture (particularly with orchards) before the 1950s, may pose a risk to students if a school is built on or near a site where it was utilized. A study in Washington State of an agricultural community that used lead arsenate insecticides from 1905 to 1947 found that soil and household dust concentrations of arsenic and lead were elevated on homes on or near sites that used lead arsenate than other homes, and that indoor levels (household dust) were significantly associated with outdoor levels (soil) for both metals (Wolz, Fenske, Simcox, Palcisko, and Kissel, 2003). Another study in Washington with organophosphate pesticides found that there was a 20% reduction in a urinary pesticide metabolite with every increasing mile from farmland sites (Coronado et al., 2011). A study of organophosphate pesticides trichlorfon and fenitrothion applications in an agricultural community in Japan demonstrated similar results. Outdoor and indoor concentrations of both pesticides decreased with greater distances from pesticide application sites, and indoor concentrations significantly correlated with outdoor concentrations (Kawahara, Korikoshi, Yamaguchi, Kumagai, and Yanagisawa, 2005). Agricultural pesticide drift, however, accounts for only some of the health outcomes associated with pesticide exposure. One study examining schools and student illnesses found agricultural pesticide drift to be associated with 31% of pesticide-related illnesses at schools (Alarcon et al., 2005). Schools, like homes, near historic and current pesticide treated sites may pose an exposure risk for students.

Child Vulnerability

Children may be more exposed to certain toxicants in the environment than adults due to behavioral and physiological reasons, and these exposures may affect children more significantly than adults due to physiological differences in the body's absorption, metabolism, and excretion of these substances (U.S. EPA, 2008; Landrigan, 1997).

Behaviorally, children are naturally curious and learn from new situations and endeavors. Because children's brains are still developing, they may not be able to think about situations as complexly or abstractly as adults, and may not recognize risky situations as adults would (Moya et al., 2004). Younger children are notorious for having more hand-to-mouth contact than adults, a behavior that increases their likelihood of being exposed to certain toxicants (U.S. EPA, 2008). Furthermore, their closeness to the ground can also cause heightened concern surrounding risk of exposure to soil and ground-level contaminants when compared with taller adults (U.S. EPA, 2008; Landrigan, 1997). Children with "pica," a habit of eating nonfood objects, are at even greater risks of environmental exposures because of increased ingestion of soil and dust (Moya et al., 2004). Children also engage in activities that naturally expose them to more soil than adults, which can produce significant exposure to toxicants through soil adherence to the skin, which allows for certain chemicals (typically hydrophilic chemicals that travel through the dermal layer) to pass through the skin (Moya et al., 2004). As such, toxic contaminants in soil at schools may pose significant health risks, as children typically take part in a variety of outdoor activities while at school. Also, children generally spend more time outdoors playing and being physically active than adults, which can increase their exposure to air pollutants (U.S. EPA, 2008); deposition of fine particles in the respiratory tract was found to be 4.5 times higher when people engaged in physical exercise than at rest (Daigle et al., 2003).

Physiologically, children have larger per-unit-mass inhalation and consumption rates than adults (U.S. EPA, 2008), a trait which puts them at risk for receiving higher doses of environmental toxicants than adults in the same environment. Children, due to their developing organs, are not as well able to metabolize and excrete toxicants as adults (Landrigan, 1997). Additionally, retention and absorption rates of certain compounds can be higher among children (U.S. EPA, 2008), increasing the biological effects of contaminants which children are exposed to. For example, children absorb about 50% of the lead they are exposed to, whereas adults only absorb about 10-15% (Needleman and Landrigan, 1994, as cited in Child Proofing our Communities, 2002). Children have narrower airways than adults, which can cause a greater impact of air pollution. For example, an adult exposed to an air pollutant and airway irritant may only experience minimal effects in terms of airway obstruction. For a child similarly exposed, the airway obstruction could significantly impair breathing (Moya et al., 2004). The shorter height of children can influence exposure as their breathing zones are lower to the ground than adults when considering any vapor intrusion or toxicants that can volatize from soil or water (Moya et al., 2004; Landrigan, 1997). Children's bodies are especially susceptible to the toxicity of various compounds as their brain, immune, endocrine, and reproductive systems, and other organs are developing (Landrigan, 1997). Effects to the brain and lungs, which do not fully develop until adolescence, are of particular concern since these can lead to long-term effects on cognitive development and respiratory health (Soto-Martinez and Sly, 2010).

Childhood Pollution, Child Development, and Health Outcomes

Many air pollutants are associated with respiratory illness exacerbation in children, and exposure to air pollution may be a causal factor in asthma development in some children (Brauer et al., 2002; Lin, Musie, Hwang, Fitzgerald, and Cayo, 2002; Venn, Lewis, Cooper, Hubbard,

and Britton, 2001). There are many toxicants that have cognitive impacts, which are associated with the development of behavior and personality disorders (Preston, Warren, Wooten, Gragg, and Walker, 2001; Nevin, 2007; Needleman, McFarland, Ness, Fienberg, and Tobin, 2002; Needleman, Riess, Tobin, Biesecker, and Greenhouse, 1996; Hornung, Lanphear, and Dietrich, 2009). The six pollutants regulated by EPA's National Ambient Air Quality Standards (NAAQS), ozone, particulate matter, carbon monoxide, nitrogen oxides, sulfur dioxide, and lead, can all cause adverse health effects (U.S. EPA, 2010b). Notably, Mohai et al. (2011) found that eleven of the top twelve toxic substances released by industrial facilities near schools can have adverse respiratory health effects. Furthermore, six of these twelve toxicants can have neurological effects and three can have developmental health effects (Mohai et al., 2011). A table of health effects of some notable toxics, including those regulated in the National Ambient Air Quality Standards is included in Appendix II.

Cognitive Effects

There are many toxicants that can have adverse cognitive effects that can impact academic achievement and social success later in life. One of the most notorious neurotoxicants has been lead, which is known to affect cognitive development and is associated with lower standardized test (Zahran et al., 2009) and intelligence quotient (IQ) scores (Kim et al., 2009). A preliminary study by Mazumdar et al. (2006) found that childhood (ages 4-10 years) blood lead was strongly associated with Full-Scale IQ (measured in the Wechsler Abbreviated Scale of Intelligence, WASI), and lead exposure among school-aged children may formulate increased susceptibility to lifelong impacts. Higher average childhood blood lead concentrations have been associated with decreases in region-specific adult grey matter volume in the brain, which may

affect the prefrontal cortex and anterior cingulate cortex that regulate mood, executive functions, and decision-making, and seems to disproportionately affect males (Cecil et al., 2008).

Prenatal and early childhood exposure to lead has been a major focus in past research, but the impact of later childhood exposures has also been a major focus in recent years. Hornung, Lanphear, and Dietrich (2009) found that children at age six have higher associations of cognitive and behavioral effects from lead exposure (measured in blood lead concentrations) than from early childhood (around age two) exposures, as previously thought. In a study with children 8-15 years of age, blood lead levels were associated with an 8.64-fold increase odds of meeting the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders* (4th edition) conduct disorder criteria (Braun et al., 2008). Children (8-15 years) with higher blood lead levels were also found to have more conduct disorder symptoms than children with the lowest quartile of blood lead levels (Braun et al., 2008). Childhood lead exposure (in children aged 4-15 years) was also found to be significantly associated with attention deficit hyperactivity disorder (ADHD), and could be a contributor to the 290,000 excess cases of ADHD in U.S. children (Braun, Kahn, Froehlich, Auinger, and Lanphear, 2006). Roy et al. (2009) found that child blood lead has been associated with higher anxiety levels, social problems, and higher attention deficit and hyperactivity disorder scores. Air lead levels have also been associated with increased crime rates later in life (Nevin, 2007). Bone lead, a measure of total lead exposure, is also associated with delinquency in youth (Needleman et al., 1996; Needleman et al., 2002). As neurological disorders, including as ADHD, have been associated with the academic performance of students (Fergusson and Horwood, 1995; Kovacs and Goldston, 1991; Rapport, Scanlan, and Denney, 1999), reducing childhood lead exposure may be an important avenue towards affecting population-wide increases in academic success. These

studies highlight the importance of protecting children of all ages from lead exposures and illustrate the magnitude of the impact such exposures can have. While a specific toxicant was not assessed, a population-level assessment in Texas found a decreased risk of autism incidence of 2.0% and 1.4% for every increasing ten miles from industrial or power plant sources, respectively (Palmer, Blanchard, and Wood, 2008).

Arsenic exposure is often related to ingestion of contaminated water, but can also occur through exposure to contaminated air, soil, and dust. A number of studies have linked even low levels of arsenic exposure to cognitive impairment. A recent meta-analysis of studies by Dong and Su (2009) compared children living in areas with higher levels of arsenic and lower to no levels of arsenic and found mean IQ to be up to six points lower in highly exposed children than in minimally exposed children. Also, a neurobehavioral study by Tsai, Chou, The, Chen, and Chen (2003) found significant associations between arsenic concentrations in home well water and increased attention switching and decreased pattern memory recognition among school children. Additionally, manganese, like arsenic and lead, is a neurotoxin that affects cognitive development and is associated with lower IQ scores (Kim et al., 2009).

Respiratory and Cardiac Health Effects

Adverse respiratory and cardiac effects, while not directly impacting academic achievement, can play an important role in student achievement in school and later in life, and damage overall quality of life for children. Elevated respiratory risk, in particular, has been associated with decreased academic performance (Pastor, Morello-Frosch, and Sadd, 2006).

Particulate matter can have a plethora of effects because the composition can vary greatly. Coarse and fine particulate matter, or PM_{10} (particles with a diameter of 2.5-10 μm) and $PM_{2.5}$ (particles with a diameter below 2.5 μm), respectively, both have harmful health outcomes,

but $PM_{2.5}$ is linked to a greater number of issues because these particles are able to travel to the deep lung where gas exchange occurs and from there has the ability to enter the bloodstream. Particulate matter primarily affects respiratory and cardiac health, but can also irritate the airways, aggravate asthma, and cause coughing or difficulty breathing, and has been associated with chronic bronchitis development, decreased lung function, irregular heartbeat, heart attacks (nonfatal), and premature death in people with heart or lung disease (U.S. EPA, 2010b; U.S. EPA, 2012i). A study in southeast Toronto, Canada concluded that exposure to increased levels of fine particulate matter ($PM_{2.5}$) is associated with significant increases in hospital admissions for asthma, bronchitis, chronic obstructive pulmonary disease, pneumonia, and upper respiratory tract infections (Buckeridge et al., 2002).

Ozone, carbon monoxide, nitrogen oxides, and sulfur oxides can have an array of health impacts, but primarily affect the respiratory and cardiac systems. Ozone exposure can cause chest pain, wheezing, coughing, throat irritation, congestion, and worsen bronchitis, emphysema, and asthma (U.S. EPA, 2012j). Carbon monoxide, because it can reduce oxygen flow to the body, can cause myocardial ischemia (reduced oxygen to the heart), chest pain, and death at high exposures (U.S. EPA, 2012o). Nitrogen dioxide, NO_2, can cause asthma irritation and airway inflammation, and worsen respiratory and heart diseases (U.S. EPA, 2012h). Controlled studies of asthmatics have found enhanced allergic response to allergens after exposure to low levels of NO_2 (American Academy of Pediatrics, 2004). The nitric acid and other particles formed by atmospheric NO_2 reactions can penetrate deep into the lungs and cause or aggravate respiratory diseases (U.S. EPA, 2012h). Short-term exposure to sulfur dioxide (SO_2) is associated with asthma aggravation and airway constriction. Sulfur oxides, formed from SO_2, can penetrate into the deep lung and are associated with worsened respiratory and heart disease (U.S. EPA, 2012n).

Proximity to high pollution sources, like major traffic areas, is significantly associated with asthma incidences (Oyana and Lwebuga-Mukasa, 2004; McConnell et al., 2010). Students who begin school with asthma, regardless of other covariates, have been found to be behind non-asthmatic students in reading in one academic year (Liberty, Pattermore, Reid, and Tarren-Sweeney, 2010). High school students with asthma have also been found to be absent from school more often, have lower mathematics course grades, and participate in fewer school related activities than their non-asthmatic counter parts (Krenitsky-Korn, 2011).

Other Adverse Health Outcomes

Toxicants can impact organ and disease development and disrupt normal bodily functions. Lead, while a significant neurotoxicant, is also associated with adverse effects to the kidney, immune, reproductive, developmental and cardiac systems (U.S. EPA, 2012m; Agency for Toxic Substances and Disease Registry, 2007b). Childhood exposure to cadmium can cause nephrotoxicity (toxicity damage to the kidneys) and osteoporosis. Childhood cadmium exposure has also been associated with immune suppressive effects (Schoeters et al., 2006), which can lead to greater sicknesses, school absences, and lower academic achievement. Furthermore, recent epidemiologic evidence has linked urinary cadmium levels in school children to learning disabilities and use of special education (Wright et al., 2011). Adult lung diseases can be attributable to factors that affect a child's lung growth and development (Soto-Martinez and Sly, 2010), as many air pollutants can impact respiratory health. The prevalence rate and risk of Alzheimer's disease, Parkinson's disease, multiple sclerosis, and suicide attempts were found to be significantly higher in high pesticide use areas than low pesticide use areas (Parrón, Raquena, Hernández, and Alarcón, 2011).

There has been evidence to suggest that environmental exposures, especially childhood exposures, facilitate cancer development both during childhood and much later in adult life (Landrigan, 1997). Childhood exposure to cadmium is associated with manifestations of lung cancer as children mature into adulthood (Schoeters et al., 2006). Exposure to polychlorinated biphenyls (PCBs) has been associated with an increased risk of acute lymphocytic leukemia (Ward et al., 2009), which accounts for about 80% of all US childhood leukemia cases (Ries et al., 2004, as cited in Ward et al., 2009). Improper endocrine function and disruption can also occur from exposure to synthetic compounds (e.g., polymers in plastics and plasticizers) (Landrigan, 1997).

Environmental quality and health goes beyond chemical exposures. Aircraft noise can also significantly decrease reading comprehension at schools located near airports (Clark et al., 2006). The disruptive nature of airports and airplanes, as opposed to a constant noise, may distract students from learning. Other industries or companies that distract students through noise or odors also have the potential to decrease students' ability to learn.

Implications of Altered Child Development

A study exploring the social and economic benefits of reducing lead exposure highlights the importance of decreasing overall pollution exposure that is linked with cognitive, neurological, and behavioral impacts, by examining the benefits of reducing the 2008 blood lead levels of children (from birth to six years) to less than 1 µg/dL (from an average of about 2 µg/dL currently) prospectively to their 65-year-old counterparts (Muennig, 2009). Lead exposures have been significantly associated with excess medical and schooling costs, teen pregnancy, low-birth weight infants, child abuse, crime, wage earnings, welfare utilization, and adult health (Muennig, 2009). Figure 2 depicts how lead can impact IQ, academic achievement,

and social functioning. Muennig concluded that this reduction in lead exposure would reduce crime and increase high school graduation rates in the projected population. The benefits of reduced crime and increased high school graduation rates (while accounting for a discount rate of 3%) would result in an annual social benefit of $50,000 (± $14,000) per child and an overall benefit of saving $1.2 trillion (± $341 billion) and allowing for 4.8 million quality-adjusted live years that could be missed if lead exposures are not curtailed (Muennig, 2009). While Muennig provides an example of social and economic costs associated with lead exposure, as we have seen, there are many toxicants that can impact health and academic achievement, and the reduction in childhood exposures to these toxicants may have numerous long-term benefits.

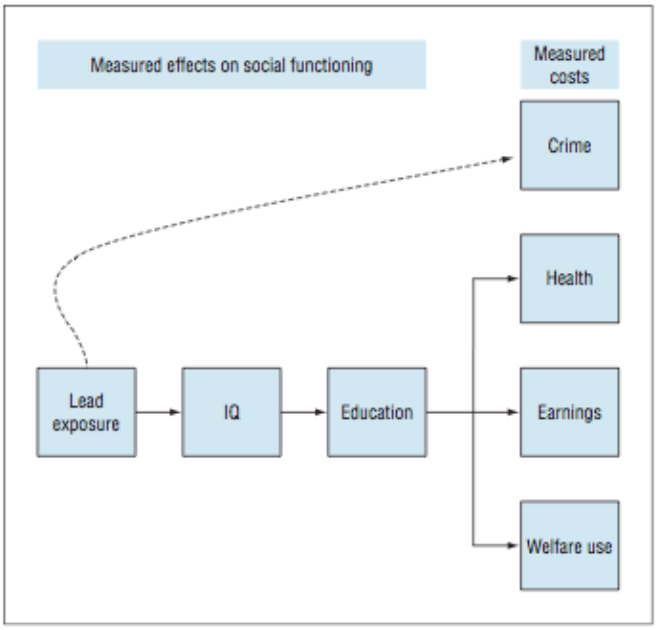


Figure 2.1.2 Muenning's (2009) model depicting how childhood lead exposure links to social outcomes and costs. Solid lines represent pathways that are mediated by educational achievement; dashed lines represent pathways that are direct effects of childhood lead exposure.

Safe Routes to School and Walkability

The ability of children to walk or bike to school has gained growing public health attention in recent years, as studies have shown that characteristics of the built environment can have an important effect on childhood physical activity, and in turn, childhood obesity (Rahman, Cushing, and Jackson, 2011). While our review focuses on health concerns as they relate to environmental pollution, we acknowledge that this is an area of high concern for child health, as promoting active transport (e.g., walking and biking) to school is an important way to encourage physical activity among children and reduce the prevalence of childhood obesity.

In particular, the federally funded, state managed Safe Routes to School programs have brought the concerns of school walkability and bikeability to greater public awareness. Throughout our stakeholder interviews, funding from the Safe Routes to School program was brought up often as an integral component towards promoting active transportation to school, as will be discussed later. Furthermore, the location of schools relative to roadways and homes within communities can impact traffic flows and the distribution of air pollution. Of note, in California, schools participating in the Safe Routes to School program increased their number of students walking to school by 38%. This indicates that improving characteristics of the built environment and implementing programs that promote walkability can be important ways of promoting active lifestyles among children (Boarnet, Greenwald, and McMillan, 2008; Rahman et al. 2011). Walkability as well as environmental quality of school sites should be assessed in school siting decisions, to determine the most appropriate course of action to promote school children's health.

Conclusion

The location of school sites can impact the daily pollution exposures to students, as well as faculty and staff. Reducing exposures to environmental pollutants through thoughtful school siting is one important way that the burden of these exposures on society can be reduced. Furthermore, there are a number of other direct and indirect ways in which thoughtful school siting can affect the health of children and communities. For example, schools sited closer to the residences of a majority of students can lead to reduced childhood obesity rates and fewer motor vehicle accidents, as more students can walk and bike to school, creating a reduction in overall traffic volume (Miles, Adelaja, and Wyckoff, 2011). We must acknowledge that there are cases where an "ideal" school location without environmental health hazards may not exist. In these instances other measures to prevent child exposures should be enacted. For example, specific HVAC systems and/or air exchange rates can be implemented to reduce potential exposure. The positive and negative health effects associated with where a school is placed will vary due to locality; rural areas, suburban areas, and urban areas may each have unique challenges that arise in making siting decisions. Ultimately, a well-informed policy should address, to some extent, all of these health concerns, while remaining flexible to other issues that play a role in siting decisions, such as financial considerations and current land use patterns. The next section will discuss how environmental health fits in with the overall environmental justice movement.

Chapter 2.2: School Siting and Environmental Justice

Environmental Justice

The environmental justice movement was borne out of the fight against environmental racism. Environmental racism has been defined as "the intentional or unintentional racial discrimination in enforcement of environmental rules and regulations which leads to the singling-out of minority and low-income communities for the siting of noxious facilities" (Bullard, 2000). This led to the defining of the environmental justice movement as "seeking to redress inequitable environmental burdens, oftentimes borne by minority and low-income communities" (Bullard, 2000). Unwanted land uses have a history of utilizing the "path of least resistance" which leads to environmental burdens being placed on communities with limited amounts of resources, such as minority and low-income communities. Resource-poor communities often lack organization, financial resources or funding and long-term personnel or dedicated grassroots organizers to maintain a long-term fight against the installation of these environmental and health hazards in their communities (Bullard, 2000; Anand, 2004). These environmental and health burdens include landfills, chemical plants, hazardous waste dumps, and power plants. The issues that these communities face are coupled with the fact that there are few advocates of environmental justice at the federal level. These minority and low-income communities have faced discrimination, in addition to burdens such as high unemployment rates, and increases in crime and drug usage which often result from high unemployment rates. These concerns often trump those of environmental health and protection as issues of importance within their communities. Furthermore, individuals living in these communities often face racial barriers to employment, adequate and fair housing, and equal access to education (Bullard, 2000; United Church of Christ, 1987). While these issues and their resulting consequences are

important, a failure to create legislation that provides better protection for marginalized communities will result in further discrimination against these communities and increased environmental and health consequences that will create increasingly large social burdens and costs for society as a whole (Intergovernmental Panel on Climate Change, 2007). Environment and health issues in low-income and minority communities range from the construction of freeways through residential areas to inadequate collection of waste (Bullard, 1994). Many of these issues arise from other institutionalized discriminatory issues, including: real estate practices, distribution of wealth, siting of industrial facilities, land use regulation, and lack of environmental regulation and enforcement (Bullard, 1994). This decision making process, at all levels of governance, is extremely difficult as the decision point lies at a junction between "science, economics, politics, and ethics" (Bullard, 1994).

Environmental Justice and Schools

While activism in the environmental justice movement is essential at the community level, children are subject to health issues resulting from environmental injustices without the ability to represent themselves as a part of the environmental justice movement. Children spend a significant portion of their time in and around school buildings, and these facilities are seen in many communities as a gathering place to host community activities and foster a safe and healthy learning/development environment. Children are also more vulnerable than adults to exposures to environmental toxicants and pollutants, as children breathe in higher levels of toxics when compared to adults, causing children to have higher exposures to toxicants such as lead, arsenic, pesticides, and other environmental pollutants (Mohai, Kweon, Lee, and Ard, 2011).

One of the most well-known and popularized case studies on environmental injustices in schools is that of East St. Louis, Illinois. The city is 98% African American, and nearly one third

of the families subsist on less than 7,500 dollars per year while 75% of the population rely on some form of welfare (Kozol, 1991).The city has been described as "the most distressed small city in America" by the United States Department of Housing and Urban Development and is polluted by emissions from Pfizer and Monsanto chemical plants, which are sited near the city (Kozol, 1991). The high levels of emissions and air pollutants in the city have been linked to one of the highest rates of child asthma in the United States (Kozol, 1991). It is estimated that in the East St. Louis school system, about ten to fifteen percent of students are in true academic programs, rather than technical or other programs, and, while 55% may graduate, only about 20% attend four-year colleges and another 10 to 20% may achieve some other form of higher education (Kozol, 1991). The city is able to spend approximately half as much per pupil each year in comparison to the top-spending districts in the state (Kozol, 1991). Many of the students within this school system, along with their educators, feel that their schools are dilapidated, their education system is failing, the surrounding environment is poisonous, and funding is lacking due to the socioeconomic make-up of the community, since this is not a plight so severe in other areas of St. Louis (Kozol, 1991).

Child Health, Environmental Justice, and School Siting

A 2007 study conducted by Chakraborty and Zandbergen researched 153 schools in Orange County, Florida, and found that minority and low-income populations may face greater health risks due to environmental justice issues of siting of toxic facilities, leading to the potential for greater health impacts on children of vulnerable groups from air pollution and school location (Chakraborty and Zandbergen, 2007). Chakraborty and Zandbergen considered three different types of air pollution: industrial facilities reporting emissions to the Environmental Protection Agency's (EPA) Toxic Release Inventory (TRI); small facilities

reporting releases to the EPAs aerometric information retrieval system (AIRS); and major roadways (Chakraborty and Zandbergen, 2007). As of 2007, there were 153 schools in Orange County, Florida, with 151,709 students; 27.09% African American, 29.55% Hispanic, and 34.69% White, with 6.91% falling into the other category (Chakraborty and Zandbergen, 2007). Both schools and home locations were accounted for in the study, resulting in more students being located closer to industrial or polluting sources at home than at school, regardless of race (Chakraborty and Zandbergen, 2007). However, black and Hispanic children were located closer to pollution sources at home and school than white children, suggesting that they were exposed to greater amounts of overall pollution than white children (Chakraborty and Zandbergen, 2007).

With more than 135,000 public and private schools in the United States housing more than 53 million students, considerations of environmental justice and child health are relevant discussions to the school siting process (Mohai, et al., 2011). As previously discussed in the health portion of the literature review, children are a vulnerable population, in comparison to adults, as exposure to environmental pollutants during stages of mental and physical development can lead to life-long health effects (Mohai et al., 2011). Health literature is increasing in scope to recognize the environmental justice issues involved in increased exposures of children in minority or low-income populations (Mohai et al., 2011). Mohai et al.'s (2011) study, mentioned earlier in the health section, examined air pollution concentrations in relation to elementary, middle, junior high, and high schools in the state of Michigan (Mohai et al., 2011). The emissions data were modeled from data provided in the EPA's Toxic Release Inventory (Mohai et al., 2011). In order to measure student academic performance, data from the Michigan Educational Assessment Program (MEAP) scores were assessed to determine percentages of students who were failing to meet the state standards in English and math portions of the exam

(Mohai et al., 2011). The study found that 62.5% of all schools in the state of Michigan were located in areas with the highest (ninth and tenth deciles – 20%of areas with the highest levels of pollution from industrial sources) levels of pollution from industrial sources, and that 67.3% of students attended schools in these areas (Mohai et al., 2011). More than half of the schools in the top two polluted deciles were in the top decile (Mohai et al., 2011). It was also noted that 81.5% of African American students and 62.1% of Hispanic students attended schools in the tenth most polluted decile, and within these schools, 62.2% of all students were enrolled in the state's free lunch program (Mohai et al., 2011). According to the EPA's Toxic Release Inventory, 95% of the air pollution from industrial sources around schools in the state of Michigan can be attributed to twelve chemicals: glycol ethers, cobalt, lead, molybdenum trioxide, hydrochloric acid, trimethylbenzene, chromium, chlorine, nickel, sulfuric acid, manganese, and diisocyanates (Mohai et al., 2011). As previously discussed in the health portion of the literature review, many of these chemicals have known health effects.

Issues of environmental health have been linked to health effects in children before they enter school facilities, such as preterm birth, low birth weight, and birth defects. Air quality in and around schools is linked to increasing adverse health effects on students (Pastor, Morello-Frosch, and Sadd, 2006). Research also suggests that schools with higher minority populations are more likely to be located in areas that have lower air quality, which demonstrates an environmental justice issue in the siting of schools and toxic facilities (Pastor et al., 2006). In examining environmental justice, air quality, and school performance in California, a recent study's results indicated a relationship between students of color disproportionately attending schools with higher respiratory hazard exposures and between respiratory hazards and student academic performance (Pastor et al., 2006). Specifically, the areas with the highest respiratory

hazard ratios (a means of quantifying respiratory health risks based on the quantity and type of pollutants in the air, and used in the EPA's National Air Toxic Assessment) are the most densely populated urban areas in the San Francisco Bay area and Southern California (Pastor et al., 2006). Furthermore, schools with respiratory hazard ratios above average are, on average, 20% less white, and have increased populations of Latinos, Asian Pacific Islanders, and African American students. The study also controlled for several factors such as parent education achievement, socio-economic status, and school size in determining the relationship between respiratory risks and lowered academic performance. The continuing association found between respiratory risks due to environmental exposures and lowered academic performance with these factors controlled for suggests that environmental quality in the school area should be a concern for policy makers and community members, as it effects student performance and has disproportionate effects on students of color and low income (Pastor et al., 2006).

Air pollution and roadway traffic have been associated with adverse cardiorespiratory effects, including increased rates of asthma (McConnell et al., 2010). Children spend a large portion of their day at school, where exposure to increased traffic and subsequent air pollution may increase their risk for asthma as increasing evidence demonstrates that living near heavy traffic corridors is associated with increased asthma rates (McConnell et al., 2010). The Southern California Children's Health Study was performed to investigate the chronic effects on respiratory health of exposure to air pollution as 10% of California's schools are located within 150 meters of roadways that carry more than 25,000 vehicles per day (McConnell et al., 2010). The study excluded students with a history of physician-diagnosed asthma, and the final study included 2,497 students enrolled in kindergarten and first grade at 45 schools (McConnell et al., 2010). Within the three years the study was conducted, children with new-onset asthma or

asthma diagnosed by a physician after the study began were tracked and ambient levels of ozone, nitrogen dioxide, and various levels of particulate matter were measured (McConnell et al., 2010). School proximity to freeways and highways was measured and concentrations of vehicle traffic air pollution were estimated (McConnell et al., 2010). During this time period, there were 120 new cases of asthma (18.7 new-onset asthma cases per 1,000 students), and African American students had the highest rate of new-onset asthma (33.9 new cases per 1,000 students) (McConnell et al., 2010). Physical education and exercise outdoors at schools could explain the strong effect that school location has on asthma rates as inhalation rates are increased during these activities, which may increase the intake of pollutants and exposure (McConnell et al., 2010). Environmental factors resulting in increased asthma rates among children in low-income and predominantly minority communities are important public health concerns, and have the potential to be mitigated and regulated in order to reduce asthma-related morbidity and mortality in these populations (Eggleston, 2007).

Lead exposures, as measured via blood levels, has been associated with learning deficits and lowered intelligence quotients (IQs) in children (Zahran, Mielke, Weiler, and Gonzales, 2009). Children are susceptible to lead absorption during prenatal development and childhood; children between the ages of two and six demonstrate the greatest susceptibility to blood lead level increases (Zahran et al., 2009). Lead exposure and neurotoxicity has been demonstrated to have an effect on learning achievement levels according to a 2009 study in pre-Katrina New Orleans public schools (Zahran et al., 2009). For this study, blood lead levels were examined through the Louisiana Childhood Lead Poisoning Prevention Program, which contains information from 2000 until the occurrence of Hurricane Katrina in 2005, and neurotoxicity was evaluated using student performance on the Louisiana Educational Assessment Program

standardized tests as a proxy (Zahran et al., 2009). The study observed that blood lead levels in students was a greater predictor of student academic performance than poverty or class size, and demonstrated a positive association between increased blood lead levels and the proportion African-American students at the school (Zahran et al., 2009). This supports previous research with environmental justice implications that focused on children living in New Orleans, which is often considered a marginalized community due to its large number of minority and low-socioeconomic status residents being exposed to high levels of toxicants from industry in the area. Zahran et al. (2009) also demonstrated a correlation between increased test scores and increased racial diversity of a school's student body, although not the focus of the study, which suggests that as schools become less racially segregated, test scores and environmental health conditions have the potential to improve.

Conclusion

These studies demonstrate that inequitable distribution of environmental exposures on the basis of race and ethnicity as well as socio-economic status can lead to negative consequences for both student health and academic achievement in pollution-burdened areas. Furthermore, they show that a lack of consideration of environmental quality in school siting can exacerbate the disproportionate pollution burdens that are often experienced by children in low-income and predominantly minority communities. The environmental justice issues associated with school siting and its effects on health further demonstrate the need for school siting policies based on environmental quality, as the presence of such policies can help reduce the pollution burdens of students at schools constructed in the future. To address the health and justice issues related to school siting, the 2007 Energy Security and Independence Act (ESIA) of 2007, inserted in an amendment by Senator Mark Pryor (D-AR), for the Environmental Protection Agency to develop

guidelines for school facility siting which accounted for vulnerabilities to hazardous pollution. The next section will discuss the development of these guidelines.

Chapter 2.3: Environmental Protection Agency Guidelines

Overview

In October 2011, the Environmental Protection Agency (EPA) released their final draft of environmental school siting guidelines which have been in development since 2007. These were spurred by a mandate placed in the Energy Security and Independence Act (ESIA) of 2007, inserted in an amendment by Senator Mark Pryor (D-AR), for the EPA to develop guidelines for school facility siting which accounted for vulnerabilities to hazardous pollution, modes of transportation for students and staff, energy efficiency, and the use of schools as emergency facilities (U.S. EPA, 2011a; Energy Security and Independence Act, 2007). While the EPA has the authority under congress to issue these guidelines, they currently have no authority to issue any regulations specifically related to school siting issues. As such, these serve as recommendations for local education agencies (LEAs) to consider when: deciding to renovate an existing school or build a new one, acquiring land for school facilities, deciding how and whether to use property already owned by the local education agencies, when renovating structures, and when leasing land.

The EPA took a number of measures to solicit public input for these guidelines. A school siting task group was created under the Children's Health Protection Advisory Committee (CHPAC), which included scientists, school administrators, legal professionals, and health professionals from the public, private, and non-profit sectors (U.S. EPA, 2010a). This task group provided input to the EPA on what should be included in their guidelines and later reviewed the first draft of the guidelines. While the EPA's final guidelines accounted for these comments as well as comments solicited by the public, they still have important limitations that we will discuss at the end of this section, in mentioning the relationship of these guidelines to state and

local-level action. Prior to that, we will present a brief overview of the most important points of these guidelines.

Steps for meaningful community involvement

One of the most important recommendations in the EPA's guidelines is that of a strong avenue for community involvement in the school siting process. The EPA guidelines include important methods for gaining public input; furthermore, they list a number of sources to redirect interested parties to their existing materials on responsible risk communication. These sources are also linked at the end of this chapter.

In their public participation strategy, the EPA recommends the creation of a school siting committee that would be responsible for making recommendations to the local education agency. These recommendations would concern decisions on whether to renovate an old school, lease a new location, or build a new school; they would also concern decisions during the school site selection process, in the latter case. Specifically, the EPA recommends that the committee comprise a diverse body of stakeholders. These include representatives of the local education agency, local government organizations, non-governmental organizations, and local businesses, as well as teachers, school staff members, parents, and age-appropriate students. While the EPA suggests that these individuals should be selected in a publicly transparent process, they do not suggest any particular ratio of public officials to other community members (U.S. EPA, 2011f). In this respect, states and municipalities may have varying interpretations of the EPA's guidelines.

The EPA recommends the development of a forward-thinking communications plan. Specifically, this means that communications to the public should be delivered in plain language and materials on site plans should be disseminated throughout key avenues in the community,

including at schools, community centers, places of worship, businesses, Parent-Teacher Association meetings, in relevant labor unions, and on the internet. In conjunction with this, public meetings and hearings should be held in which members of the community have the opportunity to comment on the disseminated site plans (U.S. EPA, 2011f). Because of this public comment and involvement consideration, the EPA recommends that training and education be offered to community members who would like the opportunity to have input in the site selection process but may not have the technical and legal knowledge to be adequately able to both understand the proceedings of hearings and give their input (U.S. EPA, 2011f).

Desirable aspects for school sites

Based on the considerations of the Children's Health Protection Advisory Committee, the EPA decided that a school site should contain the following five desirable attributes. 1) Sites should not expose students and staff to unacceptable environmental or health risks. 2) Sites should be nearby community facilities to facilitate walking and biking, and should be in an area in which a large portion of the student body lives within ½ to 1½ miles of the school. School sites should also have safe routes for pedestrians and bicyclists to make it to the school, such as having adequate sidewalks, crosswalks, and bike lanes. 3) Sites should ideally be able to use existing infrastructure (water, power, sanitation, and transportation services) as much as possible. 4) School sites should not be located on sensitive lands, such as critical wildlife habitat, or important farmland, among others. 5) Finally, sites should have the potential to make use of alternative and renewable energy sources (U.S. EPA, 2011e). Our summary of the EPA recommendations will focus on the first three of these categories.

Stages of site review

The EPA recommends a stepwise process for the selection of school sites based on environmental characteristics, and performed by environmental professionals, with input from communities (U.S. EPA, 2011d). The basic steps are outlined in Figure 1.

Stage 1 – Scoping of candidate sites

This is a basic screening of potential school sites based on the desirable school site criteria described above, with considerations for costs of sites as well (U.S. EPA, 2011d).

Stage 2 – Preliminary environmental assessment of candidate sites

This stage involves the assessment of sites that are selected for further review. These sites are to be assessed by an environmental professional, as designated by the American Society for Testing and Materials' system standards(U.S. EPA, 2011d). The EPA recommends that a report be generated which combines an Environmental Site Assessment (ESA) of onsite contamination, as well as assessments of offsite environmental impacts on the site, the impacts of the project on the environment, and the adherence of the site to the desirable school site criteria listed above. Furthermore, the local education agency should solicit public comments on this preliminary assessment and address these comments in the next stage (U.S. EPA, 2011d).

Stage 3 – Comprehensive environmental review

A comprehensive environmental review is similar in goals to the preliminary assessment, but involves a more detailed analysis of the public health and environmental impacts of a potential

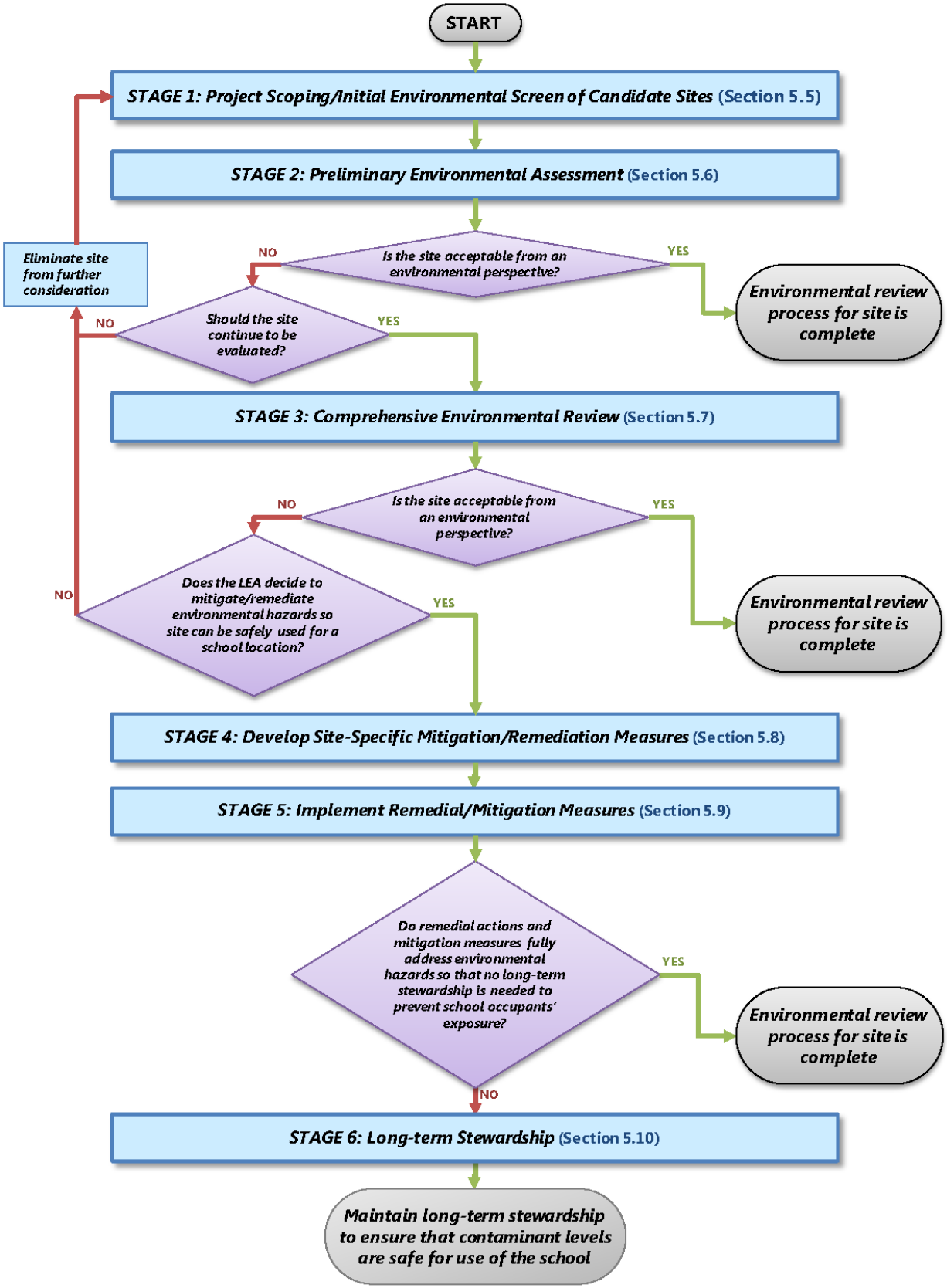


Fig 1. EPA School Siting – Stages of Site Review (U.S. EPA, 2011d)

site. The EPA recommends that this comprehensive review be completed for the prospective site or sites that are selected for further consideration after Stage 2. In this step, an environmental professional would, after the detailed analysis of a site, identify mitigation methods for potential public health concerns or environmental issues involved with a site if they are identified during Stage 2 site assessments. This would include preliminary cost estimates as well as timelines for these mitigations. The final report would then be, ideally, submitted to a school siting committee and posted for a public comment period (U.S. EPA, 2011d).

Stage 4 – Develop site-specific mitigation/remediation measures

Once a school site has been selected, this stage involves the creation of a detailed impact mitigation and environmental remediation plan if needs for mitigation/remediation have been identified at the site during Stage 3. In addition to the immediate workplan, this would include the development of a long term stewardship plan for the site, if it is deemed necessary. This workplan should be submitted to both the state and/or tribal environmental agency for approval as well as to the public for a comment period, after which approval of the final plan may occur (U.S. EPA, 2011d).

Stage 5 – Implement mitigation/remediation measures

This stage involves the implementation of the mitigation/remediation workplan at the site developed in Stage 4. In their guidelines, the EPA includes a variety of example situations that may be encountered and would require such measures. These include the presence of volatile organic compounds (VOCs) or petroleum in the soil and groundwater, cases of contaminated ground fill existing at a site, and the presence of currently banned pesticides from historic agricultural and pest management practices (U.S. EPA, 2011d).

Stage 6 – Long-term stewardship

This stage involves the implementation of the long-term stewardship plan developed in Stage 4. Long-term site stewardship should involve a periodic assessment of the environmental characteristics of the facility. Plain-language summaries of the routine monitoring should be made available to the public. The EPA makes no explicit recommendations for the timeline of this monitoring, but does make a couple of suggestions. First, local education agencies may require annual site reviews for the first few years at sites that have been remediated or require other environmental controls, as part of long-term monitoring plans. Furthermore, the EPA also suggests that its monitoring plan used for assessing Superfund sites, which involves site assessments every five years, may be used as a model (U.S. EPA, 2011d).

Environmental Pollution Considerations

The EPA school siting guidelines include a detailed set of environmental pollution considerations that local education agencies should account for in the site selection process. Contrary to what is included in the siting guidelines and mandates in some states, the EPA's guidelines do not include consideration of minimum distance ("buffer zone") recommendations from environmental hazards. This is in spite of the fact that these were originally requested by the School Siting Task Group (U.S. EPA, 2010a). Comments both for and against the inclusion of buffer zones were addressed by the EPA. One principle argument for mandates is that minimum distance requirements can be an easy early screening process for sites, saving school districts time and money during the siting process.

However, others feel that environmental hazards should be taken into consideration in a community-wide context, as many of the pollution issues faced in certain areas are not only faced by schools. Additionally, the EPA note the possibility for multiple pollution sources

beyond a minimum buffer distance from a site yielding a worse air quality at the school site than a single pollution source within that minimum buffer distance. Ultimately, the EPA, while acknowledging the potential benefits of buffer zone recommendations, felt that it would be inappropriate to issue such recommendations from a federal level, adding that there is the potential for minimum buffer distances to obscure the mission of school districts to adequately assess each individual site, and may provide counterproductive results (U.S. EPA, 2011b).

In addressing environmental hazards, the EPA issued a set of factors involving environmental risks for school districts and communities to look over in the context of both new schools and existing schools. Factors accounted for are: air pollution, soil contamination, local pesticide usage, ground-and-surface water contamination, safety hazards, noise, and odors. Furthermore, the EPA issued considerations for communities to account for in the siting of new schools with regard to environmental and safety hazards; while not including buffer distances, there are recommendations to review potential environmental health hazards within certain distances (ex. ½ mile, 1 mile) of the school site (U.S. EPA, 2011c).

Air Pollution

The EPA recommends that communities take into account a number of considerations with regards to sources of air pollutants. The recommended screening perimeter for industrial and roadway sources of pollution is roughly a half-mile. These sources may include highways and other major roadways, bus terminals, truck stops, garages with heavy truck traffic, fossil fuel power plants, as well as other large industrial facilities. Additionally they recommend that smaller facilities, such as dry cleaners using toxic chemicals like perchloroethylene, that are within 1000 feet of schools be considered as potential hazards. Considerations which local

education agencies should take into account include: the type and volume of contaminants that are released, the distance of the school to the pollution source, the timing of releases, and meteorological conditions such as wind speed. Furthermore, the guidelines direct schools to a number of different online air quality monitoring tools (Air Explorer, AirData, and the National-Scale Air Toxics Assessment [NATA]). Each of these tools would play a part in air quality assessments of potential school sites (U.S. EPA, 2011c).

Soil and Water Pollution/Waste Disposal Facilities

The EPA recommends that communities identify and evaluate all solid waste landfills, waste transfer stations, and hazardous waste sites (including Superfund and Resource Conservation and Recovery Act sites), as well as smaller sources of pollution, such as auto body shops and small manufacturing facilities, within approximately one mile of any potential school site. Furthermore, they recommend that hazardous material pipelines, such as those transporting natural gas and oil, that are within 1,500 feet of school sites be considered as potential hazards, as there might be serious safety considerations with such pipelines in emergency situations. Specifically, local education agencies should evaluate potential or existing soil contamination, groundwater contamination, and vapor intrusion into structures from contaminated soils. This evaluation should be conducted by environmental professionals, as designated by the American Society for Testing and Materials' system standards (U.S. EPA, 2011d). Examples of soil and groundwater contaminants include certain volatile organic chemicals (VOCs), arsenic, lead, mercury, and other heavy metals (U.S. EPA, 2011c).

Noise and Odors

In addition to the health related considerations above, the EPA recommends that noise and odors in the environments around potential school sites be taken into account, as they act as distractions. With regards to noise, which may occur from potential sources of air pollution or soil and groundwater contaminants, the EPA recommends that local education agencies account for the distance of sites from the noise source, the timing of the noise (whether it is noisy during school hours), the intensity of the noise, and what sorts of barriers exist or could be put into place to reduce the amount of noise experienced at the site. Odors at the site that emanate from the aforementioned sources of soil and air pollution, or any other sources, should also be accounted for in terms of their timing and intensity. The EPA recommends the consideration that odors be mitigated through the use of enhanced air cleaning and ventilation systems, as well as locating sensitive portions of school facilities, such as playgrounds and athletic fields, away from odor sources (U.S. EPA, 2011c).

Transportation Considerations

The EPA recommends that schools be located in areas where most students are able to safely walk and bike to school. Specifically, they recommend that schools be sited such that the majority of the student body lives within approximately a half mile for elementary schools, approximately one mile for middle schools, and approximately one and a half miles for high schools. Areas near schools should also have access to transportation infrastructure items which may facilitate walking and biking to school, such as the presence of sidewalks, crosswalks, and public transit stops. Furthermore, they recommend that schools be located close to other community assets, such as parks and community centers. Ideally, this would allow students to

walk or bike to these other resources, increasing exercise and reducing space required for parking (U.S. EPA, 2011b).

State Role in School Siting

While there has been a growing presence in school siting issues from both the federal government as well as nationally-active NGOs, there is still a necessary role for state governments to play in promoting responsible school siting. In their guidelines, the EPA notes that "at a minimum, state agencies are important resources for communities on siting issues" (U.S. EPA, 2011g). In order to make their resources more easily available to local education agencies, the EPA recommends that states coordinate with each other and provide liaisons to these local education agencies who are designated to answer siting-related questions (U.S. EPA, 2011g).

For local education agencies to adequately follow the EPA guidelines, a variety of new support structures at the local and state level would be needed. One example of this is the creation of local school siting committees that would contain not only affiliates of the school, but also other local stakeholders. On the state level, geographic information system (GIS) support, such as information on the traffic volumes associated with major roads, as well as the locations of potentially hazardous facilities, such as dry cleaners, that would not be included in Toxic Release Inventory (TRI) geographic datasets. For these reasons, without a state policy on school siting, independent efforts among local and state agencies would be needed to promote the atmosphere of cooperation and community involvement which the EPA guidelines recommend. As such, the state-wide coordination that such a policy would provide would be highly valuable in promoting healthy school siting.

Chapter 2.4: State Policies across the United States Literature Review

Introduction

As the Rhode Island Legal Institute demonstrated in their 2006 report called *Not in my schoolyard: Avoiding environmental hazards at school through improved school site selection*, environmentally oriented siting policies do exist in other states. The state of Michigan would not undertake a previously neglected issue by approaching this policy gap—it is an issue that nearly half of the U.S. has decided requires a policy intervention. The Rhode Island Legal Institute publication also explores the diversity of policies in each state. This section begins with an overview of the Rhode Island Legal Institute's review of state policies, continuing with a closer look at the policies that exist in a selection of these states.

Overall, state policies vary wildly in stringency and scope. The autonomy of states, and the districts within them, results in a diversity of school trends, regulations, and policies in which school siting is just one portion. Our Interview Synthesis will affirm the vast swath of needs for each state and each district. This section explores several state policies and their contexts. The states reviewed in this section include: California, New Jersey, North Carolina, New Mexico, Minnesota, and Florida. These states all have policies we have deemed adequate or generally above average, and they were also targeted for our interviews. Our policy recommendations attempt to extract portions of state policies that we found particularly affective and relevant for Michigan. We aimed to garner information not only about substantive statutes directly related to siting, but also building trends and school construction funding mechanisms that are critical to our understanding of school siting policies at the state level.

Not in my schoolyard

Not in my schoolyard provides an overview of school siting policies across the U.S. and was released in 2006. Their overarching results showed many states without school siting policies and additional states with policies lacking in important criteria (Fischbach, 2006):

- Twenty do not have a school siting policy, including Michigan.
- Of the states with policies, 14 do not explicitly ban building schools on certain sites, including sites that may be unsafe for children.
- Twenty-one states have what this report refers to as guidelines (States are not mandated to adhere to them.). The Rhode Island Legal Institute suggests that guidelines are inadequate for ensuring siting decisions that protect child health. In particular, the Rhode Island Legal Institute was seeking to categorically ban, in the form of a mandate, the siting of schools on or near former landfills.
- Twelve states require the sponsors of school projects to solicit public input on school sites through the use of public notices, public meetings or hearings and these states may not have additional environmental or pollution policies for school siting.
- The Rhode Island Legal Institute also advocates for additional collaborative processes and public involvement by recommending the formation of school advisory committees. As of 2006, eight states advised or mandated such a committee.

From the Rhode Island Legal Institute's findings, one can see the lack of uniformity and consensus on state-level school siting. The Rhode Island Legal Institute criticized many policies as "vague." However, the Rhode Island Legal Institute identified California's policy as particularly comprehensive in the report's seven key policy areas: having a policy that addresses environmental hazards, prohibition of school siting on some sites, other factors (guidelines),

environmental hazard assessments, solicitation of public input, and requiring the creation of a school advisory committee. The Rhode Island Legal Institute concluded their report by creating a model policy that emphasizes their key criteria. Below is a brief outline of the key components:

Insuring Meaningful Participation in School Siting Decisions

The Rhode Island Legal Institute recommends engaging a broad swath of local stakeholders to undertake the siting of a new school by forming a standing school siting committee. This committee would create a website that would allow community members to access up-to-date siting news. The Rhode Island Legal Institute also recommends improving and broadening public participation by mandating timely public notices about emerging school siting issues and offering ample time for public comment.

Categorical Exclusion for Candidate School Sites

The Rhode Island Legal Institute asserted that state law must prohibit the siting of schools on certain contaminated sites that present "unacceptable risk." Their particular recommendation was that "Under no circumstances should a school be built on top of or within 1,000 feet of a site where hazardous or garbage waste was landfilled, or where disposal of construction and demolition materials occurred." To help avoid these sites and other potentially hazardous sites, the Rhode Island Legal Institute recommends performing a preliminary environmental assessment and subsequent and more comprehensive assessments if hazards are identified on a potential school site. The state of New Jersey utilizes this principle in their school siting policy. Finally, the Rhode Island Legal Institute identifies a series of steps called "last resort guidelines" to be used when a school must be built on a contaminated or remediated site (Fischbach, 2006). The Rhode Island Legal Institute acknowledges that in some communities, avoiding these sites is simply unavoidable. In Michigan, for example, highly developed urban

areas such as Detroit or Grand Rapids might need to utilize a type of "last resort guidelines" for new school sites.

Not in my schoolyard was a fairly comprehensive and groundbreaking overview of school siting. The policy recommendations found in our report are a synthesis of the Rhode Island Legal Institute's foundational work, the EPA guidelines, interview feedback, lessons from siting policies implemented in other states, specific considerations for the state of Michigan, and, finally, contributions of new criteria for the school siting process.

Review of Selected States

This section will provide an overview of California, New Jersey, North Carolina, New Mexico, Minnesota, and Florida's school siting structures that includes: statewide trends in school building and student population, funding mechanisms, the origin of that state's school siting policy, the key features of the policy, and any information available about siting outcomes that may have been affected by the policy's passage. When possible, this section will illustrate similarities and differences between the selected states and Michigan.

California

According to California Department of Education, there were 6,217,002 students enrolled in elementary and secondary public schools during the 2010-2011 school year (California Department of Education, n.d.). According to a 2007 report from the California Budget Project, California generally spends less per student and per capita than other states (California Budget Project, 2007). According to the most recent statistics available, California ranks 34th in the U.S. for elementary through secondary school spending per student at $8,607 (The national average in 2005 was $9,566.) (California Budget Project, 2007).

Funding for school construction is allocated through the California Government's Office of Public School Construction. The Office of Public School Construction is under the authority of the State of California's Department of General Services (California Department of General Services, 2011). The Office of Public School Construction implements and administers a $35 billion voter-approved school facilities construction program (California Department of General Services, 2011). On December 14, 2011, the Office of Public School Construction announced that the State Allocation Board approved Priority Funding apportionments totaling $923.8 million which will help finance 377 school construction projects in 154 school districts statewide (California Department of General Services, 2011). The apportionments were made possible by the State Treasurer's October 19, 2011 bond sale, which yielded nearly $1 billion for the state School Facility Program (California Department of General Services, 2011).

In order to qualify for the School Facility Program and receive funding, sites selected by school boards for school construction are required to go through a rigorous siting process that heavily factors in the environmental health of the site. This stringent school siting process became effective January 1, 2000 (California Department of Education, 2000). These two bills require assessments and remediation or clean-up of toxic contamination on school sites (including naturally occurring hazardous materials). These bills were passed with the intention of ensuring that sites selected for school construction are free of significant contamination. The passage of these bills occurred after the controversial decision to halt construction of the Los Angeles Unified School District's (LAUSD) Belmont Learning Center in Los Angeles in 1999 after concerns of the site's safety were raised. This put the school district in a difficult position, since the district had already purchased the land and built two buildings on the site (California Department of Toxic Substances Control, 2002).

The Los Angeles Unified School District began construction on the Belmont Learning Center in 1997, but the site was an abandoned oil field and environmental tests revealed hydrogen sulfide was present in the athletic field and campus area (California Department of Toxic Substances Control, 2005). Hydrogen sulfide can be toxic, even at low levels (California Department of Toxic Substances Control, 2005). Because portions of the site were located within the boundaries of the Los Angeles Oil Field, naturally occurring crude oil, methane, and hydrogen sulfide exist in the soil under the site. In addition, investigation found that the area was previously used as a gas station, where fuel was stored in underground tanks. This may have led to additional contamination of soils and groundwater in some areas (California Department of Toxic Substances Control, 2002).

However, in 2003, the school board voted to proceed with using the property for school purposes and developed a costly and extensive remediation plan (California Department of Toxic Substances Control, 2005). The seemingly avoidable costs incurred to remediate the Belmont Learning Center site catalyzed the development and subsequent passage of California's school siting policy.

The current school siting process for California is led by the California Department of Toxic Substances Control (DTSC) - Schools Property Evaluation and Cleanup Division and is explained thoroughly on their website. All potential school sites must complete a Phase I Environmental Assessment. Phase I Environmental Assessments does not require soil or air samples, but are essentially a research investigation into the current and historic uses on and in proximity to potential school sites to determine if a hazard may be present (DTSC, 2001; DTSC, 2011). Phase I Environmental Assessments are reviewed to meet the Department of Toxic Substances Control standards for "residential" use of land, which is the California Department of

Toxic Substances Control's most protective standard. If the Phase I Environmental Assessment concludes that there are potential hazards that present risks to children's health, further investigation is required and a Preliminary Endangerment Assessment (PEA) is needed (California Department of Toxic Substances Control, 2011). This is a Phase II Environmental Assessment.

The school district enters into an agreement with Department of Toxic Substances Control to oversee the preparation of the Preliminary Endangerment Assessment and is responsible for contracting a qualified environmental consultant to prepare a Preliminary Endangerment Assessment. During a Preliminary Endangerment Assessment, samples are taken and tested (California Department of Toxic Substances Control, 2011). During the policy's first two years, the new rules for environmental assessments resulted in assessments for more than 700 potential school sites in nearly 280 school districts throughout California. Remediations were performed at twelve sites (California Department of Toxic Substances Control, 2002). The process of school site selection also mandates public involvement and the formation of local school siting committees made up of community stakeholders. California's policy also requires active communication with the local planning commission. The California Department of Education developed a comprehensive flow chart to illustrate the process of site assessment; that's publicly available online (California Department of Education, 2002).

Despite low funding per pupil, California is able to generate substantial funds through voter initiatives. These funds make their comprehensive policy possible. Their existing structure of state oversight in schools allowed California to add stringent school siting regulations without overhauling their bureaucratic mechanisms. Michigan would need substantial changes in their funding mechanisms and the addition of a state oversight organization in order to execute the

policy that California has. However, California's policy demonstrates the kinds of mandates that most aggressively target better health and environment siting outcomes—Michigan could utilize aspects of their policy with success.

New Jersey

Considerably smaller in area and population than the state of California, New Jersey's public schools had an enrollment of 1.35 million students during the 2010-2011 school year (Cerf, 2012). In contrast to California, New Jersey budgeted $7.7 billion for students for the 2011-2012 school year (Cerf, 2012). As a result, New Jersey has the third highest spending per pupil in the United States, according to the Census Bureau's 2009 review of government finances (U.S. Census Bureau, 2011). By contrast, Michigan ranks 22nd nationally on spending per pupil (U.S. Census Bureau, 2011).

Funding is an important issue for New Jersey education. In February 2012, the State of New Jersey Department of Education released a document simply titled, "Education Funding Report." The report outlines a series of reforms needed for the state's education funding practices. The Department of Education provided data contending that simply concentrating funding on underachieving and disadvantaged populations would not close the achievement gap the state experiences. The report offers a series of reforms that would offer stipulations to the funding that the Department of Education feels would generate improved achievement for disadvantaged students. The report summarizes, saying, that New Jersey school funding has largely solved the problem of "how much," but needs to solve the problem of "how well" (Cerf, 2012, p. 9).

Of the states identified in this section, New Jersey has undergone the most substantial siting policy changes since the Rhode Island Legal Institute report. The change occurred because

the State of New Jersey School Construction Corporation, which the Rhode Island Legal Institute described as a "a quasi-public corporation charged with constructing schools in the 30 poorest districts in the state," was disbanded in 2007 after the organization was accused of various instances of corruption and negligence in preventing issues like the mercury contamination of Kiddie Kollege Daycare in 2006, which is described in more detail later in this section (Fischbach, 2006; Romalino, 2011). The School Construction Corporation was replaced by the State of New Jersey School Development Authority. Many of the 2003 regulations were preserved.

New Jersey's siting process is a part of "preconstruction activities" (New Jersey Administrative Code, 2008). All preconstruction activities are required for a school district to earn approval of a project. These approvals are granted by a state oversight agency, the School Development Authority. The process begins with Site Identification, which requires that the local board of education and the governing body of the local municipality must assemble a written report that includes an inventory of sites that are owned by the district, owned by the municipality, or are privately owned sites that the school district is interested in acquiring. There are four key features of this written report: estimation of costs and timetable; discussion community fit and potential negative impacts; identification of infrastructure needs such as water supply, sewage capacity, utility capabilities, and traffic characteristics; identification of significant environmental considerations such as remediation needs, soil and groundwater quality, historic and cultural uses, neighboring land uses, and ecological impacts (impact on wetlands, streams, endangered species, etc) (New Jersey Administrative Code, 2008).

The School Development Authority encourages, but does not require, a district to form a community advisory committee to promote community participation throughout the

preconstruction phase of a project. These committees could include virtually any interested community members (New Jersey Administrative Code, 2008).

This initial inventory that is required is quite broad. After the School Development Authority has used the broad inventory to determine which sites might be suitable, the district can choose one to three specific sites and seek additional approvals on those. If a community advisory committee has been formed, the committee should hold a public hearing for input on this narrower list of potential sites. After the hearing, the committee must provide an endorsement of the choices as a portion of the approval application process. In addition, the district board of education president and chief school administrator must sign a statement stating that a special meeting was held dedicated to discussion of the proposed sites (New Jersey Administrative Code, 2008). This ensures a careful and thoughtful siting decision.

After the School Development Authority approves the identification of these one to three sites, the department begins feasibility studies on the sites. Some aspects of the next phase of the preconstruction activities are architectural in nature, but this phase also has many siting considerations. For example, the School Development Authority may choose to undertake a traffic study performed by a qualified engineer. At this point, any feasibility studies are reported in writing and made available to the school district—some sites may be identified as unsuitable and rejected. Sites that meet a specific set of criteria and are identified as particularly suitable may be streamlined through the process. More likely, sites will have considerable uncertainties. In these cases, increasingly stringent feasibility studies are performed. During any stage of the increasingly stringent feasibility studies, a potential site may be quickly eliminated from consideration (New Jersey Administrative Code, 2008).

The community is also involved in this phase of the project. The school district will receive an environmental screening report from the School Development Authority. This report assesses "the likelihood of obtaining the various environmental, historical, and cultural and land use approvals and permits relevant to the proposed site" (New Jersey Administrative Code, 2008, p. 8). The school district must hold a public school board meeting no later than 30 days after receipt of the environmental screening report. It must disseminate public notice of this meeting and inform the community advisory committee, if applicable. The School Development Authority can assist the school district in "communicating the results" of the environmental screening report" (New Jersey Administrative Code, 2008, p. 9).

Following the feasibility studies and public input, the School Development Authority chooses a site based on the following considerations (New Jersey Administrative Code, 2008):

- Cost and schedule impacts
- Community impacts
- Infrastructure considerations
- Environmental considerations

These are the same criteria that the school district and municipality are required to utilize when performing the initial inventory of sites. In New Jersey, the remainder of the process is then largely controlled and executed by the School Development Authority who acquires the land and permits and oversees construction and remediation.

Seemingly ample funding and comprehensive policy has not spared New Jersey's education system from controversy, and school siting has, in fact, been a source of such controversy. A daycare in Franklin Township, New Jersey called Kiddie Kollege became the catalyst that sparked reform in school siting in the state (Romalino, 2011). In 2006, the state's

Department of Environmental Quality abruptly closed Kiddie Kollege when the Department discovered that over 100 children were exposed to high levels of mercury vapor (New Jersey Office of the Governor, 2007). When the daycare leased the site in 2004, they were not aware that the property was the former site of a thermometer factory (Romalino, 2011). Subsequent lawsuits on the matter are still underway in the New Jersey courts (Romalino, 2011).

The New Jersey legislature responded quickly to Kiddie Kollege. On January 11, 2007, former Governor Jon S. Corzine signed legislation designed to "help ensure that child care and educational facilities are environmentally safe for the children attending them" (New Jersey Office of the Governor, 2007, p. 1). Acknowledging the special vulnerability of children to toxicants, the legislation is especially interested in identifying "high risk" sites:

> Environmentally high risk sites include sites that were previously used for industrial, storage, or high hazard purposes; known or suspected to be contaminated; industrial sites that are subject to the provisions of the Industrial Site Recovery Act (ISRA); or used as a nail salon, dry cleaning facility or gasoline station. (New Jersey Office of the Governor, 2007, p.2)

Once a high risk site is identified, the school must undertake two steps to receive a building permit from their municipality. The school must obtain certification for indoor environmental quality from the Department of Health and Senior Services (DHSS), which is not a siting activity. Then, "it must demonstrate that the site has been remediated to Department of Environmental Protection (DEP) standards and that a DEP-issued 'no further action letter' has been obtained" (New Jersey Office of the Governor, 2007, p. 2). To deter noncompliance, the legislation imposes fines of $25,000 per day for first violations and $50,000 per day for second violations (New Jersey Office of the Governor, 2007, p. 2). The law endows the Department of

Environmental Protection with increased enforcement powers that include: authority to issue orders, impose civil administrative penalties, bring an action for civil penalties, or bring a civil action for injunctive or other relief.

While the school siting law was moving through the legislative process, Governor Corzine convened a task force to address other school siting issues more swiftly in response to Kiddie Kollege. In general, the task force's goal was to investigate potential initiatives to improve communication channels between state agencies and municipalities. The task force also worked with the Department of Environmental Protection to cross check databases to unify the list of high risk sites and improve the reporting of these sites.

Finally, late in 2007, the Department of Environmental Protection instituted new rules that required better community notification surrounding the remediation of any contaminated site (New Jersey Department of Environmental Protection, 2007). These rules were also a response to Kiddie Kollege and were formulated with the aim that a facility like a daycare or school could not unknowingly build on a contaminated (or formerly contaminated) site. Rather, schools could more easily identify these sites and proceed through the two aforementioned steps to obtain a building permit. The rules included a mandatory series of ways in which the party responsible for the contaminated site would inform the community about the status of the site (New Jersey Department of Environmental Protection, 2007):

- Posting a sign
- Sending letters to local officials and to owners and tenants of properties within 200 feet of the site's boundary
- Identifying sensitive populations within 200 feet of the site

- Providing additional public outreach if the community petitions the Department of Environmental Protection, or if the contamination exists beyond the site's boundaries

These three responses—legislation, the task force, and the Department of Environmental Protection rules—were initiated because of Kiddie Kollege in 2006. However, New Jersey had instituted school siting policies prior to the Kiddie College incident; the Rhode Island Legal Institute report identified the state's policy as one of the most developed in the U.S.

Like California, the state of New Jersey has the funds and bureaucratic mechanisms to implement a stringent school siting policy. New Jersey's response to Kiddie Kollege also demonstrates that changes to other aspects of policy, such as brownfield management and recordkeeping, can positively alter school siting outcomes. When Michigan decides to draft school siting policy, legislators should examine the resources and policies that are already in place and could be altered modestly to protect the environment and children's health.

North Carolina

During the 2011-2012 school year, 1,436,162 students attended one of 2,512 elementary or secondary public schools in North Carolina. Nearly two-thirds of the funds utilized by North Carolina public schools come from the state level (Public Schools of North Carolina, n.d.).

North Carolina has a unique school siting policy, in which a set of guidelines, offered by the State Board of Education's Department of Public Instruction. These guidelines were set up to cover the wide range of issues that must be accounted for in the school siting process, and environmental health issues are included in these considerations.

Under North Carolina State law, no local school board may spend any money on the construction of new schools or spend any money loaned by the state on renovations or repairs of old schools until it has "developed plans based upon a consideration of the State Board's

facilities guidelines, (ii) submitted these plans to the State Board for its review and comments, and (iii) reviewed the plans based upon a consideration of the comments it receives from the State Board." (North Carolina General Statutes § 115C-521). Also, "to reduce the impact of operation costs on local and State budgets", schools must account for a separate set of guidelines on energy usage, which also briefly mention that local sources of air pollution should be considered for their effects on indoor air quality (Department of Public Instruction, 2009). While this system of guidelines has a strong effect in requiring local school districts to consider the wide range of issues that encompass school siting and get feedback with the Department of Public Instruction's concerns, there are, ultimately, no mandates placed on the school to take any actions in particular.

Under the guidelines, when a school district decides a new school is needed, they are recommended to create a school siting committee, comprised of board members and school administrators. This committee, if formed, is responsible for identifying the activities that would occur at the new school and the types of facilities which would be required, such as athletic fields, areas for nature and conservation education, and the potential for use of off-campus facilities surrounding the site for educational purposes. After this, the committee would select the desirable characteristics of the potential site, based upon the needs of the new school. These include acreage, accessibility, safety and security, utilities availability, ambient noise level, soil conditions, topography, and cost, among others. The committee would then select sites that fit these criteria, ranking sites in order of preference. In this stage, the guidelines recommend that the district spend extra money on soil tests at preferred candidate sites, so that the cost of any necessary soil remediation is taken into account. These guidelines do not, however, provide specifics into what soil conditions require action to remediate soil at the site. In the property

acquisition stage, the guidelines stress that, in addition to per-acre site costs, the long-term costs of developing, operating, and maintaining facilities on the site should be accounted for (Department of Public Instruction, 2010).

The Department of Public Instruction's siting guidelines do mention specific environmental health issues for school districts to consider; however, there was concern from our informants that these considerations are too vague. A narrative of their feedback is incorporated into the next section, the Interview Synthesis. The guidelines explicitly mention that schools should not be too close to "congested traffic arteries and highways that are noisy and will cause delays or special hazards for school traffic" (Department of Public Instruction, 2010). Furthermore, schools should be located "away from industrial and manufacturing plants to avoid bad air quality problems" and other problems such as dust and noise (Department of Public Instruction, 2010). One of our informants mentioned, however, that these guidelines do not provide the necessary information to school planners on "how far is far enough" from these types of health hazards (Personal communication). In fact, only one environmental hazard has distance considerations included, which is distance to electricity transmission lines of certain voltages. However, the authors of the guidelines acknowledge that experts still do not have an agreement to what extent these lines pose any health hazard (Department of Public Instruction, 2010).

In addition to these environmental health recommendations, the North Carolina Department of Public Instruction provides many recommendations for different site and facility considerations. These include guidelines on site topography and drainage, access and traffic, soil conditions (aside from contaminated soil, which is not addressed), noise levels, utility access and costs, and facility heating and cooling (Department of Public Instruction, 2010).

The North Carolina system of guidelines has many benefits in its flexibility as well as its specificity in many areas, but also lacks in certain areas at addressing environmental health concerns. Given that the guidelines are provided by a state agency, these could be changed much more easily than, for example, amendments to state statutes on school siting that would have to pass through the state legislature. In spite of this, only relatively minor changes have been made in the over 15 years that the guidelines have been in place. One example of this would be the addition of "smart growth" considerations involving small school sites to the acreage recommendations provided in the most recent set of guidelines (Department of Public Instruction, 2010). Ultimately, the model of granting authority for state agencies (such as the Department of Environmental Quality and the Department of Education, in Michigan) to make environmental health recommendations, or even mandates, has many benefits. In particular it provides for flexibility over time as new scientific information on environmental exposures and their effects on health and educational outcomes become known. This would help prevent the environmental health considerations of siting guidelines from becoming dated. However, there may be concerns in the state legislature over granting this level of authority to state agencies.

New Mexico

New Mexico's total population is significantly smaller than California, New Jersey, or Michigan, which are three of the U.S.'s most populous states. As a result, enrollment in public schools is also substantially smaller—337,225 students for the 2011-2012 academic year (New Mexico Public Education Department, n.d.).

New Mexico also ranks well below average in spending per pupil (U.S. Census Bureau, 2011). Despite lower than average funding, New Mexico developed policy that aims to decrease the disparity between the richest and poorest school districts. Enacted in 1974, the goal of the

State Equalization Guarantee is to "equalize educational opportunity at the highest possible revenue level while minimizing the financial loss to the richest school districts" (Skandera and Aguilar, 2011). Even twenty years later, a 1996 study found that the formula was still effective in reducing spending disparities between school districts. Recently, the program also added incentives for districts that implement utility conservation initiatives (Skandera and Aguilar, 2011).

To generate the revenue for school facility construction, New Mexico school districts are expected to sell bonds, appeal to their community for various levies, use earnings from investments, and sell property and equipment. Funds are also made available through the Public School Capital Outlay Act which ranks the condition of every public school in New Mexico and prioritizes funding to school districts with the poorest facilities (Skandera and Aguilar, 2011). School districts are expected to supplement this fund with local bonds and millages when possible—local funding is determined by the voters of the locality.

In a state with humbler funding capacity, the siting policy also lacks the complexity of those of California and New Jersey. School siting considerations are largely outlined through a series of general best practices that help guide a school district's collective mindset as it prepares to construct a new school (New Mexico Public School Facilities Authority, 2010). There are four best practice categories: function; long-term operations, maintenance and sustainability; long term energy costs; and construction cost. The New Mexico Public School Adequacy Planning Guide (hereby referred to as "the Guide") is one of numerous resources available to the public and to school districts on the State of New Mexico Public School Facilities Authority webpage. The Guide states that the design of schools is a collaborative process and functional school buildings contribute to desired educational outcomes.

Sustainable design is also an important tenant of school planning because "the fruit of a good sustainable design is protection of taxpayer investment, lesser operational costs, and more funding available for the classroom" (New Mexico Public School Facilities Authority, 2010, p. 9). The Guide implores school districts to consider the "responsibilities of long-term building ownership" (New Mexico Public School Facilities Authority, 2010, p. 9). Importantly, the sustainable design effort should also include consideration of the school's location; some conditions the school district should consider include infrastructure cost, future traffic projections, and the character of the future neighborhood. The Guide also warns school districts of the volatility of energy markets and the difficulties in projecting energy costs in the long term. As a result, the Guide encourages school districts to utilize energy efficient design. In general, the Guide advises school districts to stay involved in the design process and question the designer when unexpected costs begin to accumulate. This includes issues of site adequacy (New Mexico Public School Facilities Authority, 2010).

The remainder of the Guide includes exhaustive standards specifically related to school design, but it also includes walkability standards based directly on recommendations of the Safe Routes to School program, a national program that advocates for better walking and bicycling routes for students going to and from school. While certain school siting factors are not mandatory, school districts must rationalize the siting decision to the New Mexico Public School Facilities Authority when the district proposes a new school. To do this, the Guide provides a Site Selection Criteria checklist in its appendix. This checklist was adapted from a 1998 document produced for North Carolina public schools, *The School Site Planner*. Several categories have particular overarching aims (New Mexico Public School Facilities Authority, 2010):

- Location: How will the school fit with the community and specific neighborhood?
- Adjacencies: Is the school located far enough from traffic, railways, airports, high voltage power lines, mines, noise pollution, air pollution, soil pollution, pollution producing sources, and flood plains? (Neither the Guide nor any regulatory statute defines “far enough” with a specific distance.)
- Soils: Is the soil free of hazardous materials and favorable for construction?
- Accessibility: Is the site favorable for traffic patterns? Does the site offer safe and convenient biking and walking routes?
- Environment: Does the site facilitate outdoor education and is it free of noise and pollution?
- Topography: Does the site drain properly and have favorable slopes for playing fields and grading?
- Size and shape: Is their sufficient space for play, parking, or future expansion?
- Utilities: Is the infrastructure available? Is it feasible to attain the utilities at a reasonable cost?
- Availability: Are the conditions for the sale of the land favorable?
- Cost: Are purchase, site preparation, and long-term maintenance fees reasonable? Does the site need toxic clean-up or environmental mitigation? Will the site require students to travel longer distances than necessary?
- Public acceptance: Is the general public and the city or county planning commission receptive to the site?

New Mexico has developed a policy based on guidelines rather than the extensive mandates New Jersey and California employ. Despite this, their guidelines encompass a variety of siting considerations that align with other state policies, the EPA guidelines, and some of the recommendations made by the Rhode Island Legal Institute. Their model, which does include a state-level oversight agency, aims to be able to improve siting outcomes without extensive additional reporting such as impact assessments and without imposing significant additional costs on the school district or state.

Minnesota

In October 2010, elementary and secondary schools in Minnesota encompassed 815,700 enrolled students (Minnesota Department of Education, 2012). School funding was $9,897,143 in the 2007-2008 fiscal year, 5.6% from Federal sources, 65.8% from state sources, and 28.5% from local sources. Just under 60% of all local revenue sources came from property taxes in this time period (U.S. Census Bureau, 2010).

Minnesota's per pupil spending has decreased since the mid-1990s, and fell 1.2% below the national average in 2005 (Van Wychen, 2010). A 2011 report on changes in per pupil funding found that since fiscal year 2003, funding has decreased 14.7% from state aid, while local levy funds have increased 135.8% for per pupil funding. This increase in school property taxes, however, has not matched the reductions in state funding, which has led to a 4.9% decrease in revenues in this same period (Van Wychen, 2011).

In 1987, the Minnesota Legislature created the general education revenue program, to reflect school district funding needs based on student counts and a determined need for each school district. When new school buildings are constructed or existing buildings are significantly renovated, bonds are issued and levies or state funds are used to pay incurred costs. For projects

over $500,000, the school district must consult with the Commissioner of Education, who is entitled to review and comment on the project positively, unfavorably, or negatively. All projects over $1,400,000 must be submitted for review and comments from the Commissioner. A school district cannot continue with a project if it receives a negative review. For a favorable review, the school district board can hold a bond referendum, but must receive at least 60% of the local votes to continue with the project; whereas, a positive review only requires a majority of votes to proceed. The Commissioners review and comments must be published in the district's legal newspaper prior to a referendum (Strom, 2011). This lends transparency to the process for the public.

School site selection has specified criteria and process in the Minnesota Office of the Revisor of Statutes 123B, Parts 1.05 and 2.07, respectively (Minnesota Department of Children, Families, and Learning, 2003). The state's policy is comprised of guidelines. A checklist or form of school site selection may be compiled for the consideration of size, location, health and life safety, topography and soil, present and previous use, zoning and utilities, and cost and availability. Specifically, the school site should be located near community or school district centers, high student population concentrations or growth areas, community resources (e.g., parks), major connecting roads and bus lines for easy access, expandable site areas, and bus routes that allow for limited travel time for students, as feasible. Sites near high-density freeways, commercial or commuter traffic flow and environmentally hazardous, noisy or congested areas (including aircraft noise zones) should be avoided (Minnesota Department of Children, Families, and Learning, 2003). Mining operations, under Minnesota Rule (M.R.) 6132.2000, cannot be sited within 500 feet of an occupied school (Minnesota Rule 6132.2000). Any site that has experienced prior use (as opposed to a greenfield that was previously

undeveloped), may need an environmental assessment for contamination (Minnesota Department of Children, Families, and Learning, 2003). Site preparation costs, beyond school facility construction costs, should also be considered. The state's *Guide for Planning School Construction Projects* emphasizes that school site access and safety concerns should be considered early in the process of site selection and should include traffic planning officials to assess potential costs. The school site selection process should include:

1) A specification of current and anticipated needed space,
2) The formation of a school site selection team of school and district staff, parents, citizens, school-community partners, and local officials,
3) Collaboration with consulting architects, engineers, local or state traffic/road officials, real estate specialists, and appraisers to evaluate the potential sites and costs of development at each site,
4) A review and research of local and regional planning and zoning requirements and land costs,
5) Public meetings to discuss school construction impacts, and
6) A review of school site criteria considerations (Minnesota Department of Children, Families, and Learning, 2003).

The guidebook also emphasizes the need for different considerations for urban and rural school districts. Urban schools may need to be more innovative with available space, and include multi-storied facilities. Consideration of indoor air quality, noise pollution, and security are all immerging issues in the decision making process. School districts, in fact, must have an Indoor Air Quality management Plan to investigate, monitor, or intervene for any air quality issues (Minnesota Statute 123B.57; Minnesota Department of Children, Families, and Learning, 2003).

Under the Minnesota Rules (M.R.), all school construction projects must comply with state and federal regulations on hazardous substances (asbestos, mercury, lead, liquid storage tanks, and polychlorinated biphenyls). Under Minnesota Statutes (M.S.) 123B.57, school districts may levy for and use revenues designated for hazardous substance removal, fire and life safety code repairs, facility violations, and environmental management (including indoor air quality), but cannot be used for new school construction or renovation of existing schools. Environmental Impact Statement (EIS) reviews are required for all school construction projects that may have "significant effects on the environment in order to minimize or avoid those effects," under Minnesota Statute 116D.04 (Minnesota Department of Children, Families, and Learning, 2003, 29). This review is most commonly accomplished through an Environmental Assessment Worksheet (EAW), but may require a more rigorous EIS.

Changes were made on acreage requirements in 2009 to 123B.70 (Minnesota Statute 123B.70). Previously, when the estimated costs of renovating or remodeling an existing school facility approach 60% of the costs of replacing the facility, the school district is expected to replace the facility over renovation (Minnesota Department of Children, Families, and Learning, 2003). With the 2009 changes, the Commissioner cannot issue a negative or unfavorable review based solely on concerns of too little acreage of a proposed site for new school construction. For existing school renovations, school districts can make decisions on renovations regardless of acreage and the Commissioner cannot evaluate whether to replace a facility only on the ratio of renovation to replacement costs (Minnesota Statute 123B.70).

Like New Mexico, the state of Minnesota has opted to utilized its existing capacity and encourage schools to adhere to guidelines. By providing this knowledge and attempting to

institutionalize it, our informants suggest that guidelines can be successful in improving school siting outcomes from the status quo.

Florida

Florida's school siting policy has been in place since a comprehensive bill overhauling the state's entire public school system was passed in 2002. For the 2009-2010 school year, a total of 2,635,115 were enrolled in Florida's elementary and secondary public schools. New public school construction in Florida is funded from a variety of sources, but, principally, construction money comes from the Public Education Capital Outlay (PECO) fund. PECO funds come from utility taxes and bonds supported by revenues from these taxes (Florida Department of Education, 2011). Recently, funding for construction in Florida public school districts has been significantly decreased due to lower tax revenues (McGrory, 2012). While charter schools did receive significant amounts of funding for construction, traditional public school districts received less in comparison. During, the 2011-2012 fiscal year, $4,367,627 was appropriated towards new school construction, and $55,209,106 was granted towards charter school construction (Florida Department of Education, 2011). Other sources of funding for school construction and renovation include the levying of local mills, local sales surtaxes of up to 0.5 percent, local bond referendum proceeds, and the Capital Outlay and Debt Service (CO&DS) fund, which comes from a tax on motor vehicle licenses (Florida Department of Education, 2011; Florida Department of Education, n.d).

Florida's siting policies are concerned with long-term planning and community fit, which are important aspects of holistic and effective school siting policy. School districts in Florida must annually submit 5, 10, and 20-year district educational facilities plan to the state. These plans include any plans for facility construction or renovation, as well as current and projected

student enrollment. Under the current Florida statutes, this plan must be integrated with the land use planning of local governments (Florida Statute 1013.33; Florida Statute 163.3177). Planned school sites must account for the proximity of students to their schools as well as issues of school location in keeping town and city centers viable (Florida Statute 1013.33).

In terms of environmental hazards, Florida has a fairly stringent policy in place to prevent the construction of schools on contaminated sites. Prior to acquiring any property for a school, districts must inquire into the history of the site's ownership and usage in order to identify air, water, or soil pollution issues that may exist at or adjacent to the site (Florida Statute 1013.65). A history of concern requires at least a Phase II environmental audit, under American Society for Testing and Materials standards that include air, water, and soil sampling (Florida Statute 1013.65). If this audit shows evidence of human health risks, then the school district must remediate the site prior to construction of facilities. While this provision offers protection from siting against the most contaminated sites, its wording is vague, and as such, considerations such as air pollution due to nearby roadways and industrial facilities at sites may not be fully taken into account with this policy.

Ultimately, Florida serves as a strong model where the plans of school districts are coordinated with local and state government. However, in the absence of a strong definition of what is and isn't permissible at a given site (the statute only states that human health risks warrant site remediation), there may be subtle health issues, such as those of air pollution, which aren't fully taken into account in siting.

Conclusion

Table 2.4.1, below, shows eight common components of school siting. This table was adapted from one developed by the Center for Health, Environment, and Justice, who has developed a table for all 50 states. It illustrates the numerous ways that states choose to address school siting policy, and the table also shows that Michigan has not adopted any of the key aspects of school siting policy (Center for Health, Environment, and Justice, n.d.).

Table 2.4.1 Selected School Siting Policies and their Key Characteristics

	PROHIBITED SITES	SITING FACTORS	ENVIRONMENTAL EVALUATION	REMEDIATION	FUNDING PROVISIONS	PUBLIC PARTICIPATION	INFO AVAILABLE	FORM AVAILABLE
CALIFORNIA	x	x	x	x	x	x	x	x
FLORIDA	x	x	x	x				
MINNESOTA		x	x			x	x	x
NEW JERSEY	x		x	x	x	x	x	
NEW MEXICO	x		x					x
NORTH CAROLINA		x	x			x		x
MICHIGAN								

In Table 2.4.1, "prohibited sites" is a characteristic of a school siting policy that designates certain types of sites as simply too dangerous for children. "Siting factors" are like policy guidelines. These aspects of policies are important but not mandatory. Minnesota's school siting policy is comprised almost entirely of optional "siting factors," while California's policy includes siting factors that are almost entirely mandates. Each state in Table 2.4.1 asks local education agencies in their state to make "environmental evaluation" a priority in their siting decisions, except Michigan. In general, many states have existing policies regarding the "remediation" of any brownfield. However, California, Florida, and New Jersey have school

siting policies that include additional remediation measures specifically for brownfields that will have a school constructed on them. Additionally, California and New Jersey each have very stringent school policies and this is made possible by "funding provisions." Finally, the last three categories in Table 2.4.1—"public participation, form available, and info. available"—are the pieces of school siting policies that seek to broaden the school siting conversation beyond local education agencies and make the school siting process more transparent.

The diverse policies reviewed in this section demonstrate the flexibility of school siting policy—there is no singular policy that fits each state and no singular policy that can achieve better school siting outcomes in terms of environmental quality and child health. Michigan can develop a policy that suits the political and economic contexts in place.

Despite the diversity of policies, there are some fundamental commonalities between all of them. The EPA and Rhode Island Legal Institute both emphasize the importance of public participation in their guidelines. They emphasize that the school siting process must be transparent and understandable for the public. California, New Jersey, New Mexico, and North Carolina have public participation measures in their school siting policies. Effective site assessment and selection is also a keystone of the EPA guidelines and the Rhode Island Legal Institute recommendations. California and New Jersey's policies are particularly similar to them, requiring holistic site assessments that seek to avoid costs while also implementing increasingly comprehensive environmental assessments to risky sites. The state policies, the EPA guidelines, and the Rhode Island Legal Institute recommendations all largely agree on what hazards need to be avoided or remediated—air pollution, groundwater and soil pollution, existing brownfields, and noise and odor pollution. Many of the policies also assert that traffic, walkability, and other transportation issues are an important part of school siting that can affect child health as well as

long-term costs. Together, the similarities and differences between all of the existing policies provide an important glimpse about what is fundamentally important to a school siting policy.

The Interview Synthesis follows this section and offers some insight about how stakeholders are interacting with these state level policies as well as the EPA Guidelines. Following the Interview Synthesis are the Policy Recommendations; many aspects of them are drawn from these state level policies. First, we have emphasized that the culture of school siting in each state plays an important role in the content of their school siting policies. The next section discusses the trends in Michigan's school siting culture.

Chapter 2.5: Current School Siting Issues in Michigan

Introduction

In Michigan, schools boards make construction decisions independently of state oversight and with relatively few guidelines. Within their autonomous decision-making lies the power to site schools; this power has implications for communities and child health. Two key reasons Michigan needs school siting policies include: research that shows that schools in Michigan tend to be located in more polluted areas of a school district (Mohai, Kweon, Lee, and Ard, 2011) and that urban sprawl is a part of a trend that results in the building of mega-schools away from city centers to attract new residents (McClelland and Schneider, 2004). This limits transportation options for students, ruling out walking and biking for a majority. Michigan schools and municipal planners do not coordinate their efforts. As a result, school construction can occur at odds with a community's master plan. Finally, no public participation is required for the school siting process. These current trends provide an important context in which a school siting policy might be developed. This section will provide a brief historical overview of current trends in Michigan school siting.

History of School Siting in Michigan

The story of school construction is almost as old as the United States. One of the most relevant overviews of this history was written by Dr. Joanne Westphal, a landscape architect and liscensed physician who currently holds a professorship appointment at Michigan State University. Westphal notes that the Ordinance of 1787 not only established the framework of government for the people who were to live in the West, but also served as a benchmark for the beginning of public education because it set provisions for the promototion and support of education for all territories that were looking to become states (Westphal and Patil, 2008).

Michigan is the state with the longest continous public education system in the United States; this demonstrates Michigan's continued commitment to educating its residents. Michigan's state constitution declared that the 16th section of every geographic township be set aside for the "maintenance of public schools within said township" (Westphal and Patil, 2008, p. 135). To ensure that all families had access to a school, school districts were required to be no larger than nine square miles and assumed schools would be built in the center of that squared area (Citizens Research Council of Michigan, 1990; Westphal and Patil, 2008). By 1850, Michigan had 110,478 children enrolled in 3,097 primary public school districts (cited in Westphal and Patil, 2008). Eventually, school size increased to the extent that the nine square miles rule was removed. Public Act 141 of 1917 and Public Act 65 of 1919 authorized school district size to be based on population (Westphal and Patil, 2008). This began the process of school consolidation and the construction of schools away from city centers (Westphal and Patil, 2008).

The end of World War II brought many changes to the already decentralizing school siting process taking place in Michigan. A slew of new policies that included tax subsidies for single family home construction, the establishment of the Interstate Highway System, and the desegregation of schools that followed *Brown v Board of Education*, created a system by the 1970s in which most children were regularly bussed to school instead of attending schools that were centrally located near their homes (Westphal and Patil, 2008). Suburbanization quickly levied an impact on urban schools. Population loss led to a decline in property taxes collected, which were the basis for most school funding in the state. In order to keep pace with the population losses and also to fund new school construction in new developments, property taxes began to be continually raised (House Fiscal Agency and Senate Fiscal Agency, 1994).

By 1993, Michigan's property tax burden was more than 33 percent above the national average, while the sales tax rested 32 percent below the national average (Michigan Department of Treasury, 2002). To correct this disparity and also alleviate local governments from having to fund most of the school construction, Proposal A was passed in 1994. Proposal A raised the state sales tax from 4% to 6% and put the state in a much larger role than local governments with regard to school funding. School funding is now (as of 1994) based on enrollment, from a per pupil mandate (Michigan Department of Treasury, 2002; House Fiscal Agency and Senate Fiscal Agency, 1994). According to the Michigan Land Use Institute's 2004 report *Hard Lessons: Causes and Consequences of Michigan's School Construction Boom*, Proposal A led to the school construction boom that lasted from the mid-1990s to mid-2000s because the change made it easier to finance new schools (McClelland and Schneider, 2004). This school construction boom produced long-term economic and cultural disparities in school quality because more money was going to new, suburban schools rather than improving existing, older schools that are largely in urban areas (McClelland and Schneider, 2004). During the school boom era of the late 1990s and early 2000s, new schools were built in fast-growing suburbs at extraordinary cost, while older, urban schools were overlooked for renovation and many were consequently closed. Approximately 300 such schools were closed in Michigan between 1996 and 2004 (McClelland and Schneider, 2004).

According to the 2002 annual report on school construction produced by the School Planning and Management organization, school construction tripled in Michigan between 1992 and 2002, outstripping the national rate, which had doubled over the same period (McClelland and Schneider, 2004). Schools were constructed without long term planning and without local insight from planning boards and have resulted in a type of "boom-and-bust" (McClelland and

Schneider, 2004, 4) cycle of school construction. Schools defer to a 36-year-old policy, the School Code Act of 1976, which states that school boards are allowed to make school siting decisions independent of the local planning and local master plans (Revised Michigan School Code Act 451 of 1976, 2008).

Suburban preference for modern schools produced an existing boom-and-bust cycle that makes planning for future enrollment difficult for school boards and investment in new buildings very risky. Unlike more prosperous eras in Michigan's history, when steadier school enrollments guaranteed that school buildings were longstanding centers of community life, school enrollments in Michigan communities have crested and are declining in less than a generation as families move farther and farther out of the city centers and into outer-ring suburbs (McClelland and Schneider, 2004). School districts remain the school construction decision makers. Proposal A catalyzed suburban school building, which was needed to keep pace with population growth, but the act was not sufficient for areas where populations would begin to quickly decrease (Michigan Department of Treasury, 2002; McClelland and Schneider, 2004).

In 2003, after meeting for six months, the bi-partisan Michigan Land Use Leadership Council produced a 100 page report which included a recommendation that there needs to be more communication between school boards and local land use authorities (Michigan Land Use Leadership Council, 2003). In December 2005, with the backing of the council's recommendation, Representative Phil LaJoy (R-Canton) introduced Public Act 276, an amendment to the School Code Act of 1976. The original language of LaJoy's bill called for the local zoning authority to be able to review any new school site plans, regardless of whether or not the school was located in a township, city, or village (House Bill 5479, 2005). The final version, passed in 2006, was substantially different. The version of Public Act 276 that was

passed and signed into law was trimmed down and restricted considerably, only including high schools in townships that were planning to expand facilities by more than 20% to submit their plans to the local zoning authority for review. As stated in Public Act 276:

> The communication required….between a governing board and a local zoning authority is for informational purposes only and does not require the governing board to make any changes in its site plan. Once the process prescribed….is complete, this section does not require any further interaction between the governing board and a local zoning authority (Revised Michigan School Code Act 451 of 1976, 2006).

Despite the effort to reform school siting discourse, the bill may have had little to no influence on school siting decisions. A 2007 study by Professor Richard Norton from the University of Michigan found that school boards, in general, are influenced most by a sense of competition with neighboring districts and shifting demographics. The study also found that little meaningful coordination is occurring between school districts and local governments, largely because of the institutional arrangements that shape the school board decision-making process (Norton, 2007).

Despite nationwide decreases in the rate of school construction, it still comprises a large percentage of construction projects in the United States and has an impact on communities (Abramson, 2011). In 2011, even with this decrease in construction, schools in Michigan, Indiana, and Ohio spent a combined $924 million on school construction (Abramson, 2011). As a result, these issues in siting remain relevant currently, and have the potential to grow in importance as future needs for new and renovated schools in Michigan come to fruition.

Michigan Bills Related to Environmental Quality and Schools

In the immediate wake of the controversy over the siting and cleanup of Beard Elementary in Detroit (discussed in Chapter 6.1 'Contaminated Soils and Schools' at the end of this report) State Representative Belda Garza proposed a bill to require cleanup of contaminated school sites prior to construction of any school facility (Couch, 2002). This legislation would have prohibited the construction of schools and playgrounds on property that is contaminated with hazardous substances, barring certain actions on the part of the organization that wants to build the school or playground on the site. Under it, environmental assessments would be required at sites with a history of disposal of hazardous materials (e.g. dumping, spilling, burial). If the site is found to be contaminated, the site owners would have to meet the cleanup criteria required for residential use in the state of Michigan under the Natural Resources and Environmental Protection Act of 1994, and would have to annually monitor the soil and air at the site to ensure that these criteria were still being met. This monitoring would have to be conducted according to a written plan that is approved by the Department of Environmental Quality (DEQ). The DEQ would then provide notice of the plan to the public. Following this, if it is requested by the public, they would provide a public hearing in the vicinity of the site within two weeks. Once cleanup at the site has been conducted such that the levels of contaminants in the soil and air at the site do not exceed background levels (or the detection limit for that substance), then construction on the site could begin (Couch, 2002). This bill was referred to the House Committee on Land Use and Environment, and never reached the floor for a vote.

More recently, in 2009, State Representative Rashida Tlaib introduced a bill that would have similar effects (House Bill 5271, 2010). House Bill 5271 (2009) would have prohibited school boards, including the boards of charter schools, from constructing a school building on

any previously-owned site or acquiring any new property for a school without first conducting an environmental assessment of the site to see if corrective action is needed to bring the property to meet environmental contamination standards for residential use in the state, under the National Resources and Environmental Protection Act of 1994. This bill passed through the state House of Representatives 70-36, with limited bipartisan support (House Bill 5271, Roll Vote, 2010), but was never brought to the floor of the Senate for a vote.

Conclusion

Ultimately, Michigan's history of school siting and the policies surrounding it emphasizes the need for a comprehensive siting policy to be created for the state of Michigan. While the primary concern of this report is that of environmental quality, we stress that siting issues are complex and multi-factorial, and that this array of issues needs to be addressed holistically by the state government. The relative success of House Bill 5271 indicates that the idea of state-level siting regulations may become more viable politically in the coming years than it was previously. However, the highly partisan house vote under which the bill was passed, exemplifies the need for school siting issues to be framed as bipartisan in the legislature. Without a strong consideration of financial and governmental efficiency issues, policies centered solely on environmental health may experience difficulty finding success in the Michigan legislature. In contrast, more comprehensive policies may be able to span partisan and ideological lines, and find a more diverse array of support from legislators. The next section will discuss the project's research methodology and implementation.

Chapter 3: Methodology

Informant Interview Development

Our team conducted a series of telephone interviews that were designed to identify issues in the development and implementation of school siting policies and guidelines in other states, as well as the current state of school siting practices in Michigan. The interview process and content was approved by the University of Michigan Institutional Review Board (HUM00054601). To preserve the anonymity of informants, all notes from interviews were kept in password-protected files on personal computers and all informants' information has been and will be kept confidential in this report and any future reports that will arise from our research. Interviews were not recorded to reduce any apprehension on the part of informants that their responses could raise any issues in the future. However, detailed notes of the interviews were constructed, which occasionally included full quotations.

To initially determine who we wanted to speak with, we began our research by examining two main reports: The Rhode Island Legal Institute's report: *Not in My Schoolyard: Avoiding Environmental Hazards at School Through Improved School Site Selection Policies* (Fischbach, 2006) and the Report of the School Siting Task Group of the Children's Health Protection Advisory Committee: *Comments on US Environmental Protection Agency Draft Guidelines for the Siting of School Facilities* (U.S. EPA, 2010a). These two reports were very important in guiding our research.

The Not in My Schoolyard report includes a comprehensive survey of state-level siting policies (Fischbach, 2006). The report described what school siting policies existed in each state and the specific differences and similarities among the policies. It was also important in informing us which states did not have school siting policies. The report provided an overview of

siting policies across the U.S., but since the report was released in 2006, we assumed some things had changed over time, and we individually researched state school siting policies to check the up to date state policies. The Rhode Island report helped us to hone in on which states we wanted to focus our interviews. We wanted to evaluate states spanning the whole spectrum of school siting policy from nonexistent to stringent. Therefore, we identified nine states that we wanted to focus on for their varying levels of school siting policy within their state. The nine focus-states are: California, Florida, Illinois (focusing on Cook County), Massachusetts, Minnesota, New Mexico, New Jersey, North Carolina, and Wyoming. Within our research team, states were assigned to individual members to identify key individuals within those states who were/are involved in the school siting policy process.

The report of the School Siting Task Group was also beneficial. Released in February of 2010, it is an up-to-date report and with many contributors listed (U.S. EPA, 2010a), we utilized it to help identify key individuals who were interested in the issue of school siting policy. These individuals possessed expertise about the EPA's draft school siting guidelines and were generally on the forefront of school siting policy development. The report helped us to better understand the EPA's draft school siting guidelines since the report presented criticisms of the draft guidelines as well as suggestions for improvement. The guidelines were just a draft at that time; the guidelines were finalized in October 2011. From the report of the School Siting Task Force, we were able to identify specific individuals and seek out their input and opinions during interviews, as well as get an advanced lesson in specific hurdles and challenges that a school siting policy faces in appeasing stakeholders.

Individuals were sought for interviews, due to their roles in school siting, policy, environmental quality, and school administration in various states. We used a snowball sampling

technique to continue our interview process. Key individuals that were initially interviewed were asked at the end of the interview for any recommendations of individuals for us to speak with (Biernacki and Waldorf, 1981). From these interviews, we were able to discern to what extent existing school siting policies are successful and the results of implementation. This technique also helped us to identify key individuals in Michigan to speak with who were interested in or actively involved in the school siting issue. Interviews consisted of open-ended questions to allow room for free speech and personal opinion. We looked both for elements of success and points of contention in developing state policies.

Interviews and Stakeholders

Informants included: school administrators, government officials, land use experts, public health researchers, and non-governmental organization (NGO) staff. The interviews focused on relevant individuals from the states of Michigan, Minnesota, Florida, North Carolina, Illinois, and also nationally-active individuals involved in the school siting movement who were not necessarily associated with any one of these states.

While interviews were open-ended, a set of pre-determined questions were asked, which often led to follow-up questions. In states with school siting policies or guidelines in place, pre-determined questions included:

- How the school siting issue was framed by legislators, voters, PTA members, etc.;
- What the concerns of various stakeholders were regarding the policy;
- What concerns stakeholders have post policy implementation;
- If the policy is well-implemented and enforceable;
- What implementation roadblocks there have been with the policy or guidelines; and
- What the informant would like to see change in their state's school siting policy.

For all informants, additional questions were tailored to better utilize each person's knowledge and experience in school siting. These ranged from questions on current land-use and planning practices, health concerns regarding school siting, issues with policy implementation, and recommendations for the role and composition of school siting committees. We were particular in the selection of our informants, aiming to gain as much insight from one interview as possible. Although the informants were from different states and areas of interest, after conducting 25 thorough interviews, we began hearing the same names, issues, and suggestions during the interviews and felt we had collected a sufficient amount of interview data to begin the process of developing our policy recommendations. This may be due to the newness of the school siting issue and the prominent role of a small number of people at the federal level.

Interview Analysis

The final stage of our project was to synthesize and analyze our information to assess what guidelines and policies have been suggested by various informants and how we can improve on these guidelines and tailor them to Michigan. The team identified common themes among the interviews and created a spreadsheet in which each informant's responses were parsed out, according to the common themes. A narrative of these common themes can be found in the Interview Synthesis section of this report. The common themes were:

- Inter-agency and government collaboration, or lack thereof
- Transportation issues
- Long term planning and true cost considerations
- Mandates versus guidelines approaches
- Comments on the EPA guidelines
- Brownfields

- Walkability and Safe Routes to School
- Reporting requirements
- Issue awareness and education
- Public involvement and feedback in siting decisions
- Central versus peripheral school building trends
- Schools as historical assets and community centers
- Opening, closing, and renovating trends in specific regions
- Acreage requirements
- Funding issues
- School siting and pollution considerations
- Comments on the political feasibility of policies

In the spreadsheet, these issues served as headings, while each interview was parsed out under the relevant headings. Table 3.1 below serves as a simple example of the spreadsheet used for interview synthesis:

Table 3.1 Example of the interview synthesis spreadsheet.

Informant	**Position/Organization**	**Reason for Contact**	**Comments on acreage requirements:**
Dr. John Doe	Researcher at University X	Published comprehensive study on acreage requirements for schools	Acreage requirements vary state to state and there is not widespread agreement about their value.
Jane Smith	School board member	Commented during webinar on Safe Routes to School	Acreage requirements can improve walkability for students.

Overall, the interviews provided important insights on the many issues outlined above. The interviews had a direct impact on our policy recommendations; some informants were able to provide direct feedback on certain policy recommendations the team was considering. Because of the open-ended nature of the interviews, and their purpose as background information for the team, a statistical analysis was not performed on the interviews. They were, however, critical in forming the team's understanding of school siting policy in states across the U.S. and were synthesized in a way that reflects the conclusions the team drew from them. The 'Interview Synthesis' section of this report explains this is much greater detail.

Policy Recommendations

Utilizing the information gathered in our literature review, background research, and interviews (via the interview synthesis process described in the next section), our team was able to create a series of policy recommendations for the state of Michigan regarding school siting and environmental health. The beginnings of our policy recommendation discussion were based on a group brainstorming session in which all of the points from our past research and interview synthesis were placed together. After sorting out the most important and relevant pieces of information, we began to place these areas of concern into relevant categories. These areas of concern are: health, environment, community, and government.

These four categories helped in developing our policy recommendations as they provided a basis for policy preferences and considerations. Health concerns included recommendations to address human health factors that are affected by school siting. Environmental concerns included recommendations to address environmental issues such as ecosystem health, environmental toxicants, and brownfield remediation. Community concerns were drafted with the goal of including community members and stakeholders in the school siting decision making process at

various stages while preventing conflict and allowing stakeholders access to pertinent information. Governmental considerations were provided to allow for inter-agency coordination and government involvement in the local school siting process as a means to assist school boards with navigating policy mandates and guidelines.

Each policy recommendation is drafted at three levels of policy intensity: stringent, moderate, and lenient. We chose to divide policies at these levels so to allow for flexibility in the policy implementation process. Stringent policies require the most change from the status quo and enforce the strongest regulations to protect student and environmental health. Lenient policy recommendations are in some ways reflective of the status quo and enforce the least amount of regulation protecting environmental health in schools. Stringent policy recommendations may overlook some political and financial barriers, but aim to offer the best outcomes for the involved stakeholders by reforming the status quo. Moderate policy recommendations are less ambitious, but still aim to provide progressive policy reforms to the status quo. Lenient policy recommendations are the least progressive in terms of altering the status quo, and in some cases do not alter from the current policy (or lack thereof), however they may be feasible in some situations due to limited financial and political involvement.

After defining the policy strength categories, the areas of concern (health, environment, community, and government) were divided between group members according to the backgrounds of various group members. Group members have backgrounds in health and politics which allowed for various members to insert personal knowledge and expertise into the development of policy recommendations. Once policy recommendations were made at each of the three levels of policy intensity, they were brought together for a discussion of synthesis and inter-workings of policy. This was an extremely important part of the policy development

process as several policy portions address similar issues, which allows for interaction between policy pieces. The consideration of these interactions is essential for feasibility issues such as piecemeal or bulk implementation of policy proposals. While these policies attempt to encompass as many issues as possible involved in the interplay between child health, industrial sources, and school siting there are undoubtedly experts at all levels of governance that have differing opinions and recommendations. Therefore these policies attempt to allow for flexibility and consideration of various situations while still protecting children from attending school in an unhealthy environment. We feel that the development of these policies, especially in stringent, moderate, and lenient varieties, allows for policy makers to best evaluate what works for the state of Michigan, in conjunction with transitioning from the current regulations and unwritten siting norms and practices. The next section will look into our interview synthesis process and how we analyzed, categorized and synthesized information gathered by informant interviews.

Chapter 4: Interview Synthesis

Introduction

As discussed in the Methodology, the interview synthesis served the important purpose of allowing us to extract insight from the 25 stakeholder interviews done across the nation. The interviews were compiled into a spreadsheet and parsed out into common themes. This section offers a narrative of those commonly identified themes. The informants' feedback directly influenced the nature of the policy recommendations in the following section. The end of each section includes a table of the advantages and disadvantages emphasized in each topic.

Inter-agency and government collaboration

Many of our informants noted the autonomous decision-making abilities of local education agencies in school siting decisions[1]. In general, informants explained that the local education agency has the final decision-making power over a school siting decision and does not have to consider community needs and fit when making these decisions. Informants in Michigan described a particularly strong rift between local governments, their planning agencies, and local education agencies. One former administrator and Michigan resident explained that the issue of school siting is a national concern that is state financed and locally controlled. A current Michigan school board member affirmed that school districts do not have to consult other planning groups, whether those groups are county or city planning groups or health or economic agencies. A former state legislator stated the yearning for school siting to be a process and involved collaboration between school boards and local planning authorities. One Michigan school board member agreed that there is a disconnect between local agencies and local education agencies in terms of understanding each other's needs. However, they added that their

[1] "Local education agencies" is an encompassing term that includes school districts and school boards. States vary in what kind of local authority presides over schools. For the sake of efficiency and anonymity, we've used "local education agency" in place of these terms.

district had collaborated successfully with their county government to agree on paving a dirt road on which their newest school was built. One Michigan planner asserted that the state lacks an "institutional arrangement to put local government and schools together." Any current collaboration between school districts and local governments is voluntary. Table 4.1 shows the advantages and disadvantages of creating such an institutional arrangement.

Table 4.1 Inter-agency and government collaboration.

Policy Topic	Advantages	Disadvantages
Bridging the rift between school districts and local planners and municipalities	Better understanding of each other's needs	Some school districts and municipalities are already successfully collaborating
	Improved outcomes for the community as a whole	

Long-term planning and true or hidden cost consideration

The collaborative rifts between local education agencies and local agencies may contribute to a lack of long-term planning that local education agencies neglect when siting schools. The aforementioned Michigan planner thinks "decision making is way too late in [the school siting] process" and that a policy should consider community fit and full cost accounting. A school administrator from Minnesota warns that full cost accounting may not be popular with local education agencies. One particular Minnesota bill proposed, in part, that schools should have to evaluate the cost of infrastructure needed for new schools.[2] This portion of the bill was eliminated after outcry from local education agencies. Despite the potential unpopularity, one former Michigan school administrator said that the state needs to plan for the future; while local education agencies may experience more upfront costs to plan "responsibly," a significant

[2] Many of the states we encountered do not require local education agencies to assess the cost of new infrastructure, such as roads, stoplights, or water and sewage lines. These costs are incurred by the responsible local agency, such as the county roads commission.

amount of money can be saved in the long run. When a Midwestern local education agency decided to build a school on a formerly contaminated site, the city had to build nearly two miles of new water line infrastructure because they had decided that drilling a well on the site was unsafe. This is an example of how a lack of coordination and planning can impose a cost on another agency.

One school siting policy advocate in Michigan reiterated the need for a school siting policy because it would foster long-term planning with community involvement. Not only would the policy foster long term planning, but the policy would also bridge the rift between local education agencies and municipalities. For example, municipalities know traffic flow patterns and sewer capacities and can help alleviate the long-term costs that surround poor siting decisions by local education agencies. In contrast, however, one Minnesota school administrator noted that schools built out of town, away from the necessary infrastructure, do not necessarily dispel undesired and neglected long-term costs. In fact, they asserted, schools built out of town spur development around the new site which negates the cost of the new infrastructure. Still, the government employee we interviewed who works in transportation contended that externalized costs for infrastructure and other expenses must be a problem, because approximately half of the states in the U.S. assess an impact fee on school developers that force the local education agency to incur the cost of increased infrastructure. In other words, the informant emphasized the legitimacy of the problem and that states recognize how schools can defer some costs onto municipalities. To combat this externalization of costs, many states have implemented impact fees that force the local education agency to consider infrastructure costs. An administrator from a state with a school siting policy noted that local education agencies have a greater understanding of costs since the implementation of their policy. An impact fee is a possible

policy step that could ensure coordination between school districts and relevant local agencies. Table 4.2 shows the advantages and disadvantages of incorporating long-term and true cost considerations into school siting policy.

Table 4.2 Long-term planning and true or hidden cost consideration.

Policy Topic	Advantages	Disadvantages
Policy that considers true cost estimates and long-term planning	Planning upfront can save money long-term	Incurring and calculating infrastructure costs would be unpopular with school districts
	The need to consider infrastructure costs would help bridge communications between municipalities and school districts	
	School districts gain a better understanding of costs	
	Long-term planning creates an avenue for community input and involvement	

Transportation Infrastructure and Student Transportation

Transportation and subsequent infrastructure issues are on the forefront of the minds of those involved with schools and school siting decisions. The Safe Routes to School initiative has reinforced the national focus on this issue. A Michigan school board member expressed that traffic is an enormous consideration for schools, especially in their district that is over 100 square miles. This school board member contested the idea that communities want schools in their downtowns to serve as community centers; rather, residents feel that schools cause traffic congestion that deters residents from the downtown area. The informant also stressed that schools must be centrally located *between* communities that might be far apart in large school

districts that may encompass multiple municipalities. A researcher from North Carolina illustrated another problem for local education agencies and transportation—a lack of understanding of hidden or external costs of infrastructure. They said, "I don't think school districts take [hidden costs] into consideration unless they're paying for them." For example, in the northern lower peninsula of Michigan, the county road commission was forced to build $500,000 worth of new infrastructure when the school district chose a site for a new school that had unfavorable traffic patterns. This example corroborates many informant responses that reported a disconnect between local education agencies and local agencies; this example also demonstrates that transportation infrastructure is one of the largest costs that local education agencies pass on to other local agencies.

Meanwhile, student transportation to schools also dominated the responses of the informants. A Michigan school board member felt that although walkability and bike-ability are popular topics currently, biking and walking to school are not happening in practice. The school board member said that parents are driving their children to school even if there are safe routes available. Additionally, they claimed that 90% of the students who can drive themselves to school will do so, even if buses are available. The North Carolinian researcher's data affirmed that walkability and bike-ability ranked last among siting considerations for local education agencies, suggesting that the favorable national sentiment does not necessarily seem to match what local education agencies or parents are doing in practice. Nonetheless, several school administrators and even legislators felt that these issues are an important part of school siting considerations, particularly, safety for students who will bike or walk to school. A government official working in transportation claimed that siting trends—schools getting farther from town centers—have eliminated transportation options for students, such as biking and walking.

Table 4.3 shows the advantages and disadvantages of having a policy with walkability considerations.

Policy Topic	Advantages	Disadvantages
Include biking and walking considerations in siting decisions	Traffic and infrastructure considerations are needed to calculate the true cost of a school	School districts are too big and must centrally locate their schools, forcing most to drive or bus
	Many stakeholders think this is an important consideration	Communities see downtown schools as traffic nuisances, not community centers

Mandates versus Guidelines

A contentious issue among informants was whether or not a state-level school siting policy should have mandatory statutes or merely guidelines. A current school administrator asserted that unless state law changes to require school districts to have school site plans integrated into state or local health, safety, or planning/zoning or economic development plans, there is nothing the state can do to guide school siting decisions. One former Michigan legislator suggested achieving a strict policy by proposing one piece at a time. If a strict policy is pursued as a whole, it is possible that nothing will be accomplished.

A senior administrator for a state level healthy schools oversight group also agreed that incremental policy is the best way to achieve an effective school siting policy: "If those guidelines are created with health in mind, they can be really effective in protecting the health of children." On the other hand, some of those more restrictive policies do create greater expense in construction. Mandates from the state can be a burden to rural, poor schools. Particularly, rural school districts feel that state-level mandates are not fair to them because they have fewer resources (e.g., money, expertise, time) available to them. One school board member said, "a lot

of folks have an ideal in their mind [as] to what they want school siting policy to accomplish, but that may require incremental change. You have to be clear about the reality of the ideal."

Many informants expressed concerns about mandatory policy from political standpoints and how effective a mandatory policy would be. One informant noted that the Michigan Land Use Institute (MLUI) proposed guidelines, but the state was not ready to make them mandatory at that time. One Michigan planner agreed, quipping, "Mandating is not going to fly in Michigan." Ultimately, Michigan adopted neither guidelines nor mandates.

Some informants offered contrasting views on how rural local education agencies would receive mandates. One superintendent in a rural Michigan district believes local education agencies might approve of thoughtful mandates: Guidelines could be help make the siting process easier and more straightforward; they want to protect student health: "You're talking about public policy, and you have to involve in [*sic*] the state legislature, which is scary." One Michigan resident advised: "In the current regulatory climate, the odds of getting something like this [mandates] passed is next to none. Guidelines would probably be more beneficial rather than attempting to implement a regulatory route, which would probably kill the bill out of the box." New Mexico has utilized guidelines with some success because the state provides funding for school construction; this pressures the school districts to consider the siting guidelines the state provides.

Indeed, the informants largely favored the concept of guidelines. An informant who worked on school siting issues at a national level recommended guidelines rather than mandates because school siting and land use decisions are local decisions; "taking a one-size-fits-all perspective is not really an applicable option." However, from an environmental and public perspective, it was emphasized that perhaps they should be more stringent rather than voluntary.

Informants from Minnesota were, perhaps, the most satisfied with the effectiveness of their school siting guidelines. One Minnesotan advised: Best practices or guidelines work better than mandates because strict rules lose flexibility and face resistance; "one size does not fit all and is not equitable for everyone."

One researcher admitted that their state has not effectively utilized their guidelines, because the guidelines are too vague. School planners, they said, do not have the expertise to attach numbers to guidelines such as those for buffer zones. As a result of this uncertainty, the guidelines are generally not followed by the local education agencies. Another informant had a similar criticism of the EPA guidelines, saying that the EPA guidelines were too vague and that guidelines need to at least be state-specific. However, one planner noted that the EPA guidelines might spark the development of state-specific guidelines. Table 4.4 shows the advantages and disadvantages of mandates and guidelines.

Table 4.4 Mandates versus Guidelines.

Policy Topic	Advantages	Disadvantages
Guidelines	Guidelines are flexible and adaptable	Guidelines can be ignored.
	Guidelines will be more popular with school districts and administrators	School districts may lack the technical expertise to assess a site themselves
Policy Topic	Advantages	Disadvantages
Mandates	Mandates are more likely to achieve the desired health outcomes	Mandates are not flexible enough to account for the differences between rural, suburban, and urban schools
	Mandates could create effective bureaucracies that could improve the entire siting process	Mandates require oversight and enforcement, which has a price
		Mandates will be very unpopular politically

Public Involvement and Awareness

The informants offered mixed responses and suggestions regarding public involvement in school siting issues. While some informants acknowledged the importance of public understanding and feedback, others were reluctant to suggest broad public involvement, because it can slow the siting process.

Even if a state, like Michigan, does not have formal public comment structures, the public will still vocalize their opinions, according to one Michigan school board member. A Michigan planner agreed, pointing out the amount of public involvement utilized in Ann Arbor for the building of Skyline High School.

As relayed from an interview in a state with guidelines, building a school on a remediated brownfield prompted extensive public outreach. Information about school construction was posted on schools' websites, local newspapers, and quarterly newsletters sent out to the community and students. The district held over 20 public meetings and 20 "coffee" sessions, some of which included presentations from the state's pollution control agency. Ultimately, however, people supported the siting decision, except for the predictable contingent of residents who did not want their taxes raised. In this community, the bond issue served as a vote of approval by the community. Public outreach can have a positive outcome for school districts because these efforts can respond to concerns and build public support for projects.

Several informants pointed out that bond issues on ballots served as the public's nod of approval. If the bond issue (that would raise local taxes to finance the school) failed, then the local education agency would know their plan for the school was flawed. In New Mexico, the state requires community input for the five-year facility master plan for each district that must be approved by the community. Districts recognize the benefits of this, because they do not want bond efforts to fail due to a lack of community support.

Despite this, a Michigan resident maintained that provisions for public involvement are necessary because people who have a vested interest in new school construction are dominating the conversation in the state. This resident concluded that a school siting policy in Michigan needs to broaden the conversation to include alternatives to new school construction.

While several informants worried that public involvement guidelines would slow down the siting process, one North Carolina researcher contended that a "squeaky wheel" might improve siting outcomes locally, because school boards are elected positions and the members

ultimately want to maintain a favorable relationship with their voters. Table 4.5 shows the advantages and disadvantages of forming mechanisms for public participation.

Table 4.5 Public involvement and awareness.

Policy Topic	Advantages	Disadvantages
Establish provisions for community involvement	Will allow more voices to be heard in the siting process	Public input slows down the process
	Public involvement can improve siting outcomes	Because local voters must approve funding measures for new schools, school districts already want to keep the public on their side. Formal mechanisms might be redundant

School Building Trends: Community Assets, Central vs. Peripheral, Renovation

The economic downturn has subdued debate about school construction in Michigan. As one Michigan informant noted, urban sprawl is not the contentious issue it once was in Michigan, because, currently, there is not a lot of construction under way. One urban planner asserted that the "mega school is not the trend people think it is" and that local education agencies originally moved away from the neighborhood school to prevent segregation. A neighborhood school would have the demographics of its surrounding neighborhood, and as a result, the schools were not diverse. The planner added, however, that there is not enough consideration of community fit or long-term growth patterns in current school siting. However, these trends offer a snapshot of the status of school construction in Michigan and across the U.S.

Many school siting stakeholders reflected on the nation's general distaste for renovating older schools, despite the depressed economy. A seasoned school administrator said Michigan's current school siting process incentivizes greenfield construction (construction on new,

undeveloped parcels of land) and that there are no incentives to renovate existing buildings, especially in urban locales. A common refrain from informants was that building out of town centers gives schools access to cheaper land. One informant observed that people often overlook the architectural quality of old, neighborhood schools when they prefer new schools that might be bigger and more modern, but are of lower quality with cheaper building materials. One planner believes that school administrators make biased interpretations of data in order to justify new school construction. Another informant added that architects prefer working with a new school building over dealing with the uncertainty of renovating an old one.

In general, the Michigan respondents observed that school closure is the key current trend in school construction within the state. One school board member admitted that when they discuss options for closing schools within their district, the oldest school is usually the target of the discussion without regard to whether or not the school can be renovated affordably or whether it is a community asset. Geography also plays a role in the closure of rural schools. As enrollments decline, several informants noted that schools in rural areas must consider how to keep schools reasonably close to all students, and that means centrally locating them between population centers and closing schools directly in those centers. Several informants agreed that a school siting policy could provide guidelines to utilize when determining which schools to close, but none were able to articulate how this might work. Table 4.6 shows the advantages and disadvantages of other uses for school siting guidelines.

Table 4.6 School building trends: Community assets, central vs. peripheral renovation.

Policy Topic	Advantages	Disadvantages
Utilize the siting policy to encourage renovations	Preserves character of communities	Unpopular, more costly
Making a school siting policy that provides guidance in school closure decisions	Provides positive environmental quality and health outcomes	Environmental health and quality are too low on the list of decisions that go into school closure

Funding Issues

A significant factor in the feasibility of a school siting policy, according to our interview responses, is the source of funding. In general, funding issues are the lynchpin that dictates decisions for schools. One local education agency board member warned, "Any criteria [*sic*] that comes at the state level on siting is going to be significantly criticized because of funding issues." This represents a key consideration of future school siting policies for the state of Michigan. Several informants explained that this criticism is borne from the lack of financial support that Michigan provides to schools. The state, they asserted, cannot dictate a policy that imposes a cost on schools without offering funding support, and Michigan, according to one informant, is determined to try to keep the burden off of tax payers. When school districts are responsible for generating their own funding, many informants stated that this is when inequities occur. Areas with a smaller or poorer population cannot generate adequate funds from their tax base. In New Mexico, this problem resulted in a lawsuit that eventually created the school siting policy they are using today. Now, the state of New Mexico supplements community funding with some state funds through the State Equalization Guarantee initiative. New Jersey also redistributes funds to eliminate disparities in spending between school districts. Table 4.7 shows the advantages and disadvantages of funding issues in school siting policy.

Table 4.7 Funding issues.

Policy Topic	Advantages	Disadvantages
Provide/mandate funding for school siting	Dedicates resources needed to build the school siting process	Where will this money come from? Unpopular politically and with schools, if it becomes an unfunded mandate

Pollution and Brownfields

Pollution and brownfields are a topic that requires some measure of technical expertise. While informants working directly on those issues were able to speak fluently about their implications for school siting, many school stakeholders demonstrated a key barrier to addressing pollution and school siting—a lack of digestible knowledge of the issues. One government employee pointed out that their state has a great resource for schools on air pollution—their annual air quality report. The employee admitted, however, that they were not even sure if the schools know the resource exists. An informant explained that it is not necessarily an issue of negligence on the part of local education agencies, but more so the fact that most people involved do not have training or background in environmental issues and also hold other jobs that are unrelated. These informants suggested that school siting is not simply a matter of common sense. Pollution issues are complicated and policy might help provide understandable guidelines to local education agencies and their communities. Perhaps, school districts need resources to hire experts that can assess potentially contaminated properties, or school districts need educational materials that can refer them to information that already exists of which they are simply unaware. Several informants added that the EPA school siting guidelines are an important step in making pollution issues a prominent school siting decision. The informants were generally supportive of the guidelines, but when asked about their major

criticism of the guidelines, the informants cited the lack of specific buffer zone distances from hazards as well as the EPA's hesitation to suggest the banning of school building on certain brownfields. To address hazards, one researcher suggested that schools utilize a volunteer health impact assessment to ensure that schools are looking at a site's impact on student health. Table 4.8 shows the advantages and disadvantages of how certain measures would address school siting and pollution issues.

Table 4.8 Pollution and brownfields.

Policy Topic	Advantages	Disadvantages
Make school districts and administrators more aware of pollution and brownfield issues	Eliminates the knowledge gap that seems to exist about pollution and brownfields	Is merely providing resources a solution? Do school districts and administrators have time to learn about this issue?
	Can utilize resources that already exist	
	Provide training and technical expertise to school districts and decision-makers	Requires the development or dedication of new personnel and resources
Policy Topic	Advantages	Disadvantages
Prohibit the building of schools on certain sites. Mandate buffer zones from pollution and hazards	Less ambiguous guidelines eliminate confusion	Determining mandates would be politically contentious and technically difficult
	Keeps schools away from highly polluted areas	Some districts lack the flexibility and space to accommodate prohibited sites and buffer zones

Conclusion

This synthesis was performed in order to preserve the anonymity of the interviews, while also allowing us to share the results. The informants generally agreed that there is a rift between local education agencies and their municipality—more collaboration is needed to negotiate the needs of the local education agency and its community. Increased collaboration could help local education agencies recognize long-term costs in their siting decisions, something that many interview respondents felt was missing in current siting practices. The siting issue on the forefront of the informants mind was often transportation. This is due, perhaps, to the fact that the national Safe Routes to School program is gaining a lot of recognition. Many agreed that the trend of building schools away from town centers has eliminated walking and biking opportunities for students.

As the questions transitioned into the details of policy formation, disagreement appeared on the matter of mandatory statutes versus guidelines. While some informants felt that some aspects of a siting policy would need to be mandatory to achieve any desired outcome, most expressed concern over the backlash mandatory policies would face in the political process. They also worried that a mandatory policy could not adapt to the diverse needs of each local education agency across Michigan. The informants were less conclusive about the importance of public involvement. They felt that formal structures were important, but that community members find ways to be heard whether or not these structures exist officially. They also noted the political nature of a school board's elected positions, asserting that a politician would not want to undermine or ignore their constituency.

While debate about sprawl has diminished in Michigan, it was once a very ripe issue for the state. Many informants felt that the elimination of neighborhood schools has left

communities without central meeting points. However, building schools in town centers has its own set of complications, including a general distaste for the amount of work it takes to renovate an older facility. Meanwhile, many agreed that a mandatory siting policy without funding support would face substantial opposition during the political process. Finally, informants admitted that local education agencies lack the knowledge and training to address brownfield issues. One researcher suggested that impact assessments could help local education agencies understand the implications of brownfield redevelopment. Ultimately, the interviews contributed directly to the policy recommendations that follow this section. The informants allowed us to distill some of the key problems with a *lack* of policy in Michigan and explore what kinds of policies could fill this gap.

Chapter 5: Policy Recommendations

Chapter 5.1: Introduction

In order to create the set of policy options that would best suit the needs of the state of Michigan, we conducted interviews with out of state and in state stakeholders in conjunction with research on various state policies and guidelines regarding school siting. These interviews, as synthesized and discussed in the previous section, were done with the purpose of determining which policy pieces were essential, successful, and implementable while also discussing which policy pieces were ineffective. In researching school siting policies and the Environmental Protection Agency's (EPA) recommended guidelines, our team was able to gather information to create a set of best practices for the state of Michigan.

Areas of Concern

Government (G)

Government concern addresses considerations of the bureaucratic and political processes in the state of Michigan that are involved with the school siting process. Examples of government considerations include:

- Inter-agency coordination and communication in order to assist districts in garnering information and resources on school siting policies and best practices,
- Conflict resolution for potential discussions between agencies on school siting considerations and student health issues, and
- Decision points for various stages of the school siting process to determine which groups are qualified to make decisions regarding environmental and child health of various sites.

Health (H)

Public health concern addresses the standpoint that public health is a crucial factor to preserve in the school siting process as child health and development can be severely affected by

exposures to environmental toxicants over a prolonged period of time. Therefore, it is necessary to protect child health and well-being while in the state-provided school environment. Examples of health considerations include:

- Acreage requirements,
- Mitigations plans,
- Prohibited sites due to pollutant proximity,
- Air quality in the school area,
- Groundwater contamination and proximity, and
- Regional pollutants that can affect child health in the school environment.

Environment (E)

Environmental concern addresses the protection and conservation as well as environmental health perspective that considers human health as a factor in maintaining a healthy living environment. Examples of environmental considerations include:

- Considerations of topography,
- Seasonal variations in toxic and environmental exposures, and
- Variations in rural, suburban, and urban environmental siting needs and processes.

Community (C)

Community concern addresses the needs and involvement of the community in the school siting process. Schools are often times a center of community support and involvement, providing means for families and students to connect and attend various events. Examples of community considerations include:

- Preservation of historic buildings and historic sites,
- Conflict resolution processes
- Ensuring public participation opportunities in the school siting processes and discussions,

- Comment periods in which the public is openly involved in the initial phases of site considerations and development, and
- True cost estimates to best determine the long-term and short-term costs of developing various sites.

Levels of Policy Stringency

In order to allow for a policy that best fits the needs of the state of Michigan, it is important to understand that various levels of policy stringency may be necessary in order to create a "best fit policy." Policy makers and stakeholders have the ability to best understand the needs of the state and local governments in the school siting decision making process; therefore, three levels of policy stringency, stringent, moderate, and lenient, were developed for each of the below policy recommendations.

> ***Stringent****:*
> *Stringent policy recommendations may overlook political or economic barriers in an attempt to provide the most comprehensive solution.*
>
> ***Moderate****:*
> *Moderate policy recommendations are less comprehensive in terms of providing a solution to an issue, but they require less funding and bureaucratic oversight and are less likely to receive political and public resistance in comparison to stringent recommendations.*
>
> ***Lenient:***
> *Lenient policies are the least stringent and contain no mandates. There are also some instances where lenient policies offer only small or no changes from the current state of school siting decision-making norms.*

These policies are not intended to be adopted in a single stream of stringency. For example, adopting all stringent policies together or all lenient policies together may not result in the best school siting policy for the state of Michigan. Rather, various policy levels should be considered together to best address the situation of school siting and the political climate within the state. These policies were also developed at various stringency levels with the intent that

policies regarding school siting could be changed and updated over time. For instance, if a lenient level policy is adopted but after evaluation is found inadequate in providing the best health or environmental protection for students, there is the possibility that it can be scaled up to a moderate or stringent level policy. In a reverse situation, a stringent policy may require oversight that is not available or be difficult to enforce, in which case the policy could be reduced to a moderate or lenient level policy. In some instances, stringent and moderate policy recommendations or moderate and lenient policy recommendations vary only slightly; in other cases, they are the same. This is due to the necessary inclusion of recommendations at certain levels in order to protect child health and make policies feasible. There are also some instances where lenient policies offer only small or no changes from the current state of school siting decision-making norms.

Stringent policy recommendations aim to offer an all-encompassing outcome for the involved stakeholders in the school siting process by providing the most comprehensive solution to the addressed issue. These policies might require more regulation in comparison to other policy recommendations, and they may require funding or creation of government oversight processes. Stringent policy recommendations may overlook political or economic barriers in an attempt to provide the most comprehensive solution. However, via the policy recommendations, we make every attempt possible to draft recommendations that are reasonably politically and economically feasible under certain circumstances. Moderate policy recommendations are less comprehensive in terms of providing a solution to an issue, but they require less funding and bureaucratic oversight and are less likely to receive political and public resistance in comparison to stringent recommendations. While moderate recommendations are, in some cases, not the strongest solution to a school siting issue, they may provide a political platform or starting point

for implementing a policy that could be altered in the future to address the issue in a more comprehensive manner. Lenient recommendations work within the context of the current system, seeking minimal reforms and making minimal or zero financial demands. While the lenient recommendations still achieve the most critical environmental quality and human health outcomes, these recommendations cede broader potential successes and are more easily circumvented by noncompliant stakeholders.

Policy Recommendations

An effective policy must identify more than the technical details that are needed to achieve healthier, cleaner schools. A complete policy must outline the expectations of the stakeholders involved, and it must also construct effective bureaucratic systems. These diverse requirements are outlined in the following policy recommendations. Our policy recommendations are divided into two categories: ***approach*** and ***evaluation*.**

Approach address issues of how to approach the school siting process. Within ***approach***, policy options are divided into two subcategories: *authority* and *communication*. *Authority* addresses who could be involved in the process and *communication* addresses how those involved in the school siting process could communicate for a more effective policy.

Approach

Authority

Guidelines vs. Mandates
School Inclusion
Authority: The Decision Makers
School Siting Committees

Communication

Inter-agency Coordination and Communication
Public Participation
Reporting
Conflict Resolution

Evaluation addresses the various on-site and off-site health, environmental and cost factors that could weigh in on the school siting decision. Within ***evaluation***, policy options are divided into two subcategories: on-site and offsite. *On-site* refers to factors on the physical school site or directly impact the school site. *Off-site* refers to factors that are mainly off-site that either affects the cost of the site, construction of the site, or transportation to and from the school site. Many of these policy recommendations, however, could be both on-site and off-site policies. Importantly, on-site and off-site policy categories should not insinuate policies as either primary or secondary.

Evaluation
- *On-site*
  - **Acreage Requirements**
  - **Topography**
  - **Polluting Facilities**
  - **Hazards and Soil**
- *Off-site*
  - **Walkability**
  - **Transportation**
  - **Roadway Traffic**
  - **True Cost Estimates**

Each category is also divided into the aforementioned stringent, moderate, and lenient degrees and marked to show which area(s) of concern it addresses.

Chapter 5.2: Approach: Authority

Approach: Authority
Guidelines vs. Mandates (G)

In this case, our team has defined policy guidelines as a statement of a policy of procedure that can be utilized in determining a course of action by the government of the state of Michigan for the siting of schools. Mandates are considered by our team to be an authoritative command or law by the government of the state of Michigan to oversee the school siting process. Guidelines are recommended policies that are not required or enforceable by the state.

There were several opinions among informants about issues regarding implementation and enforceability of mandates or guidelines at the state level for the oversight of the school siting process. There were concerns that a strict policy, if passed all at once, would have efficacy and enforceability issues, and therefore, a mandated policy could be passed in an incremental process. Informants did note that mandated policies, however, provide benefits in that they are the safest way to ensure that child and environmental health is protected at school. Overall, informants favored guidelines as the process of school siting varies across the state, and many had political feasibility concerns regarding mandates.

Rhode Island Legal Institute example: The Rhode Island Legal Institute recommends mandates as the most effective method for achieving school siting outcomes that ensure the protection of child health.

State example: California and New Jersey have two of the nation's most stringent school siting policies, because of their completeness and strict regulations. This is accomplished through considerable state oversight that is accompanied by the necessary funding. Largely, the capacity for this state level oversight was in place before the siting policies were passed into law, and the siting policies altered how sites were chosen.

Informant comment: Although informants did not agree universally about whether a policy should primary utilize guidelines or mandates, many Michigan informants felt some guidelines would provide flexibility to school districts that have diverse needs.

State example: Minnesota, New Mexico, and North Carolina utilize guidelines. Our research indicates that these states do not allocate any additional funding for the implementation of these guidelines and little or no oversight is utilized. Rather, the states provide school districts with worksheets and materials that the school districts are expected to consider when siting schools. In these states, mechanisms for public participation are highly encouraged, because the public can hold school districts accountable for considering the guidelines.

***Stringent**:*

At this policy level mandates are recommended. This would mean that policy decisions made regarding school siting, regardless of other stringency levels, would be enforced by the state via law. The state government should work to allocate funds for school siting (infrastructure, building, and renovation). This money could come from a variety of places. Lobbying the federal government for state school siting funds (if this policy is innovative Michigan could make the case that it would be to the benefit of

students and with Michigan's struggling education funding, policy, and overall state economy there could be a case for federal assistance). This could also be done with reallocation of property or other taxes, as current property taxes allocations are kept within districts. However the state could exercise the right to reallocate these around the state with each district petitioning for a portion of these funds should they need to build schools. The state sales tax could be increased or redistributed in order to accommodate the financial needs of districts looking to renovate/site schools under these new guidelines.

***Moderate**:*

Guidelines are recommended at this level. This means that all policies decided upon by the state would be recommendations rather than requirements and are not enforceable. There is no additional government funding for school siting, therefore the state government lacks the ability to create or push for a policy that is more than recommended siting guidelines.

***Lenient**:*

Guidelines are recommended at this level. This means that all policies decided upon by the state would be recommendations rather than requirements and are not enforceable. There is no additional government funding for school siting, therefore the state government lacks the ability to create or push for a policy that is more than recommended siting guidelines.

Approach: Authority

School Inclusion (G) (C)

Public schools are elementary or secondary schools in the United States and the state of Michigan that are supported by public or state funds and thereby provide education for children within a district. Charter schools are similar to public schools in that they receive public funding; however, they operate independently of the district's school board, and in some instances, provide a curriculum that varies from the state provided curricular requirements. Parochial schools are supported by a religious organization, and in some cases, these institutions are eligible to receive public funds. Private schools, which are not included in these policy recommendations, are schools supported by private funds via individuals or corporations. The significance of differentiating between various types of schools and their inclusion in these

policies, is that while schools are bound by state educational standards they are not all bound by state funding or oversight.

Ideally, all Michigan schools would be subject to a school siting policy, since the objective is protecting child health. However, we recognize that private schools and public schools do not operate under the same conditions and including them in the same policy may be politically or practically impossible.

***Stringent**:*

All public, private, and parochial schools (including charter academies) should follow the school siting policies or guidelines that the legislature chooses. In some cases, for example, true cost estimates that involve county funding, these may not apply to private and parochial schools. Local education agencies should account for the different environmental impacts of siting decisions in urban, rural, and suburban communities.

***Moderate**:*

All public schools (including charter academies) should follow the school siting policies or guidelines that the legislature chooses. Local education agencies should account for the different environmental impacts of siting decisions in urban, rural, and suburban communities.

***Lenient**:*

All public schools should follow the policies or guidelines the legislature chooses.

Approach: Authority

Authority: The Decision Makers (G) (C)

In the state of Michigan the decisions regarding school siting and renovation issues are the responsibility of school boards. Michigan school districts are extremely autonomous in their school siting decisions; they do not have to confer with the state or with the municipality. Legislators must decide whether or not to continue this tradition of autonomy or enact a policy that builds more avenues for collaboration. We recommend that school districts at least work with their local municipalities to create agreeable siting decisions, but when additional stakeholders and agencies become involved with the process, someone must have the authority to come to a final decision.

State example: In California and New Jersey, the state makes the final siting decision, but mechanisms are in place to give the school district as much influence over the decisions as possible. In Minnesota, the Commissioner of Education does not explicitly reject or accept siting plans, but rather, comments on them favorably or unfavorably. Informants from Minnesota suggested that an unfavorable comment is taken seriously by school districts.

***Stringent**:*

The school siting committee agrees on a school site. Since it is comprised of several agents representing state and local interests, this is the most comprehensive place for the decision regarding school siting to be made.

***Moderate**:*

Local school district will still have the final decision on siting locations. Any recommendations that are made from the school siting committee regarding site preferences and concerns should be considered by the school district in the decision making process.

***Lenient**:*

Local school districts will still have the final decision on siting locations. Any recommendations that are made from the school siting committee regarding site preferences and concerns should be considered by the school district in the decision making process.

Approach: Authority

School Siting Committees (C)

The Environmental Protection Agency recommends that local education agencies (LEA) create local school siting committees which involve making recommendations on the factors involved with school siting and building renovation discussions. They recommend that these committees be comprised of local education agency representatives (e.g. school board members or health and safety staff), local government officials (e.g. city planners, environmental health specialists, auditors), and representatives from the community (e.g. parents, school staff, health organizations, environmental advocates, community planners, not-for-profit organizations, and preservation organizations) (U.S. EPA, 2011f). One informant noted that the EPA does not suggest a ratio for how many people should be involved from each sector. School districts should

work with the state (if applicable) or with the community to determine a combination of membership in the committee that is the most equitable for all interests.

Effective committees should be transparent to the public and work to consciously involve as many interests as logistically practical. School districts and municipalities should communicate frequently with the school siting committee and seek their approval on the final site selection for a school.

While public involvement does not relate directly to environmental quality and child health, most states with policies emphasize its importance in the school siting process. Equitable and transparent decisions are more likely to pass favorably with local voters, and committees can draw on the unique local knowledge that community members have. In the long term, public involvement reduces conflict and long-term costs.

EPA example: The EPA recommends the creation of a school siting committee comprising of not only representatives of the local education agency, but also other local community stakeholders.

Rhode Island Legal Institute example: The Rhode Island Legal Institute recommends school siting committees as the best method for ensuring public involvement and broadening the conversation among stakeholders. According to their 2006 survey, only eight states are utilizing school siting committees.

State example: New Jersey recommends, but does not require, school districts to form school siting committees. If a committee is formed, they are tasked with involvement over the course of the whole project, and in particular, approving of the final site selection. New Jersey's policy does not explicitly discuss how conflicts should be resolved.

Stringent:

School board members, local government authorities, teachers/union representative, county road commissioner (other community utilities/infrastructure parties), parents and concerned citizens, state agencies that are interested in a specific school siting case (transportation, education, health) should have a designated representative for cases in which they wish to be involved, representative from the state to aid in understanding of what the guidelines are and how they should be implemented.

***Moderate**:*

School district, local authorities, teachers/union representative, county road commissioner (other community utilities and infrastructure parties), parents and concerned citizens, state agencies that are interested in a specific school siting case (transportation, education, health) representative from the state to aid in understanding of what the guidelines are and how they should be implemented.

***Lenient**:*

School districts, local authorities, teachers/union representative, county road commissioner (other community utilities/infrastructure parties), parents and concerned citizens, representative from the state to aid in understanding of what the guidelines are and how they should be implemented.

Chapter 5.3: Approach: Communication

Approach: Communication

Inter-agency Coordination and Communication (G) (C)

State Agencies that are currently involved with aspects of education, environmental regulation, social justice, and health and safety regulations in the state of Michigan include: the Michigan Department of Transportation (MDOT); Michigan State Housing Development Authority (MSHDA); the Department of Environmental Quality (DEQ); Michigan Department of Education (MDE); Michigan Department of Labor and Economic Growth (DLEG); and the Michigan Economic Development Corporation (MEDC) (Michigan Association of Planning, 2011). These agencies, in conjunction with local education agencies, have a stake in ensuring that, should recommendations or policies be created regarding school siting, they are implementable and successful. This requires that successful lines of communication regarding school siting in the state of Michigan exist between these agencies so they are able to effectively implement, monitor, and alter policies without straining agency resources and personnel.

In the state of Michigan, several informants noted a lack of communication between government agencies, local governments, and local education or planning agencies. They also observed that the state lacked an institutional arrangement to facilitate communication between

local education or planning boards and state government agencies. Communication between these parties was noted by informants as beneficial to the planning process, and in a case where it was implemented successfully, better planning and cost distribution were included in the building process. The Kiddie Kollege incident in New Jersey illustrates the consequences of miscommunications during school siting. Had proper policies been in place, the owners of Kiddie Kollege may have been made aware that the site was the former property of a thermometer factory.

Informant comment: Our informants largely agreed that much more collaboration was needed between school districts, stakeholders, and agencies in school siting process.

State example: In New Jersey, municipalities and school districts must work together to inventory potential sites for a school. These sites are presented to the state-level School Development Authority who chooses one to three sites that the school district and municipalities must assess. In New Mexico, municipalities and school districts are not required to work together on a school siting decision, but the school siting guidelines

Stringent:

Both local and state interests should be represented on a school siting committee. The local interests on the school siting committee should elect a representative, as should the state, in order to best represent their interests in a communication and remediation process without delaying communication channels. In addition to these representatives, representatives from invested state agencies should also be involved in the communication pathways in order to demonstrate the needs of their agencies, offer recommendations and expertise, and keep their agencies informed with regards to school siting decisions as they are being made. School districts and municipalities should work together to agree on a school site in a process that is transparent to the public. If the local interests disagree about site selection, a state-level mediator should be made available. If a state oversight agency is formed, the state could serve as the "tie-breaking" vote on a site. However, reaching local agreement should be the preferred resolution.

Moderate:

Similar to the school siting committee, both local and state interests should be represented here. The local interests on the school siting committee should elect a representative, as should the state, in order to best represent their interests in a communication and remediation process without delaying communication channels.

Lenient:

Local representative (possibly from school siting committee – such as an elected chair) and the state representative from the school siting committee. If the state is not involved with the school siting process, the school siting guidelines should encourage school districts and municipalities to discuss the school site selection publicly. This keeps a clear communication channel without involving too many interests (which could create unnecessary conflict.)

Approach: Communication

Public Participation (C)

The *Hard Lessons* study by the Michigan Land Use Institute indicated that the more the community is involved in the school siting discussion the more likely a school board was to develop less costly solutions for the long-term (McClelland and Schneider, 2004). The Environmental Protection Agency's (EPA) School Siting Guidelines, as previously discussed, provide seven steps for public involvement: "plan and budget; identify those to involve; consider providing assistance; provide information; conduct involvement review and use input and provide feedback to the public; and evaluate involvement" (U.S. EPA, 2011f). The recommended communication strategy suggests that school siting decisions be delivered to stakeholders in accessible language and provided to parent-teacher organizations, labor unions, businesses, residents, neighborhood organizations, and elected representatives via newspaper publication and school and community organization postings (U.S. EPA, 2011f).

Some informants acknowledged the importance of public participation in the school siting process, but many expressed concerns. These concerns were related to the pace of school siting, as broad public involvement can reduce the pace of the siting process and potentially stall key decisions. There was acknowledgement for cases in which the school siting process had included public involvement, whether formally or informally. One Michigan informant mentioned that these provisions should be considered a necessary part of the process, rather than relying upon the passage of bonds as a sign of community approval, as this can improve local

siting decisions. The recommendations that we provide for the content of these meetings was primarily derived from the conversations that we had with our informants, and the concerns that they highlighted.

The Rhode Island Legal Institute reported that, in 2006, 12 states required school districts to solicit public input. Only eight required or recommended the formation of a school siting committee (Fischback, 2006). The Rhode Island Legal Institute recommends the formation of such committees, and New Jersey and North Carolina are among the states that employ this measure.

EPA example: The EPA recommends that a number of avenues be taken to involve the public in the school siting process. These include disseminating materials online and in community centers. Furthermore, the EPA recommends public stakeholder meetings and comment periods, during which local education agencies can solicit the input of members of the public (U.S. EPA, 2011f; U.S. EPA, 2011d).

Rhode Island Legal Institute example: The Rhode Island Legal Institute report emphasizes that public participation is very important and recommends the formation of local school siting committees to facilitate public participation (See our recommendations on School Siting Committees.).

State example: California, New Jersey, and New Mexico all include provisions for public participation in their school siting policies.

***Stringent**:*

The local school board must establish a school siting committee, whose job is to recommend to the public, sites for building new schools, leasing space for new schools, and/or expanding existing schools. The committee shall include representatives of the public body as well as representatives from the following stakeholders: parents (particularly those from the schools that will comprise the new school's population), teachers, a school nurse or health director, officials from local health departments, community members, local public health professionals, environmental advocacy groups, and age-appropriate students. Information about school construction is posted on schools' websites, in local newspapers, in community centers, and in quarterly newsletters to community members and students. A 60-day public commenting period is required before any final decision is made. Public meetings are held to discuss the siting options with parents, residents, and other stakeholders.
Information to be included at public stakeholder meetings:

- *Project the costs to acquire or lease the property and to cleanup and maintain the property in accordance with the Michigan Department of Environmental Quality's residential housing standards*
- *Project the time period required to complete a cleanup of the property for school purposes prior to occupancy by obtaining a Letter of Compliance from the Michigan department of environmental quality*
- *Provide the rationale for selecting the property for use as school purposes and an explanation of any alternatives to selecting said property considered by the project sponsor*
- *Provide a total cost estimate for building the new school including the cost to taxpayers from necessary infrastructure creation or alterations. Concerted effort is made to give notice to a local planning agency to comment on the project. Environmental site assessments are also made available for public review.*

***Moderate**:*

The local school board must establish a school siting committee, whose job it is to recommend to the public body sites for building new schools, leasing space for new schools, and/or expanding existing schools. In addition to school board members, the committee shall include representatives from the following stakeholders: parents (particularly those from the feeder schools that will comprise the new school's population), teachers, school nurse or health director, officials from local health departments, community members, local public health professionals, environmental advocacy groups, and age-appropriate students. Information about school construction is posted on schools' websites, in local newspapers, in community centers, and in quarterly newsletters to community members and students. A public commenting period of 60 days is required before any final decision is made. Public meetings are held to discuss the school siting options with concerned parents, residents, and any other stakeholder. Information to be included at public stakeholder meetings:

- *Project the costs to acquire or lease the property and to cleanup and maintain the property in accordance with the Michigan department of environmental quality's residential housing standards*
- *Project the time period required to complete a cleanup of the property for school purposes prior to occupancy by obtaining a Letter of Compliance from the Michigan Department of Environmental Quality*
- *Provide the rationale for selecting the property for use as school purposes and an explanation of any alternatives to selecting said property considered by the project sponsor*
- *Provide a total cost estimate for building the new school including the cost to taxpayers from necessary infrastructure creation or alterations. Concerted effort is made to give notice to a local planning agency to comment on the project. Environmental site assessments are also made available for public review.*

***Lenient**:*

Information about school construction is posted on schools' websites, in local newspapers, in community centers, and in quarterly newsletters to community members and students. A public commenting period of 60 days is required before any final

> *decision is made. Information to be included; project the costs to acquire or lease the property, and to cleanup and maintain the property in accordance with the Michigan Department of Environmental Quality's residential housing standards; projects the time period required to complete a cleanup of the property for school purposes prior to occupancy by obtaining a Letter of Compliance from the Michigan Department of Environmental Quality; the rationale for selecting the property for use as school purposes and an explanation of any alternatives to selecting said property considered by the project sponsor; and a total cost estimate for building the new school including the cost to taxpayers from necessary infrastructure that would need to be built.*

Approach: Communication
Reporting (G) (H) (E) (C)

The Environmental Protection Agency's School Siting Guidelines recommend several stages to a site review in order to best evaluate the environmental and health hazards of a potential school site. These stages of the site review process include: project scoping/initial screen of candidate sites; preliminary environmental assessment; comprehensive environmental review; develop site-specific remediate/mitigation measures; implement mitigation/remediation; and long-term stewardship plan (U.S. EPA, 2011f). There are several sub-categories that should be a part of each consideration/assessment phase including community needs and amenities; existing infrastructure; potential impacts or hazards (U.S. EPA, 2011f). These impacts and hazards include increases in traffic and issues of pedestrian safety; water quality; local utilities; historic and public resources; threatened/endangered flora and fauna; habitat loss; aesthetics; and potential exposure to toxicants (U.S. EPA, 2011f). Reporting has important implications for transparency to the public. As a result, report requirements fit with our recommendations for addition public participation measures. Transparency and public participation provide the foundation for siting decisions that all stakeholders can endorse.

EPA example: The EPA guidelines recommend several stages of comprehensive site review.

Rhode Island Legal Institute example: The Rhode Island Legal Institute asserted that reporting and transparency are important aspects of effective school siting policy. They recommend increasingly stringent assessments when potentially risky sites are being considered for construction.

State example: New Jersey asks school districts to make reports and decisions publicly available during the school siting process. California and New Jersey require increasingly stringent assessments when a potentially risky school site is being considered for construction. Other states, like North Carolina and New Mexico, recommend assessments for potentially hazardous school sites.

***Stringent**:*

Require an impact statement for all new school facilities and existing school renovations; a traditional Environmental Impact Statement (EIS) for all new buildings; a health impact assessment (HIA) for the site, and a report on impacts to school development and the benefits of the site (technical impact assessment). Create a checklist and report of factors that have been assessed (finances, tax burden, indoor air quality, acoustics, environmental impact, health impact, etc.) that is presented to the public for a 60-day comment period.

***Moderate** to **Lenient**:*

Require a checklist of assessed factors (finances, tax burden, indoor air quality, acoustics, environmental impact, health impact, etc.) that is presented to the public for a 60-day comment period.

Approach: Communication

Conflict Resolution (G) (H) (E) (C)

Conflict can arise in any situation where people are organized together with the purposes of setting goals, reaching goals, or facilitating discussions. Dimensions of conflict can be defined as: "threats or disputes over territory, whether the boundaries of the territory are physical, social, or work boundaries; and threats to values, goals, and policies, as well as threats to behavior" (The Ohio State University, n.d.). While conflict has a negative connotation in many social situations, in some instances conflict can be utilized to: "improve the quality of decisions, stimulate involvement in the discussion; and build group cohesion" (The Ohio State University,

n.d.). These recommendations attempt to provide a procedural resolution to conflict should it arise in the school siting process with the goal of facilitating compromises between groups. It is important in managing conflict to: recognize that conflict exists; analyze what is the cause of the conflict and who is involved; facilitate communication between groups and individuals by providing facts, listening to questions and concerns, and providing a safe space for open communication; and negotiate the terms and conditions surrounding compromise (The Ohio State University n.d.). As indicated in our interview synthesis, there is often miscommunication, or a lack of communication entirely, between stakeholders and decision makers, and in these cases, conflicts can arise. In order to streamline communication and ensure that opinions of various groups are accounted for in the decision making process, it is necessary to reduce conflict and enact effective, safe group communication. Ideally, school siting committees will help alleviate conflict before it arises.

Conflict resolution is not explicitly discussed in the states we explored, the EPA guidelines, or in the Rhode Island Legal Institute's recommendations. However, holistic school siting policies address conflict indirectly by trying to prevent it from arising in the first place. Our recommendations recognize that conflict is inevitable, and addressing that likelihood directly could make these conflicts a productive part of the school siting process.

Stringent:

The school siting committee is the most comprehensive place for understanding issues with the school siting process and many interests are represented here. This process should also include a moderator or a conflict resolution team in order to expedite the process (preventing any party/member form restraining the decision making process) and ensure that interests are given fair and equal representation.

Moderate:

The school siting committee is the most comprehensive place for understanding issues with the school siting process and many interests are represented here. This process should also include a moderator or a conflict resolution team in order to expedite the process (preventing any party/member form restraining the decision making process) and ensure that interests are given fair and equal representation.

***Lenient**:*

The school district can facilitate communication and conflict resolution within a district. This allows for the district to have jurisdiction over the decision making process as a whole and better understand the needs of the community.

Chapter 5.4: Evaluation: On-site

Evaluation: On-site
Acreage Requirements (E)

Currently the state of Michigan's Department of Education does not provide any recommendations on acreage or space requirements for educational facilities (Council of Educational Facility Planners International, 2003), and in some states (South Carolina, Rhode Island, Maine, Minnesota) acreage requirements have been overturned in order to assist in meeting goals related to walkability (Safe Routes to School National Partnership). However, recent trends demonstrate that the average school site size is increasing, and these sites tend to be located farther away from the communities that they serve (Safe Routes to School National Partnership, n.d.). Acreage requirements can drive schools out of community centers. By keeping acreage requirements out of siting policy, school districts can utilize available space and work with their local government to incorporate new schools into the community's development plan. Furthermore, educational materials on the benefits and drawbacks of large and small acreage sites should be provided by the Michigan Department of Education.

Informant comment: Several informants from other states have also stressed the importance states not having either acreage requirements or guidelines. This includes both official requirements and guidelines as well as a culture of "unwritten rules" which tend to be followed; in some instances, this can lead to local education agencies assuming that they need large plots on which to site schools, ignoring some of the benefits that including small plots as potential sites can bring.

State example: In 2009, Minnesota eliminated a policy that allowed the Commissioner of Education to reject school siting plan on the basis of acreage of the site.

Stringent:

Assess land parcels based on usable acres, not just total acres in the site. Consider special cases for urban or dense school siting locations. For urban/densely built locations, consider multi-story or innovative options.

Moderate to Lenient:

Assess land parcels based on usable acres, not just total acres in the site.

Evaluation: On-site

Topography (H) (E)

It is important to consider topography and terrain in order to assess risks of naturally occurring hazards and risk of pollution. Topography can be defined as "the shape or configuration of the land, represented on a map by contour lines, hypsometric tints, and relief shading" (Michigan Department of Technology, Management, and Budget, n.d.). Although topography is not among the most pressing school siting issues, it is most commonly addressed by states with a school siting policy, according to the Rhode Island Legal Institute (Fischbach, 2006). Many states have recognized that siting on floodplains or wetlands can have expensive consequences for school districts.

Rhode Island Legal Institute example: Many states with school siting policies address natural hazards (topography). Avoiding natural hazards, such as wetlands, preserves critical ecological habitat and can save schools and communities infrastructure costs.

Stringent:

School siting process should assess topography of land in site assessment to avoid areas of natural hazards, such as 100-year floodplains. In choosing a site it is also necessary to determine if new school buildings or renovations will alter the existing topography therefore having an effect on the natural environment.

Moderate:

School siting process should assess topography of land in site assessment to avoid areas prone to natural hazards, such as 100-year floodplains.

Lenient:

School siting process should take into consideration areas prone to natural hazards, such as 100-year floodplains.

Evaluation: On-site

Polluting Facilities (H) (E)

As discussed previously, polluting facilities near educational facilities can have long-term effects on child health and development. Studies suggested that in the state of Michigan, "schools located in areas with the highest air pollution levels had the lowest attendance rates … and the highest proportions of students who failed to meet state educational testing standards" (Mohai et al., 2011). According to research and the responses of our informants, schools are often sited on land that has a low-property value to keep initial costs low. However, these sites are located near "polluting industrial facilities, major highways, and other potentially hazardous sites." As a result, more than half of Michigan's public schools are located in the most polluted parts of their district (Howes, 2011). As industrial facilities are variable in the types and amounts of pollutants that they emit into the air, we recommend air quality assessments at sites, as opposed to rigid minimum buffer distances.

EPA example: The EPA recommends that industrial facilities within ~1/2 mile of school sites (~800 meters) be assessed for their potential health impacts. Facilities should be assessed on a case-by-case basis, as industrial facilities can vary tremendously in the types and amounts of pollutants that they emit (U.S. EPA, 2011c).

State example: Minnesota and North Carolina advise school districts to consider siting their schools away from potentially hazardous industrial sites. In some cases, in these states, environmental assessments are recommended as appropriate but not necessarily required.

Stringent:

All candidate sites must have air quality assessments performed no less than 30 days prior to construction on land already owned by the school district or prior to purchasing new land. The results of these air quality assessments must be made publicly available, along with considerations of background outdoor air quality levels in the district. Also, because the results of a single air quality assessment may not be fully indicative of what types of pollutants are emitted on an intermittent basis, candidate sites for school facilities must be assessed for their proximity to all air-polluting facilities within 800 meters of the school. Polluting facilities must be characterized by the nature and amount of pollutants they report under Toxic Release Inventory (TRI) records or

other identified hazards. The lists for potential site(s) shall be made available for public review and commentary. Furthermore, sites must be evaluated for odor and noise pollution impacts of nearby facilities (within approximately 800 meters) that may disrupt classroom activities. Roughly one half-mile, or 800 meters, is the distance recommended by the EPA in which to evaluate industrial facilities near sites (U.S. EPA, 2011c).

***Moderate**:*

Air quality assessments are recommended no less than 30 days prior to construction on land already owned by the school district or prior to purchasing new land. Candidate sites for school facilities must be assessed for their proximity to all air-polluting facilities within 800 meters of the school. Polluting facilities must be characterized by the nature and amount of pollutants they report under Toxic Release Inventory (TRI) records or other identified hazards. These facilities should also be assessed for potential odors and noises that may disrupt classroom activities. The lists for potential site(s) shall be made available for public review and commentary. For sites in close proximity industrial facilities of particular concern, air quality assessments are highly recommended. A set of guidelines regarding polluting facilities and their potential effects on schools is to be created and disseminated among school systems.

Lenient:

School districts should consider major sources of air pollution when siting new schools. Assessments of industrial facilities within 800 meters are suggested. A set of guidelines regarding polluting facilities and their potential effects on schools is to be created and disseminated among school systems.

Evaluation: On-site

Hazards in soil (H) (E)

Soil on prospective sites could be contaminated with lead and other heavy metals (e.g. mercury, arsenic, cadmium, chromium), as well as a variety of volatile organic compounds which can cause vapor intrusions into buildings. Site assessments prior to construction are optimal. One case study from Detroit demonstrates the risks contaminated soils possess and is described in more detail in the Case Studies section that follows the Policy Recommendations. Children may be exposed to toxicants via contaminated soils while at school. In the case of Beard Elementary School in Detroit, the 6.45 acre site had a history of industrial use resulting in soil contamination from arsenic, lead, polychlorinated biphenyls (PBCs), and volatile and semi-volatile organic compounds (Agency for Toxic Substances & Disease Registry, 2009). While

contaminants had been removed during the site remediation process, some contaminants, such as arsenic, remain in the soil (Agency for Toxic Substances & Disease Registry, 2009). Detroit Public Schools was asked to develop a plan to prevent human exposure to soil contaminants which includes conducting monthly inspections of the site cap (paved areas, concrete building floor, and exposure barriers) (Agency for Toxic Substances & Disease Registry, 2009). Furthermore, a plan for annual assessments of remediated sites was included in HB 5320, introduced by Representative Belda Garza in the wake of the Beard Elementary case (Couch, 2002). Out of state incidents, like Kiddie Kollege in New Jersey and Belmont Learning Center in Los Angeles also demonstrate the risk soils pose for children, as well as the cost improper siting decisions can incur.

EPA example: The EPA recommends that all potential school sites be assessed for their proximity to hazardous waste sites within ~1 mile (approximately 1,600 meters). As the contents of waste sites and the prospective risks of locating schools near these sites differs by the type, amount, and storage method of contaminants at each site, prospective school sites located near hazardous waste sites should be evaluated on a case-by-case basis (U.S. EPA, 2011c).

Informant comment: One informant—working for a state level environmental agency—lamented that school districts seem unaware of the resources that are available through their environmental protection agency. The informant suggested that school districts need to be made aware of resources available that can help them identify and avoid brownfields.

State example: California and New Jersey require extensive assessments, and in cases where soils might be contaminated, soil tests must be performed. The New Jersey requirement was created in response to mercury poisoning at the Kiddie Kollege daycare center that was unknowingly sited on the unremediated property of a former thermometer factory. After the incident, the New Jersey Department of Environmental Protection endeavored to ensure that the state's brownfield databases were consistent and up-to-date. The Department of Environmental Protection also added additional reporting and public notice requirements for those responsible for a brownfield and its remediation. In California, if a school district decides to remediate a contaminated site, the site must meet residential standards, which are the most stringent clean-up standards that the state requires. Minnesota and New Mexico require school districts to remediate contaminated sites according to state-regulated standards. However, environmental assessments of sites are only recommended if the district has reason to believe that the site is contaminated.

Stringent:

The history of the site should be accounted for in the selection process and should be publicly available knowledge. Environmental Site Assessments, including soil tests, conducted by licensed environmental consulting firms or state employees, are mandatory for all considered school sites. Sites with soils contaminated with heavy metals, volatile organic compounds (VOCs), and other contaminants of concern, past permissible residential levels must be remediated in accordance with MDEQ residential standards. If a school is within 1,600 meters of a Superfund site, Resource Conservation and Recovery Act (RCRA) hazardous waste site, state-regulated hazardous waste site, or other waste site, an assessment of the potential health impacts of that siting decision is required.

Moderate:

The history of the site should be accounted for in the selection process and should be publicly available knowledge. If the site's history provides evidence of contamination, an Environmental Site Assessment, conducted by licensed environmental consulting firms or state employees, must be performed. Sites with soils contaminated with heavy metals, VOCs, and other contaminants of concern, past permissible residential standards, must be remediated in accordance with MDEQ residential standards. If a school is within 1,600 meters of a Superfund site, RCRA hazardous waste site, state-regulated hazardous waste site, or other waste site, an assessment of the potential health impacts of that siting decision is required.

Lenient:

The history of the site should be accounted for in the selection process and should be publicly available knowledge. Proximity to industrial sites, brownfields, and remediated brownfields should also be considered. Schools should consider conducting Environmental Site Assessment on sites with histories of concern. If the site contains heavy metals, VOCs, and other contaminants at levels of concern, the site should be remediated according to MDEQ residential standards. Also, decision makers should account for the proximity of school sites to Superfund sites, RCRA hazardous waste sites, state-regulated hazardous waste sites, or other waste sites when deciding whether or not to acquire property or build on previously purchased property.

Chapter 5.5: Evaluation: Off-site

Evaluation: Off-site

Walkability (H) (E) (C)

The federal program Safe Routes to School (SRTS) was created under the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users in 2005 (Michigan Fitness Foundation, 2012). This allocated federally provided dedicated state dollars to aid with infrastructure improvements and non-infrastructure activities that:

> ...Enable and encourage all children to walk and bike to school; make bicycling and walking to school safer and more appealing alternative modes of transportation; and develop projects and encourage activities that will improve student health and safety while reducing traffic, fuel consumption, and air pollution in the vicinity of schools. (Michigan Fitness Foundation, 2012)

Projects that qualify for funding include: sidewalks; bicycle and pedestrian facilities; traffic diversion in school vicinities; traffic education; and public awareness/community outreach (Michigan Fitness Foundation, 2012). At the federal level, these dollars are administered by the Federal Highway Administration (FHWA) Office of Safety, and in the state of Michigan the dollars are regulated by the Michigan Department of Transportation (MDOT) (Michigan Fitness Foundation, 2012).

The Federal Safe Routes to School program was noted several times in our interviews as it has come to the forefront in debates of issues regarding child health, obesity, and school/community walkability. Michigan informants mentioned that in large Michigan school districts, where transportation is a key concern, communities express interest in having centrally located schools that serve as community centers. Informants also felt that although this is a popular topic in discussions of child health, this interest is not represented in practice, and should be considered in the school siting process to facilitate more implementation of safe school access and walkability.

State example: New Mexico's school siting guidebook recommends that school districts ensure walkable and bike-friendly routes for students and staff that are reasonable in distance and safe from traffic.

Stringent:

Provide safe routes to school to encourage walking and safety. If safe routes are provided, set up initiatives to foster walking/biking to school programs.

***Moderate**:*

Provide safe routes to school to encourage walking and safety. If safe routes are provided, set up initiatives to foster walking/biking to school programs.

***Lenient**:*

Encourage safe environments for students to walk/bike to school.

Evaluation: Off-site

Transportation (G) (H) (E) (C)

In the state of Michigan, school districts are not required to transport students to and from their educational facilities, and if the district does provide transportation, there is no requirement on safety of transporting children to and from bus stops, where the bus stops, and how long the length of the child's ride is on the bus (Michigan Department of Education, n.d.). Transportation is a multifaceted school siting issue that encompasses environmental quality and child health. School districts can encourage students and parents to utilize provided transport to reduce traffic around the school and improve air quality as well. Creative publicity initiatives or school parking policies could encourage students to use school-provided transportation.

Informant comment: One school administrator wished that more students took advantage of provided transportation (bussing) in order to decrease driver congestion around schools. The informant added that this is a particular problem around high schools, since it seems that none of the student drivers want to utilize the bus system.

***Stringent**:*

Encourage students to take provided transport (i.e., buses) to reduce traffic burden and pollution. Set up initiatives to foster these behaviors and systems. Require an assessment of: how new school will impact current traffic corridors and systems; the impact of altered traffic on students' safety, including safety in walking or biking; and impact of reduced traffic flow on local air pollution. Consider transportation requirements of students and busing needs when considering new school sites especially in relation to school site relevant to majority of district home locations.

***Moderate**:*

Encourage students to take provided transport (i.e., buses) to reduce traffic burden and pollution. Set up initiatives to foster these behaviors and systems. Require an

assessment of: how new school will impact current traffic corridors and systems; and the impact of altered traffic on students' safety including safety in walking or biking.

***Lenient**:*

Encourage students to take provided transport (i.e., buses) to reduce traffic burden and pollution. Require an assessment of how new school will impact current traffic corridors and systems.

Evaluation: Off-site

Roadway Traffic (G) (H) (E) (C)

Road traffic discussions include a multitude of issues that include student ease of access to facilities, proximity of educational facilities to transportation corridors, and the health effects of this proximity to transportation corridors for prolonged periods of time. Wu and Batterman (2006) conducted a study of proximity of K-12 schools in Wayne County, Michigan to commercial and non-commercial traffic. The study concluded that the annual average daily traffic (AADT) is an inadequate reflection of traffic related exposures, given the differences in health effects of exposure to diesel and gasoline emissions, and that a larger proportion of grade 7-12 schools are exposed to traffic emissions (Wu and Batterman, 2006). They also demonstrated that 4.9% of the 845 Wayne County schools and in the urban core area 7.2% of schools and 7.6% of students experience traffic exposures while in school (Wu and Batterman, 2006). Of the schools included in the study area, 2.8% are located within 150 meters of roadways that carry at least 5,000 trucks (indicating diesel emissions) per day (Wu and Batterman, 2006). In considering environmental justice, students in Wayne County schools that are located near high traffic corridors "are more likely to be Black or Hispanic, to be enrolled in a (school) meal program, and to reside in a poor area" (Wu and Batterman, 2006).

Reducing vehicle idling around schools is another way to combat air pollution levels around schools. The U.S. Environmental Protection Agency recognizes this issue and promotes

the National Idle-Reduction Campaign. The campaign provides school districts with guidance and materials on implementing a "Do-it-yourself" idle-reduction campaign (U.S. EPA, 2011g).

Informants raised other concerns regarding traffic patterns and congestion that can be altered or created by a school. In some instances where school traffic travels through a community or business center, other residents may be detracted from using this area in times of high traffic volume, which creates a potential loss of business in these areas. There can also be large costs placed upon road commissions in creating new infrastructure if traffic needs to be diverted elsewhere or a roadway expanded to facility heavy traffic flow for schools.

Informant comment: Informants said that when schools do not assess traffic patterns when considering school sites, the community incurs the cost and impacts.

Literature example: As a result of Yi-Chen Wu and Stuart Batterman's research outlined in this section, we felt that schools should be siting away from traffic corridors as much as possible.

State example: Birchler Arroyo Associates, Inc, a Michigan-based consulting firm working to assist municipalities and school districts in creating successful traffic solutions offers several solutions for traffic access to school facilities. These recommendations include: evaluating current traffic conditions and providing a written assessment; listening to school staff and community stakeholders in order to better understand the issue; creating mitigation alternatives such as pavement markings and street signs; evaluating turn lanes and signals usefulness; implementing a traffic impact study; and developing a walkability program (Birchler Arroyo Associates, Inc., n.d.). In the case of Jefferson Middle School in St. Claire Shores' Lakeview Public School District, a bus loop was designed and constructed on an abutting street to prevent the idling and congestion of buses on a local side street and in the school parking lot which offered inadequate space to accommodate both bus and private drop-off and pick-up activities (Birchler Arroyo Associates, Inc., n.d.). The successful communication and participation of a consulting group with the district can be seen in the case of Gallimore Elementary School in Plymouth's Plymouth-Canton Community School District. The consulting firm conducted a traffic review that provided for the development of safely separating pedestrian and vehicle traffic (Birchler Arroyo Associates, Inc., n.d.).

Stringent:

No new K-12 or early-education school shall be sited within 300 meters of a major roadway or freeway. Zhou and Levy (2007) found that air pollutant concentrations reached background levels 150-200 meters away from major roadways. Furthermore,

Wu and Batterman (2006) define heavy traffic exposure for Detroit students as average annual daily traffic (AADT) greater than 50,000 with a school within 150 meters. However, we recommend an increased distance due to uncertainty regarding the amounts of pollutants emitted as well as prevailing wind directions, which may result in background concentrations of air pollutants being reached at longer distances from roadways. Furthermore, risks of siting near non-highway roads that carry large traffic volumes should be considered. A portion of new parking lots (aside from spaces pertaining to accessibility needs for handicapped students, faculty, and community members) must be sited away from schools in order to minimize exposure to idling traffic among those on the school grounds and promote exercise among students. New major roadways shall not be built within 300 meters of any operating elementary or early education school property, as early exposures are likely to have the greatest effects on children. We recommend 300 meters as a minimum distance from roadways, as opposed to 200 meters, to provide an additional safeguard in case specific aspects of the roadway and the prevailing wind direction and speed create longer distances at which roadways may cause localized pollution. Any new highway construction project within 300 meters of an existing school must provide funding and mediation plans via an environmental impact statement (EIS) for adequate heating, ventilation, and air conditioning modifications to the school, which would mediate indoor air quality effects from the additional outdoor air pollution. The prevailing direction of wind should also be accounted for in planning for school construction and ventilation systems. Local education agencies should also consider potential noise pollution issues from highways greater than 300 meters away from school sites.

***Moderate**:*

No new elementary or early education school shall be sited within 300 meters of a highway, and risks of siting near non-highway roads that carry large traffic volumes should be considered. Risks of siting near highways and major roadways should also be considered for middle and high schools. The prevailing direction of wind should also be accounted for in planning for school construction and ventilation systems. New major roadways shall not be built within 300 meters of any operating elementary or early education school property. Any highway construction project must provide funding and mediation plans via an environmental impact statement (EIS) for adequate heating, ventilation, and air conditioning (HVAC) modifications to the school.

***Lenient**:*

The consideration of safe school distance from highways and major roadways is optional at this policy level. Elementary schools, especially, are encouraged to be a safe distance from major roadways, at least 200 meters, as the recognized distance from roadways at which pollution falls to background levels is 150-200 meters (Zhou and Levy, 2007).

Evaluation: Off-site

True Cost Estimates (G) (H) (E) (C)

School construction causes increases in taxes and creates concern surrounding economic and community stability, which can have long terms consequences for the school district (McClelland and Schneider, 2004). Construction of educational facilities can aid or deter businesses from locating in communities, which is a large factor in community economic success or failure (McClelland and Schneider, 2004). The state of Michigan has experienced a billion-dollar-per-year school construction boom, matching the cost of annual road construction in the state, but many urban, older suburban, and rural school districts have been left behind due to a lack of district funds for school construction or renovation (McClelland and Schneider, 2004). New school construction in the state of Michigan has been associated with debt for homeowners and businesses, increasing from $4 million to $12 million since 1994 (McClelland and Schneider, 2004). Since 1996, the state's student population has increased by 4.5%, however 278 older schools were closed and at least 500 new facilities were constructed even though in every case studied by the Michigan Land Use Institute building a new school cost more than renovating an existing building (McClelland and Schneider, 2004).

True cost estimates, that take into account issues such as transportation infrastructure and utilities costs not paid for by the local education agency, are important in the school siting process as they determine the cost in the long term rather than only considering the cost of constructing the facility. Taking true cost estimates into account can lower the overall cost incurred to communities and the state which are demonstrated to be on the rise in recent years. Strictly speaking, true cost estimates are defined as "an economic model that seeks to include the cost of negative externalities into the pricing of goods and services" (Investopedia, n.d.). Our informants suggested that school districts are not including negative externalities in the cost of a new school facility. Student health and subsequent medical costs might be one externality. A

more concrete externality is the cost of new infrastructure for schools that are sited far from population centers. In Michigan, county road commissions adopt this cost, not the school district. In some cases, a lack of site assessments causes unexpected costs when remediation is suddenly needed.

Our informants mentioned that true costs are assessed too late in the planning process and are ineffective as a result. An informant mentioned that, while local agencies may reject the need for true cost estimates, as they cause the local agencies to bear greater costs at the onset of the project, long-term planning and true cost estimates have the potential to save money over the course of several years. The following recommendations focus on how infrastructure costs are allocated between school districts and road commissions. However, the policy recommendations in the entirety of this report seek to address true costs and avoid unexpected costs for school districts and communities.

Informant comment: Informants explained that long-term, hidden, or true costs are largely overlooked by local education agencies because they are not necessarily responsible for incurring these costs and because the lack of collaborative processes leaves these costs unrecognized. According to our informants, traffic infrastructure is one of the main costs that Michigan school districts overlook.

State example: The Los Angeles Unified School District incurred millions of dollars of extra cost when it chose a polluted site that needed remediation for the Belmont Learning Center (Fischbach, 2006). An environmental impact assessment or better cost protection mechanisms might have avoided this cost. In addition, angry parents sued the district—another unexpected cost that could have been avoided.

***Stringent**:*

Assess impact fees to school districts that would force them to bear the costs of new infrastructure for schools located far from population centers. This provides districts with an incentive to keep their schools as close to population centers as possible. The Michigan Department of Transportation may be able to oversee this process, but local road commissions could also estimate and assess the fees since they will ultimately have responsibility for the infrastructure construction. This process should be highly collaborative and should consider the benefits the community receives from the development of new infrastructure.

Moderate:

Road commissions and school districts work together to estimate new infrastructure needs and costs for potential school sites. The road commission and school district publicizes this estimate and splits the cost.

Lenient:

Road commissions and school districts work together to estimate new infrastructure needs and costs for potential school sites. The road commission continues to incur these costs, which is the current status quo in Michigan.

Chapter 5.6: Conclusion

These policy recommendations are crafted to be considered at various levels of implementation and stringency, both as individual policies and in combination, in order to create a policy that best addresses the health needs of children in the state of Michigan. Varying stringency levels were created to allow for policy flexibility, and while some policies did not directly address health issues all policies were created with end goal of protecting child health in schools as education is mandated in the state of Michigan. These recommendations should be considered with the explanations that are provided in this section, the literature review, the information provided by informants, and the case studies that follow. In order to best address the needs of Michigan, stakeholders and policy makers should consider the efficacy and feasibility of these policies in the current and future political and school siting climate within the state of Michigan.

Chapter 6: Case Studies

Chapter 6.1: Contaminated Soil at Schools

Cooper Elementary School (Westland, MI), Beard Elementary School (Detroit, MI), Priest Elementary School (Detroit, MI)

(New James Beard Elementary; J. L. Judge Construction Services Company, LLC, 2009)

A persistent concern in school siting cases is that of contaminated soils at school sites built on or near areas containing hazardous waste. This section focuses upon three sites in Southeast Michigan that have been points of recent contention: Cooper Elementary School in Westland, Beard Elementary School in Detroit, and Priest Elementary School in Detroit.

Cooper Elementary School was built in 1966, on top of a former landfill which accepted industrial waste. The landfill was closed in the 1950s, and topped with a layer of clay. It was not until 1991, after orange-colored material was reported to be seeping out of open spaces in the ground, that soil tests from the playground and other areas found that the site was contaminated with dangerously high levels of lead, mercury, cadmium, arsenic, and the now-banned insecticide DDT (Kanamine, 1991; Greenwire, 1991). Outcry from parents after the soil tests caused the school's closure (Greenwire, 1991). However, there are lingering issues from the siting of the school on this land. Students were moved across the street, to the site of Whittier Junior High, which was closed at the time. Tests at the Whittier site deemed the soil to be safe. However, years later, in 2006, parental concerns over site safety arose again when

reorganizations of the Livonia School District led to a proposal to move hundreds more students to the Whittier site in what is now Cooper Upper Elementary School, serving fifth and sixth graders (Jun, 2006). Despite this controversy, that site is currently presumed safe and is now the site of Cooper Upper Elementary School.

Beard Elementary School (formerly known as both New Beard Elementary School and Roberto Clemente Learning Academy), located in Southwest Detroit, also stands as a poignant and recent example of a school built on a contaminated site, the cleanup of which was mainly spurred by popular concern. The school at this site replaced the historic Beard Elementary School (now Beard Early Childhood Education Center) located five blocks from the new site, built in 1876, as well as McMillan Elementary school. The decision to move Beard Elementary was spurred by a number of considerations. In particular, a lack of a cafeteria and overcrowding were two major reasons for the need for a new location. The announcement about the move was made in 2000 and was met with significant controversy (Lucero v. Detroit Public Schools, 2001; Cohen, 2001).

The site for the New Beard Elementary School is located on a brownfield once occupied by a variety of manufacturing and metalworking industries, as well as the U.S. Army. The U.S. Army donated the land to the Detroit Board of Education, who ran a vocational education center, the McNamara Skills Center, there until 1986, after which the site was vacated and all buildings on it were demolished (Lucero v. Detroit Public Schools, 2001). In 1998, prior to the announcement that the new Beard school would be built, Southwest Detroit Environmental Vision requested background data on the site from Detroit Public Schools (DPS), a request which went unfulfilled. Subsequently, Southwest Detroit Environmental Vision arranged for students from the University of Michigan to conduct a review of the site's history. Southwest

Detroit Environmental Vision brought the history of the report to Detroit Public Schools in 1999, who retorted that the site's history did not prove that it was contaminated. After this, Southwest Detroit Environmental Vision sought assistance from the Michigan Department of Environmental Quality (MDEQ) and the Wayne County Brownfield Redevelopment Authority (WCBRA) in assessing the site; funds from a federal pilot program allowed an engineering consulting firm to conduct a site assessment. Based on the history of the site, the firm conducted a geophysical survey of the area. Sampling of the area found a number of hazardous contaminants at levels higher than permissible for residential areas, including arsenic, lead, polychlorinated biphenyls (PCBs), carbon tetrachloride, and benzo(a)pyrene (Lucero v. Detroit Public Schools, 2001).

In spite of this, Detroit Public Schools decided to build on the site, claiming that it was the only site large enough to suit the district's needs (Lucero v. Detroit Public Schools, 2001). Detroit Public Schools spent over $1.3 million on necessary remediation efforts, which included removing over 30,000 tons of contaminated soil, laying down crushed concrete, and filling in new soil. Even after these efforts, continuing environmental health concerns led to a lawsuit in which families of students sued to stop the opening of the school based on environmental justice concerns. This claim was denied in federal court, although the judge presiding over the case ruled that Detroit Public Schools must follow through with their "Due Care" plan, which involved regular monitoring of the site (Lucero v. Detroit Public Schools, 2001). The New Beard Elementary School was opened in September 2001 (Upton, 2001).

In 2001, a new Priest Elementary School facility was slated to be built on top of a field adjacent to the then-existing Priest Elementary School, built in 1920 over a bulldozed residential area. Rapid construction would allow the new elementary school to be opened in the fall of 2002.

However, tests prior to construction found that the field, which children had played on for years, was contaminated with elevated lead and arsenic levels. Lead levels at the site were up to 30-times higher than the 400 parts per million which are considered acceptable for human exposure by the EPA (U.S. EPA, 2012c). Upon this discovery, soil tests were immediately ordered at the existing Priest school, although the summer school session continued. New building of the school continued with a proactive site clean-up on the part of Detroit Public Schools as the contamination was discovered on the heels of the Beard Elementary Controversy (Cohen and Torres, 2001). Given the industrial history of Detroit and other areas throughout Michigan, cases of contaminated school properties may become more apparent in the future.

In 2009, in response to cases such as these, Michigan State Representative Rashida Tlaib introduced a bill to amend the state education code to regulate school siting. The law would have mandated that school districts, intermediate school districts, or the boards of directors of public school academies must perform an environmental assessment of a site to determine if there are concentrations of hazardous waste beyond that acceptable for unrestricted residential use at potential school sites. This assessment would have to be performed within 28 days of acquiring a new site or starting construction at an existing site (House Bill 5271, 2010). This bill passed in the House of Representatives, but was not brought to the floor for a vote in the Michigan Senate. A policy mandating site assessments based on site history and physical tests, prior to the acquisition of new land or the construction of a facility on existing school property would help minimize the risk of students being exposed to harmful contaminants through school soil. Our policy recommendations propose to evaluate the history of the proposed school site, the relative location to superfund and industrial sites, and recommend environmental site assessments,

environmental impact statements, and soil contaminant reviews in order to take into account all potential health hazards contained in soils in potential school yards.

Chapter 6.2: Charlevoix High School

(Charlevoix, MI)

(Charlevoix High School, n.d.)

Charlevoix High School is located in the northern part of the Lower Peninsula in Charlevoix, Michigan. The construction of the school was completed in 2002. The school has 375 students in grades 9-12 (Schooldigger, 2012). Charlevoix, Michigan, is a small community of about 2,000 residents. The building of Charlevoix High School serves as an example of lack of coordination with the local planning board and a lack of community involvement in the school siting process. The school district built a 74 acre new high school three miles outside of town, at a cost of $17.4 million. The site was previously used as pastureland and its location added additional transportation costs for the district and individual families (Eisberg, Friedman, Lollini, and Slingluff, 2006).

The Charlevoix school board held just two public forums and discussed the school construction proposal at only one school board meeting. The first Charlevoix forum revealed that most of the approximately 100 people in attendance wanted their schools to be located in town, as opposed to outside of town (McClelland and Schneider, 2004). The board appointed a building committee to consider options; it met privately for only two months before offering three choices at a second forum. The three choices were: $14.4 million to remodel all the existing Charlevoix public schools, $16.6 million to build a new middle school at a new location and

remodel the high school, and $18.5 million to build a new high school on a new site, remodel the old one into a middle school, and abandon the historic middle school in town (McClelland and Schneider, 2004). Two weeks later, with only ten citizens attending, the committee recommended the most expensive option to the school board. The decision to build a new school was not unanimously agreed upon within the community (McClelland and Schneider, 2004). The millage passed 1,440 to 1,340, a margin that magnified the sharp divide the board's closed process caused (McClelland and Schneider, 2004; State of Michigan, n.d.).

During the siting process, the school board voted unanimously to override the township planning commission's decision that the school proposal was not compatible with the township's master plan (Matheny, 2000a). This was permissible because the school board is only obligated to submit plans to the township planning commission; they are not obligated to follow the advice or suggestions of the township's master plan (Matheny, 2000a). The decision to build in this location was the result of closed-door sessions among just a few stakeholders, which ended in the decision to build new facilities rather than to renovate older ones at lower costs. The public generated several lawsuits that failed, in addition to an attempted school board recall (Matheny, 2000b; Matheny 2000c; McClelland and Schneider, 2004). With more public input consideration and the consideration of the township's master plans, the tension and lawsuits over building Charlevoix High School may have been avoided. Several of the recommendations found in the Policy Recommendations section of this report may have helped facilitate a better outcome for Charlevoix. These include provisions for increased public participation, conflict resolution, and school siting committees that represent the views of the community members. Increased public participation and feedback can help school districts make siting decisions that align with community priorities and can save the school district unforeseen costs, such as lawsuits.

Chapter 6.3: Southwestern High School
(Detroit, MI)

(The New York Public Library, 2012)

Southwestern High School in Detroit, built in 1921, serves as an important example of the need to incorporate considerations of school locations in land-use planning. In the time since the construction of Southwestern High School, environmental hazards have been constructed in the surrounding area. Although it is slated for closure at the end of this year, the school remains an important reminder of the importance of considering schools in all land use planning.

Recently, Southwestern High School has portrayed an important part of an ongoing debate on the impact of the New International Trade Crossing (NITC, formerly Detroit River International Crossing) on the surrounding community. This proposed bridge between Detroit and Windsor, Ontario would act as a companion to the Ambassador Bridge, which carries a large portion of freight traffic between the United States and Canada. Due to the large volumes of diesel trucks which cross the bridge, it carries a large pollution footprint. In the first years of its operation, this freight traffic load would be split between the two bridges. Traffic density at each

bridge would increase over time, though per-vehicle emissions of many pollutants would decrease. Importantly, the proposed plaza area for this bridge, where all freight traffic would need to pass through, would lie immediately to the south of Southwestern High School. Furthermore, the traffic interchange area for the bridge would lie in the Fisher Freeway portion of Interstate 75 directly to the north of the school (Detroit River International Crossing Study, 2008a).

This case study does not serve to vilify the Michigan Department of Transportation for the location of the plaza. Ultimately, there were a host of considerations that went into choosing from the twelve alternative locations for the bridge plaza; extreme proximity of certain areas of the plaza to Southwestern High School was even given as a reason not to choose one alternative (Detroit River International Crossing Study, 2008b). However, while the Michigan Department of Transportation has pledged to provide for the school's necessary new heating, ventilation, and air conditioning equipment to mitigate the effects on indoor air quality in the school, the increase in traffic volume in the area would still lead to detrimental effects on the air quality at the school's outdoor athletic facilities.

Ultimately, the long history of the original land use decision to locate the Fisher Freeway in its current location, immediately adjacent to Southwestern High School, is an important factor in the currently proposed location of the plaza next to the school, as the plaza would need to be near a highway interchange. Furthermore, the location of the school near riverfront industrial land uses likely plays a part in the area's usefulness for receiving increased freight traffic.

In addition, Southwestern High School is located close to a number of industrial facilities. Of note, an abandoned site owned by MichCon, a subsidiary of DTE Energy Co., only a few blocks from the school, contained old equipment, abandoned cars, and soil heavily

contaminated with polychlorinated biphenyls (PCBs). PCBs are persistent organic pollutants, and are listed by the EPA as probable human carcinogens. In 1997, cleanup of the site was initiated by both the State of Michigan and the Environmental Protection Agency (EPA), when 37 drums of chemical waste and 2,300 tons of PCB-contaminated soil were removed from the property. In 2001, the EPA ordered MichCon to spend up to $1.3 million to clean up the site (McWhirter, 2001). The location of this site so close to Southwestern High School illustrates the ideal that policies on the siting of schools alone may not be enough to ensure the safety of students. In contrast, what is needed is a system in which schools are fully accounted for in the decisions made by land-use planners, so that, for example, potentially hazardous industries are not permitted to be sited near schools.

Currently, Southwestern High School is scheduled for closure in 2012, along with eight other public schools in the city, spurred by the continued decline in school enrollment in Detroit and, ultimately, a decision by Detroit Public Schools Emergency Manager, Roy Roberts. This leads to another issue, as the loss of Southwestern High School has been lamented by many as a loss of an important asset to the community it has served (Foley, 2012). Southwestern High School would benefit from several of the previously discussed policy recommendations especially considerations of roadway traffic. All policy levels proposed recognize a safe distance for schools to be located from traffic corridors, and in a situation where a school is built prior to the surrounding transportation corridors, this policy can still be utilized to protect child health in schools. This case demonstrates the multifaceted nature of environmental hazards that may surround schools, as their proximity to schools can be a product of historical land use practices.

Chapter 6.4: Skyline High School
(Ann Arbor, MI)

(Skyline High School, n.d.)

Skyline High School is a recently constructed public high school in Ann Arbor, Michigan. The school opened in the fall of 2008 in an attempt to relieve overcrowding at the city's two existing high schools, Huron High School and Pioneer High School (Jesse, 2008). The facility provides an example of a construction process for a school that lacked the involvement of the public and local planning authority in the school siting process. The siting process began with the defeat of a 2002 bond proposal to expand Huron and Pioneer High Schools. In response, in June 2004, the Ann Arbor Public School Administration developed a $240 million bond and sinking fund proposal which included not only the construction of a new high school, but renovations to all of the district's school buildings. This bond and sinking fund were approved, and funds were allocated for the creation of Skyline High School (Ann Arbor Public Schools, 2007).

The public was not actively included in choosing the location of the new high school facility. Although parents and citizens were able to comment on the potential school location via written comments and public meetings, ultimately, the decision making power was held by the school board. Citizens for Responsible Schools, a local citizens' action group, was formed to

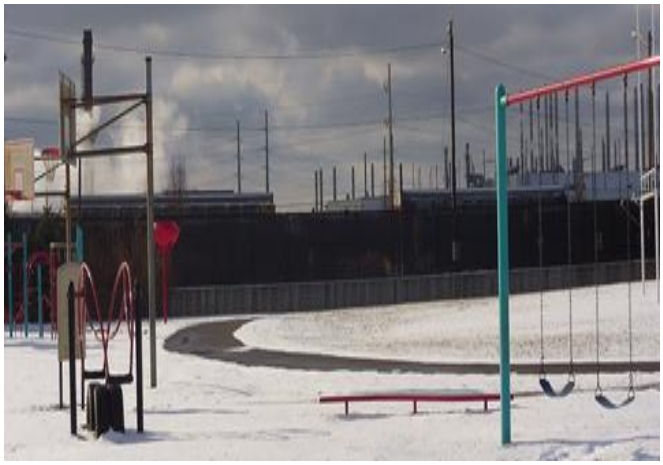
bring various community and parental concerns to light. The group was particularly concerned that the site chosen for the school was unsafe as the proposed school entryway was located on a highway, creating traffic congestion and safety issues for drivers. Utilizing the highway as the main entryway also affects the school's capacity to provide walkable access to students, which created another concern for the citizen group (Citizens for Responsible Schools, n.d.).

This school site was chosen primarily because the district previously owned the land, which significantly reduced the cost of building and construction (Ann Arbor Public Schools, 2007). According to an anonymous informant from our Interview Synthesis, the school board held public meetings, but these meetings were focused on whether or not a school should be constructed, with siting of the facility explicitly left out of the conversation. The informant also recalls that if the subject of siting the facility was brought up by a public participant, it was quickly noted that this particular subject was not open for discussion at that time. The local planning commission was also excluded from the school siting process. It is important to note that the Ann Arbor Planning Commission rejected both the school siting plans and the district's request that the new high school be annexed into the city, which is essential to give the school access to water and sewer services. This rejection was disregarded in the siting process, however, as school district projects are exempt from municipal zoning and building codes. The Ann Arbor School District had submitted the siting plans to the Ann Arbor Planning Commission as a courtesy (Ann Arbor Area Community News, 2005).

This case study demonstrates the lack of coordination and communication that exists between the local planning board and local school board and demonstrates the priority of cost considerations in school siting decisions (Norton, 2007). The siting process failed to fully take into account public opinion and the expertise of planning commission members. Environmental

factors were also a low priority when siting Skyline High School as the facility was built on a parcel of land already in the possession of the school district. Cost factors appear to be of the highest priority in terms of siting; however, in the long run, ensuring the health and academic success of students by siting an environmentally healthy school lowers the long-term cost to individuals and society as a whole. Many of these issues could have been avoided by several of the policy recommendations previously discussed. These include: conflict resolution strategies (mediators, involving proper parties, recognizing that a conflict exists, and provision of a safe space for discussion concerns); the creation of more inclusive school siting committees that are able to address the needs of community members, local education authorities, and school siting mandates; and the overall inclusion of the public in the school siting process by allowing access to information and allowing for stakeholders to voice concerns and opinions.

Chapter 6.5: Salina Elementary School
(Dearborn, MI)



(Personal photograph by Emily Etue. 14 Jan. 2012.)

Salina Elementary is located in Dearborn, Michigan, which lies on the border of southwest Detroit. The educational facility was built in 2003, long after the industrial facilities in the area had been built and established. Salina Elementary is a public school that serves 504 students ranging from preschool to third grade. Salina Intermediate is located adjacent to the elementary facility, which accommodates students in fourth through eighth grades.

According to USA Today's *Smokestack Effect* survey, a widely published and popularized project, the ambient air quality at Salina is situated in the second percentile of examined educational facilities. This can be interpreted to mean that only 1% of schools across the United States have higher air toxicity levels (USA Today, 2009). In total, there are 13 industrial facilities in Dearborn that have reported their levels of toxic chemical productions to the Environmental Protection Agency (EPA). Two of the reporting facilities are located in the 48102 zip code, which is also the home zip code of Salina Elementary (EPA, 2012d). Of the 13 reporting facilities in Dearborn, the facilities that are a cause of major concern for the air quality surrounding Salina are: Ford Motor Company—Dearborn Truck Plant; Edward C. Levy

Company—Plant 6; Double Eagle Steel Coating Company; United States Steel Corporation Great Lakes Works; and Severstal North America Inc. Toxic releases from the previously stated facilities that are of the greatest concern include manganese and manganese compounds. Prolonged manganese exposure can cause mental and emotional disturbances, as well as fatigue. Children are more susceptible to the health risks of manganese than adults, allowing for prolonged exposures to have lifelong health effects for children exposed in area, including while in school (USA Today, 2010). Other chemicals of concern that have a significant presence in the area are: Di(2-ethylhexyl); phthalate (bis(2-ethylhexyl) phthalate); glycol Ethers; hydrochloric acid; and trimethylbenzene (USA Today, 2010). The *Smokestack Effect* report, previously referred to, based its research on emission data collected by the U.S. Environmental Protection Agency as part of the agency's Toxics Release Inventory (TRI) program.

Personal photograph by Emily Etue. 14 Jan. 2012.

The playground area at Salina Elementary is directly adjacent to the Severstal North, Inc. facility, and the lack of a proper buffer zone allows the facility to pose an immediate threat to child health (USA Today, 2010). This particular Severstal facility is the former Rouge Steel Plant. The Russian based steel company is currently the fourth largest producer of steel in the United States (Severstal, 2006). In 2010, the facility reported over 543,000 pounds in chemical and toxic air emissions. That number demonstrates a dramatic increase from the reported 2009 emissions of 485,000 pounds and the 2008 reports of 249,000 pounds (Hijazi, 2011).

A recently recognized study, which is a collaborative effort between Wayne State University, Michigan State University, the University of Michigan, and the Arab Community

Center for Economic and Social Services (ACCESS, a nonprofit organization in Dearborn), sought to examine the effects of pollution on respiratory health in age groups ranging from children to the elderly residing in Dearborn's South End, an area which includes Salina Elementary. The study found that the rate of asthma hospitalizations in the area are more than double the average number of hospitalizations attributed to asthma in Michigan (Hijazi, 2011). In conjunction with the discovery of these results, a local citizen action group has formed to aid championing the need for clean, healthy air in the community. Concerned Residents of South Dearborn (CRSD) have argued that the location of Salina Elementary, which is so close to the Severstal facility, has created more than air quality problems and noise pollution. Windows must often stay closed in order to prevent the noise pollution from becoming a distraction to students. This recommendation is especially difficult to comply with during hot days at the neighboring Salina Intermediate, as there is no air conditioning at the school (Snell, 2008). A lawsuit settled in 2003 forced Severstal to work to control its noise emissions (Snell, 2008). Although, at the time of this case study, no evidence could be found to demonstrate of any changes in action on the part of Severstal to comply with this decision. Residents in the area also complain of odor problems (Hijazi, 2011). The May-June 2007 Salina Intermediate Schools newsletter reported that children were required to remain indoors due to high levels of toxic air reported by the Michigan Department of Environmental Quality's air quality monitoring station located near the school (Dearborn Public Schools, 2007). This monitoring station is checked regularly by school officials to monitor toxicity levels (Dearborn Public Schools, 2007).

Salina Elementary is an example of a case in which child health is jeopardized due to the proximity of the school to industrial facility sites. The siting of a school in what is essentially the backyard of the Severstal factory demonstrates the recent findings by Drs. Paul Mohai, Byoung-

Suk Kweon, and Sangyun Lee. Their findings (Mohai et al., 2011) indicate that in the more polluted areas of Michigan, there is a higher probability that a district's school will be sited in the most polluted zone within that area. As discussed in the policy recommendations, along with a previous discussion of their findings, the school siting process can benefit from consideration of polluting facility locations. The stringent, moderate, and lenient policy recommendations all recommend that a series of guidelines (if not mandates) be established regarding toxic facility sites be distributed to schools and that sources of air pollution should be of greater consideration in school siting discussions. Moderate and stringent policy recommendations also recommend that candidate sites must be evaluated for their proximity to toxic facilities, and that potential site lists must be made available to the public for comment therefore increasing saliency of information and public involvement. Salina Elementary is located in one of the most polluted areas within the school district, exposing children to toxic releases with known health effects that have been linked to lower academic performance, developmental issues, and life-long health detriments.

Chapter 7: Conclusion

As demonstrated by the content contained in this report, there is ample evidence and support for the creation of a school siting policy in the state of Michigan. We have worked to ensure that the information contained in this report provides a holistic view of the health issues at stake for children at school, as well as the measures that currently exist across that United States to foster an environmentally safe environment. While some aspects of our report do not specifically relate to the health or justice issues that are of focus, they are important in creating a feasible policy that protects child health in educational facilities. It should also be noted that the information and policy recommendations contained in this report are to be considered by stakeholders, citizens, and policymakers in creating a policy that best fits the needs of the state of Michigan. The information contained in the literature review, interview synthesis, and policy recommendations makes the case that children need protection from policies in order to ensure that their health, development, academic-achievement, and overall well-being is preserved and fostered in the school environment rather than subject to hazards and toxicants from the surrounding environment. Children are extremely susceptible to the health effects of exposure to environmental hazards and toxicants, and in order to protect them all of the information contained in this report as well as the vast amount of literature and policy recommendations regarding child health, school siting, and environmental justice should be taken into consideration in the policy making process. If we are to mandate that our children spend time in educational facilities across the state of Michigan, we have a duty as citizens, educators, policymakers, and researchers to ensure that these health and justice stakes are protected while in this environment.

Appendix I: Summary of Policy Recommendations

Policy Category	Stringent Policy Recommendation	Moderate Policy Recommendation	Lenient Policy Recommendation
Polluting Facilities	No school shall be sited within 300 meters of any major air polluting industrial facility. Candidate sites for school facilities must be assessed for their proximity to all air-polluting facilities within 800 meters of the school. Polluting facilities must be characterized by the nature and amount of pollutants they report under Toxic Release Inventory (TRI) records or other identified hazards. The lists for potential site(s) shall be made available for public review and commentary.	Candidate sites for school facilities must be assessed for their proximity to all air-polluting facilities within 800 meters of the school. Polluting facilities must be characterized by the nature and amount of pollutants they report under Toxic Release Inventory (TRI) records or other identified hazards. The lists for potential site(s) shall be made available for public review and commentary.	School districts should consider major sources of air pollution when siting new schools. A set of guidelines regarding polluting facilities and schools is to be created and disseminated among school systems.
Hazards in Soil	The history of the site should be accounted for in the selection process and should be publicly available knowledge. Mandatory Environmental Site Assessment for all considered school sites. If necessary, an Environmental Impact Statement should be performed. Sites with soils contaminated with heavy metals, VOCs, and other contaminants of concern, past permissible residential levels must be remediated in accordance with MDEQ requirements. New schools may not be located within 500 meters of an identified Superfund site.	The history of the site should be accounted for in the selection process and should be publicly available knowledge. If there is a history of industrial use, an Environmental Site Assessment should be performed. Sites with soils contaminated with heavy metals, VOCs, and other contaminants of concern, past permissible residential levels must be remediated in accordance with MDEQ requirements. New schools may not be located within 500 meters of an identified Superfund site.	The history of the site should be accounted for in the selection process and should be publicly available knowledge. Proximity to industrial sites, brownfields, and remediated brownfields should also be considered. Schools should consider conducting Environmental Site Assessment on sites with histories of concern. If the site contains heavy metals, VOCs, and other contaminants at levels of concern, the site should be remediated. New schools may not be located within 500 meters of an identified Superfund site.

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Policy Category	Stringent Policy Recommendation	Moderate Policy Recommendation	Lenient Policy Recommendation
Acreage Requirements	Assess land parcels based on usable acres, not just total acres in the site. Consider special cases for urban or dense school siting locations. For urban/densely built locations, consider multi-story or innovative options.	Assess land parcels based on usable acres, not just total acres in the site.	Assess land parcels based on usable acres, not just total acres in the site.
Walkability	Provide safe routes to school to encourage walking and safety. If safe routes are provided, set up initiatives to foster walking/biking to school programs.	Provide safe routes to school to encourage walking and safety. If safe routes are provided, set up initiatives to foster walking/biking to school programs.	Encourage safe environments for students to walk/bike to school.
Transportation	Encourage students to take provided transport (i.e., buses) to reduce traffic burden and pollution. Set up initiatives to foster these behaviors and systems. Require an assessment of: how new school will impact current traffic corridors and systems; the impact of altered traffic on students' safety including safety in walking or biking; and impact of reduced traffic flow on local air pollution. Consider transportation requirements of students and busing needs when considering new school sites especially in relation to school site relevant to majority of district home locations.	Encourage students to take provided transport (i.e., buses) to reduce traffic burden and pollution. Set up initiatives to foster these behaviors and systems. Require an assessment of: how new school will impact current traffic corridors and systems; and the impact of altered traffic on students' safety including safety in walking or biking.	Encourage students to take provided transport (i.e., buses) to reduce traffic burden and pollution. Require an assessment of how new school will impact current traffic corridors and systems.

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Policy Category	Stringent Policy Recommendation	Moderate Policy Recommendation	Lenient Policy Recommendation
Roadway Traffic	No new K-12 or early-education school shall be sited within 200 meters of a major roadway or freeway. Zhou and Levy (2007) finding that air pollutant concentrations reached background levels 150-200m away from major roadways and Wu and Batterman (2006) define heavy traffic exposure for Detroit students as AADT>50,000 with a school within 150 meters. A portion of new parking lots (aside from spaces pertaining to accessibility needs for handicapped students, faculty, and community members) must be sited away from schools in order to minimize exposure to idling traffic among those on the school grounds and promote exercise among students. New major roadways shall not be built within 200m of any school property. Any new road construction project near an existing school which would bring the total AADT in the area surrounding the school (200m radius) up to 30,000 should provide funding and mediation plans via an environmental impact statement (EIS) for adequate HVAC modifications to the school .The prevailing direction of wind should also be accounted for in planning for school construction and ventilation systems.	No new elementary or early education school shall be sited within 200 meters of a major roadway or freeway. Risks of siting near roadways should also be considered for middle and high schools. The prevailing direction of wind should also be accounted for in planning for school construction and ventilation systems. New major roadways shall not be built within 150 meters of any elementary school. Any new road construction project near an existing school which would bring the total AADT in the area surrounding the school (150m radius) up to 30,000 should provide funding and mediation plans via an environmental impact statement (EIS) for adequate HVAC modifications to the school.	Optional consideration of safe school distance from highways and major roadways. 150-200m is recognized as the boundary at which pollution falls to background levels (Zhou and Levy, 2007). Elementary schools, especially, are encouraged to be a safe distance from roadways.

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Policy Category	Stringent Policy Recommendation	Moderate Policy Recommendation	Lenient Policy Recommendation
Guidelines vs. Mandates	At this policy level mandates are recommended. This would mean that policy decisions made regarding school siting, regardless of other stringency levels, would be enforced by the state via law. The state government should work to allocate funds for school siting (infrastructure, building, and renovation).This money could come from a variety of places. Lobbying the federal government for state school siting funds (if this policy is innovative Michigan could make the case that it would be to the benefit of students and with Michigan's struggling education funding, policy, and overall state economy there could be a case for federal assistance). This could also be done with reallocation of property or other taxes, as current property taxes allocations are kept within districts. However the state could exercise the right to reallocate these around the state with each district petitioning for a portion of these funds should they need to build schools. The state sales tax could be increased or redistributed in order to accommodate the financial needs of districts looking to renovate/site schools under these new guidelines.	Guidelines are recommended at this level. This means that all policies decided upon by the state would be recommendations rather than requirements and are not enforceable. There is no additional government funding for school siting, therefore the state government lacks the ability to create or push for a policy that is more than recommended siting guidelines.	Guidelines are recommended at this level. This means that all policies decided upon by the state would be recommendations rather than requirements and are not enforceable. There is no additional government funding for school siting, therefore the state government lacks the ability to create or push for a policy that is more than recommended siting guidelines.

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Policy Category	Stringent Policy Recommendation	Moderate Policy Recommendation	Lenient Policy Recommendation
Inter-Agency Coordination and Communication	Similar to the school siting committee, both local and state interests should be represented here. The local interests on the school siting committee should elect a representative, as should the state, in order to best represent their interests in a communication and remediation process without delaying communication channels. In addition to these representatives, representatives from invested state agencies should also be involved in the communication pathways in order to demonstrate the needs of their agencies, offer recommendations and expertise, and keep their agencies informed with regards to school siting decisions as they are being made.	Similar to the school siting committee, both local and state interests should be represented here. The local interests on the school siting committee should elect a representative, as should the state, in order to best represent their interests in a communication and remediation process without delaying communication channels.	Local representative (possibly from school siting committee – such as an elected chair) and the state representative from the school siting committee. This keeps a clear communication channel without involving too many interests (which could create unnecessary conflict.)
School Siting Committee	School district, local authorities, teachers/union representative, county road commissioner (other community utilities/infrastructure parties), parents/concerned citizens, state agencies that are interested in a specific school siting case (transportation, education, health) should have a designated representative for cases in which they wish to be involved, representative from the state to aid in understanding of what the guidelines are and how they should be implemented.	School district, local authorities, teachers/union representative, county road commissioner (other community utilities/infrastructure parties), parents/concerned citizens, state agencies that are interested in a specific school siting case (transportation, education, health) representative from the state to aid in understanding of what the guidelines are and how they should be implemented.	School district, local authorities, teachers/union representative, county road commissioner (other community utilities/infrastructure parties), parents/concerned citizens, representative from the state to aid in understanding of what the guidelines are and how they should be implemented.

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Policy Category	Stringent Policy Recommendation	Moderate Policy Recommendation	Lenient Policy Recommendation
Authority: The Decision Makers	School Siting Committee. Since it is comprised of several agents representing state and local interests, this is the most comprehensive place for the decision regarding school siting to be made.	School district. Any recommendations that are made from the school siting committee regarding site preferences and concerns should be considered by the school district in the decision making process.	School Board.
Conflict Resolution	The school siting committee is the most comprehensive place for understanding issues with the school siting process and many interests are represented here. This process should also include a moderator or a conflict resolution team in order to expedite the process (preventing any party/member form restraining the decision making process) and ensure that interests are given fair and equal representation.	The school siting committee is the most comprehensive place for understanding issues with the school siting process and many interests are represented here. This process should also include a moderator or a conflict resolution team in order to expedite the process (preventing any party/member form restraining the decision making process) and ensure that interests are given fair and equal representation.	The school district can facilitate communication and conflict resolution within a district. This allows for the district to have jurisdiction over the decision making process as a whole and better understand the needs of the community.
School Inclusion	All public, private, and parochial schools (including charter academies) should follow these policies or guidelines. For urban/rural/suburban communities, consider different environmental impacts in each community.	All public, private, and parochial schools (including charter academies) should follow these policies or guidelines.	All public schools should follow these policies or guidelines.
True Cost Estimates	Assessment of impact fees and infrastructure costs should be handled by the county and the school district or by the state if necessary. Interagency coordination is needed in this process.	Initial costs should be estimated and divided between the county and the school district, depending on who necessitates infrastructure creation or alterations and who benefits from these changes.	No recommended change to the current system of not requiring or recommending true cost estimates as a part of the school siting process.

Appendix I: Summary of Policy Recommendations

Policy Category	Stringent Policy Recommendation	Moderate Policy Recommendation	Lenient Policy Recommendation
Reporting	Require: an impact statement for all new school facilities and existing school renovations; a traditional Environmental Impact Statement (EIS) for all new buildings; and an "impact statement" that incorporates how schools will impact the surrounding environment (including transportation, EIS), health effects (health impact assessments; HIAs), and impacts on school development/benefits (technical impact assessment). Create a checklist and report of factors that have been assessed (finances, tax burden, indoor air quality, acoustics, environmental impact, health impact, etc.) that is presented to the public for a comment period.	Require a checklist of assessed factors (finances, tax burden, indoor air quality, acoustics, environmental impact, health impact, etc.) that is presented to the public for a comment period.	Suggested checklist of assessed factors (finances, tax burden, indoor air quality, acoustics, environmental impact, health impact, etc.).
Topography	School siting process should assess topography of land in site assessment to avoid areas of natural hazards (ex. floodplains) and of high pollution. In choosing a site it is also necessary to determine if new school buildings or renovations will alter the existing topography therefore having an effect on the natural environment.	School siting process should assess topography of land in site assessment to avoid areas prone to natural hazards or high pollution areas.	School siting process should take into consideration areas prone to natural hazards or high pollution areas as areas to potentially avoid.

Appendix I: Summary of Policy Recommendations

Policy Category	Stringent Policy Recommendation	Moderate Policy Recommendation	Lenient Policy Recommendation
Public Participation	The local school board must establish a school siting committee, whose job it is to recommend to the public, sites for building new schools, leasing space for new schools, and/or expanding existing schools. The committee shall include representatives of the public body as well as representatives from the following stakeholders: parents (particularly those from the schools that will comprise the new school's population), teachers, school nurse or health director, officials from local health departments, community members, local public health professionals, environmental advocacy groups, and age-appropriate students. Information about school construction should be posted on schools' websites, local newspapers, and quarterly newsletters to community members and students. A public commenting period is required before any final decision is made. Public meetings are held to discuss the siting options with parents, residents, and other stakeholder. Information to be included at public stakeholder meetings: Project the costs to acquire or lease the property and to cleanup and maintain the property in accordance with the Department of Environmental Management's Rules and Regulations for the Investigation and Remediation of Hazardous	The local school board must establish a school siting committee, whose job it is to recommend to the public body sites for building new schools, leasing space for new schools, and/or expanding existing schools. The committee shall include representatives of the public body as well as representatives from the following stakeholders: parents (particularly those from the feeder schools that will comprise the new school's population), teachers, school nurse or health director, officials from local health departments, community members, local public health professionals, environmental advocacy groups, and age-appropriate students. Information about school construction is posted on schools' websites, local newspapers, and quarterly newsletters to community members and students. A public commenting period of 60 days is required before any final decision is made. Public meetings are held to discuss the school siting options with concerned parents, residents, and any other stakeholder. Information to be included: project the costs to acquire or lease the property, and to cleanup and maintain the property in accordance with the Department of Environmental Management's Rules	Information about school construction is posted on schools' websites, local newspapers, and quarterly newsletters to community members and students. A public commenting period of 60 days is required before any final decision is made. Information to be included; project the costs to acquire or lease the property, and to cleanup and maintain the property in accordance with the Department of Environmental Management's Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases (the Remediation Regulations); projects the time period required to complete a cleanup of the property for school purposes prior to occupancy by obtaining either a Letter of Compliance from the Department of Environmental Management or a determination by said department that the property is not jurisdictional under the Remediation Regulations; the rationale for selecting the property for use as school purposes and an explanation of any alternatives to selecting said property considered by the project sponsor; and a total cost estimate for building the new school including the cost to taxpayers from necessary infrastructure that would need to be built.

Appendix I: Summary of Policy Recommendations

Public Participation Continued	Material Releases (the Remediation Regulations); project the time period required to complete a cleanup of the property for school purposes prior to occupancy by obtaining either a Letter of Compliance from the Department of Environmental Management or a determination by said department that the property is not jurisdictional under the Remediation Regulations; the rationale for selecting the property for use as school purposes and an explanation of any alternatives to selecting said property considered by the project sponsor; and a total cost estimate for building the new school including the cost to taxpayers from necessary infrastructure creation or alterations. Concerted effort is made to give notice to a local planning agency to comment on the project. Environmental site assessments are also made available for public review.	and Regulations for the Investigation and Remediation of Hazardous Material Releases (the Remediation Regulations); project the time period required to complete a cleanup of the property for school purposes prior to occupancy by obtaining either a Letter of Compliance from the Department of Environmental Management or a determination by said department that the property is not jurisdictional under the Remediation Regulations; the rationale for selecting the property for use as school purposes and an explanation of any alternatives to selecting said property considered by the project sponsor; and a total cost estimate for building the new school including the cost to taxpayers from necessary infrastructure that would need to be built. Concerted effort is made to give notice to a local planning agency to comment on the project. Environmental site assessments are also made available for public review	

Appendix II: Table of Health Toxics Relevant to School Siting

Agent	Description & Use	Exposure Source[+]	Health Outcomes[+]

Arsenic (As)	• Naturally occuring in the earth's crust[1]
	• Inorganic As is in treated lumber; organic arsenic in some pesticides[1]
	• As is a by-product of some industrial activities, it can enter drinking water through the ground or as runoff into surface water sources[2]
		• Found in 68.2% of National Priority List sites[1, ++]
		• Often a contaminant in water, but also in soil, food, and air[1]
		• Contaminated air near smelters, wood traetment or pesticide application sites[1]
		• As can enter drinking water through the ground or as runoff into surface water sources[2]
			• Death at high levels of inorganic As[1]
			• Nausea and vomiting[1]
			• Decreased red and white blood cell production[1]
			• Abnormal heart beat, blood vessel damage, tingling of the extremities[1]
			• Adverse fetal and pregnancy impacts (ATSDR, 2007a)
			• Lower IQ scores for child exposures[3]
			• Inorganic arsenic:
			  ○ Sore throat, lung irritation (high levels in air)
			  ○ Death (high levels)
			  ○ Skin discoloration (ingestion or inhalation) or swelling (dermal)[1]

Cadmium (Cd)	• Naturally occurring in the earth's crust[4] • All soils and rocks contain some Cd[4] • Used in batteries, pigments, metal coatings, and plastics[4] • Cd Contamination from mining, industry, coal burning, and household wastes[4]	• Found in 59.7% of EPA's National Priority List sites[4] • Most exposure occurs through breathing cigarette smoke or ingesting cadmium-contaminated foods, or contaminated air near industrial facilities[4]	• Irritation of the stomach, vomiting, and diarrhea (high ingestion levels)[4] • Potential of kidney disease (long-term, low levels)[4] • Lung damage (long-term inhalation, low levels)[4] • Fragile bones (long-term, low levels)[4] • Can also impact cardiovascular, developmental, reproductive, and neurological health[4] • Known human carcinogen[4]
Chromium (Cr)	• Naturally occurring in rocks, animals, plants, soil, and volcanic dust and gases[5] • Many different forms of Cr in the environment: Cr(III) is an essential nutrient; Cr(VI) and Cr(0) (metal form) are generally products of industry[5] • Cr(VI) and Cr(III) used in chrome plating, dyes and pigments, leather tanning, and wood preservation[5] • Cr(0) is used in making steel[5]	• Exposure through ingesting contaminated food, inhalation or dermal exposure in occupational settings, contaminated drinking water, or close industrial sites[5] • Occupational exposure	• Immunologic, renal, and respiratory organ system effects[5] • Inhalation of high levels of Cr(VI) can cause irritation to the lining of the nose, nose ulcers, runny nose, and breathing problems[5] • Anemia, irritation and ulcers of the stomach (ingestion of Cr[VI])[5] • Potential of skin ulcers or allergic reactions to dermal exposure[5] • Known human carcinogen[5]

Appendix II: Table of Health Toxics Relevant to School Siting

Agent	Description & Use	Exposure Source[+]	Health Outcomes[+]
Carbon Monoxide (CO)*	• Product of the ombustion processes, specifically the burning of fossil fuels[6, 7] • Nationally and, particularly in urban areas, the majority of CO emissions to ambient air come from mobile sources[6] • CO levels in indoor air vary depending on appliances or equpment use and tobacco smoking[7] • Industrial releases from manufacturing of some chemicals[7]	• Most exposure through inhalation of contaminated air from vehicle exhaust, stoves, furnaces, stoves, heaters, generators, or cigarette smoke[7]	• Reduction in the oxygen-carrying capacity of the blood[6] • Death at high levels[7] • Headache, nausea, vomiting, dizziness, blurred vision, confusion, chest pain, weakness, heart failure, difficulty breathing, seizures, and coma (inhalation)[7] • People with lung or heart disease are more vulnerable[7]
Lead (Pb)*	• Naturally occurring in earth's crust[8] • Mainly from gasoline burning (for vehicles prior to banning in 1996; in use in some piston-engine aircraft gasoline), mining (lead smelters), and manufacturing[8, 9] • Used in the production of batteries, ammunition, metal products, and X-ray shielding devices, and as an additive to paints, ceramic products, caulking, and pipe solder[8]	• Found in 75.5% of EPA's National Priority List sites[8] • Ingestion of contaminated foods, soil, or water[8] • Lead-based paint or contaminated soil and dust consumption by children[8, 9] • High air concentrations near lead smelters[9] • Occupational exposure[8]	• Can effect almost every organ and system in the body, but main toxicity is to the nervous system[8] • Nervous system impairment (long-term exposure)[8] • Weakness in fingers, wrists, or ankles[8] • Small increases in blood pressure and anemia[8] • Brain and kidney damage or even death (high exposures)[8] • Lower IQ and standardized test scores[10-12] • Mood and decision-making alterations[13] • Behavioral effects (conduct disorders and ADHD)[14-16] • Heightened anxiety & social problems[16] • Miscarriage in pregnant women[8] • Male reproductive organ damage[8] • Probable human carcinogen[8]
Manganese (Mn)	• Naturally occurring metal in many rock types and most foods[17] • Used mainly in steel production or as an additive to gasoline[17] • An essential nutrient, so small exposures are necessary[17]	• Can be in air, soil, and water[17] • Exposure through food consumption[17] • Occupational exposure (welding, steel factories)[17] • In groundwater and soil at low levels[17]	• Neurobehavioral effects, such as behavioral changes, and slow or clumsy movements (referred to as "manganism") (high, occupational exposures)[17] • Childhood exposures can cause changes in behavior and learning and memory ability at high levels[17] • Lower IQ scores[11]

Appendix II: Table of Health Toxics Relevant to School Siting

Agent	Description & Use	Exposure Source[+]	Health Outcomes[+]
Mercury (Hg)	• Several forms: organic (most commonly methylmercury, which can bioaccumulate in animals), and metallic and inorganic mercury[18] • Inorganic and metallic mercury used in dental fillings, dental fillings, skin lightening creams, thermometers (historically), and antiseptics, and in the production of chlorine gas[18] • Found in many rocks, including coal. Coal-burning power plants are the largest U.S. source of air Hg emissions.[19] • Sources from mining ore, coal and waste combustion, and manufacturing (inorganic Hg)[18]	• Found in at least 48.7% of EPA's National Priority List sites[18] • Found in air, water, and soil[19] • Exposure from contaminated air, water, and food, and dental amalgams or other medical treatments[18] • Vapor exposure from spills, incinerators, and industries[18]	• Damage to the brain, kidney, heart, lungs, immune system, and the developing fetus (high exposure to all forms)[18, 19] • Irritability, shyness, tremors, changes in vision or hearing, and memory problems[18] • Lung damage, nausea, vomiting, diarrhea, increases in blood pressure or heart rate, skin rashes, and eye irritation (short-term, high exposures to metallic Hg vapors)[18] • Childhood exposures may cause problems with nervous and digestive systems, and kidney damage, and may impact the ability to learn[18, 19] • Adverse fetal development and pregnancy impacts[18] • Mercuric chloride and methylmercury are possible human carcinogens[18]
Nitrogen Dioxide (NO_2)*	• Forms quickly from emissions from cars, trucks and buses, power plants, and off-road equipment[20]	• Higher air concentrations near major roadways and traffic corridors, and energy-combustion facilities[20]	• Adverse respiratory effects, including airway inflammation in healthy people and increased respiratory symptoms in people with asthma from short-term exposures (30 minutes to 24 hours)[20] • Can penetrate deeply into sensitive parts of the lungs and can cause or worsen respiratory disease[20] • People with asthma, children, and the elderly are more suseptible to adverse effects[20]

Appendix II: Table of Health Toxics Relevant to School Siting

Agent	Description & Use	Exposure Source[+]	Health Outcomes[+]
Ozone (O_3)*	• Created by chemical reactions between oxides of nitrogen (NO_X) and volatile organic compounds (VOC) in the presence of sunlight[21] • Emissions from industrial facilities and electric utilities, motor vehicle exhaust, gasoline vapors, and chemical solvents are the major sources of NO_X and VOCs[21]	• Higher air concentrations near major roadways and traffic corridors, and industrial sources[21]	• Even relatively low levels of ozone can cause health effects[22] • Inflame and damage the airways, even when symptoms are not obvious[22] • Shortness of breath and pain when taking a deep breath, coughing and sore or scratchy throat[22] • Make it more difficult to breathe deeply and vigorously[22] • Aggravate lung diseases such as asthma, emphysema, and chronic bronchitis, and increase the lung's susceptibility to infection[22] • Increase the frequency of asthma attacks[22] • People with lung disease, children, older adults, and people who are active outdoors may be particularly sensitive to ozone[22] • Children are at greatest risk from exposure to ozone because their lungs are still developing and they are more likely to be active outdoors when ozone levels are high, which increases their exposure, and children are more likely than adults to have asthma[22]
Fine Particulate Matter ($PM_{2.5}$)*	• Particles less than 2.5 micrometers in diameter ($PM_{2.5}$); approximately 1/30th the average width of a human hair[23] • Air dispersal from all types of combustion activities (motor vehicles, power plants, wood burning, etc.) and certain industrial processes[23]	• High air concentrations near roadways, energy-combustion facilities, and some industry[23]	• The small size means particles can penetrate deeper into the parts of the lungs that are more vulnerable to injury[23, 24] • Effects are varied, depending on the constituency of the PM[24] • Effects on breathing and respiratory systems, damage to lung tissue, cancer, and premature death[24]

Appendix II: Table of Health Toxics Relevant to School Siting

Agent	Description & Use	Exposure Source[+]	Health Outcomes[+]
Coarse Particulate Matter (PM_{10})*	• Particles less than 10 micrometers in diameter (PM_{10})[23] • Air dispersal mainly from fuel combustion sources, industrial processes, and transportation sources, crushing or grinding operations, and dust from paved or unpaved roads[23, 24]	• High air concentrations near roadways, energy-combustion facilities, and some industry[23]	• Can be inhaled into lower regions of the respiratory tract and accumulate in the respiratory system.[23] • Effects are varied, depending on the constituency of the PM[24] • Effects on breathing and respiratory systems, damage to lung tissue, cancer, and premature death[24] • The elderly, children, and people with chronic lung disease, influenza, or asthma, are especially sensitive to the effects of particulate matter[24]
Polychlorinated biphenyls (PCBs)	• A mixture of 209 chlorinated compounds (congeners)[25] • No known natural sources of PCBs[25] • Semi-volatile organic compounds[25] • Used as coolants and lubricants in transformers, capacitors, and electrical equipment up until 1977 in the U.S.[25]	• Found in at least 31.2% of EPA's National Priority List sites[25] • Exposure from contaminated air, water, soil, and animal foods (particularly aquatic animals)[25]	• Acne and rashes (high exposures)[25] • Potential of liver damage[25] • Adverse fetal development and pregnancy impacts[25] • Probably carcinogenic to humans[25]
Sulfur Dioxide (SO_2)*	• Largest sources are from fossil fuel combustion at power plants (73%) and other industrial facilities (20%)[26] • Smaller sources include industrial processes such as extracting metal from ore, and the burning of high sulfur containing fuels by locomotives, large ships, and non-road equipment[26]	• High air concentrations near fossil-fuel-combustion facilities, certain industry (e.g., smelters)[26]	• Associated with an array of adverse respiratory effects including bronchoconstriction and increased asthma symptoms from short-term exposures (5 minutes to 24 hours)[26] • Adverse effects are particularly important for asthmatics at elevated ventilation rates (e.g., while exercising or playing.)[26] • Can cause or worsen respiratory disease, such as emphysema and bronchitis[26] • Can aggravate existing heart disease, leading to increased hospital admissions and premature death[26]

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