

# Key Messages for Communicating About Carbon Neutral Schools



GETTING TO  
**zero**

# Healthy, Efficient and Carbon Neutral Schools Stakeholder Engagement and Messaging

Effective communication is critical to successfully engaging school decision makers and ultimately achieving an ambitious goal of designing, constructing, and operating healthy, efficient, carbon neutral schools. This document will address key questions around how to effectively communicate these goals and how to engage various stakeholders in the process.

Knowledgeable school district stakeholders understand the value of healthy, high performance school facilities. Understanding these benefits along with the drivers that motivate decision makers is helpful when communicating with stakeholders. While student educational outcomes are the primary driver of most school stakeholders, upon closer inspection, it becomes clear that each stakeholder has a unique perspective. Framing messages with their priorities, needs and perspectives in mind is helpful. For audiences that are not technical, focusing on outcomes, rather than the technological approach for achieving decarbonization, may be a more successful strategy.

In this guide you will find facts about carbon neutral schools, links to research sources, and key messages relevant to particular stakeholders. Although stakeholders may vary slightly from district to district, and the final decision maker may change, they are usually a similar group of decision makers and drivers. This guide outlines some of the key concepts and research that will help everyone gain a common understanding of what is possible and how to achieve healthy, efficient, carbon neutral goals.



# Key Messages

Moving to carbon-neutral school buildings will deliver enormous health, climate, and educational benefits to students, teachers, and communities across the nation. With attention to improved ventilation, removal of utility gas, and transition to renewable energy sources, districts can provide healthy learning spaces contribute to the wellness and productivity of all occupants.

A carbon neutral building is a well-ventilated, highly energy efficient building that does not contribute emissions of carbon and other greenhouse gases that contribute to climate change. A building is considered carbon neutral operations if it:

- » maximizes energy efficiency while providing healthy indoor environments,
- » is all-electric and has no onsite fuel combustion
- » offsets all the electricity used with 100% renewable energy sources

A decarbonization roadmap lays out achievable goals and actionable steps to eliminate fossil fuel combustion in school district building while providing healthy, productive spaces for learning.

- The education sector is a currently underutilized and a key social tipping point to achieve rapid decarbonization. While K-12 schools are responsible for a modest share of overall building and transportation emissions in the US, the sector is positioned to catalyze increased awareness, public support, workforce development, innovation, and, most critically, the shifts in mindset that form the foundation for any success with building decarbonization.
- K-12 schools and school buses fall within a public span of control. This span of control is critical in responding swiftly to the climate emergency. School districts can pass resolutions that acknowledge the climate crisis and commit to developing a roadmap to decarbonize their buildings and transportation fleet.
  - » You can find a link to this resolution [here](#).
- Research suggests that one year of intensive climate change education has a meaningful impact on lifetime emissions [\[source\]](#). The results suggest that, if scaled up, the impact of education on emissions reductions would be commensurate with the kind of emissions associated with other interventions such as increased deployment of rooftop solar or electric vehicles.
- Resilient schools provide essential shelter and services and serve as gathering spaces in cases of extreme weather events or community emergencies.
- Research by the U.S. Department of Energy confirms that zero energy schools cost less to construct and less to operate [\[source\]](#).
- NBI has documented 241 zero energy educational projects on the [Getting to Zero List](#). 52 are verified, and 189 are emerging (sources [\[1\]](#), [\[2\]](#)).
- The first zero-energy school opened in Richardsville, KY in 2021 [\[source\]](#). Within its first 8 years, the school saved \$11.5 million to put towards other energy projects in the District [\[source\]](#).

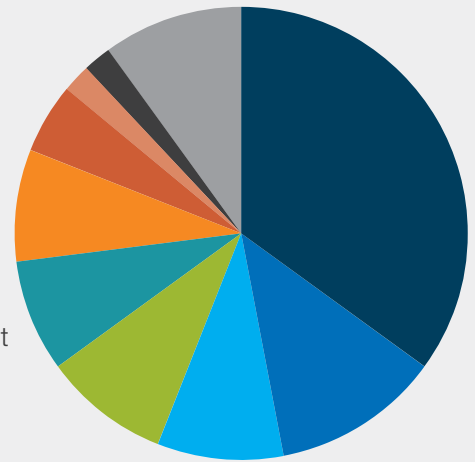
# Fast Facts About Schools, Energy, and Emissions

- Public K-12 school buildings represent 7.8 billion square feet of building space, or 85% of all K-12 building space [\[source\]](#).
- 17% of the population in the United States is a student or school staff and spend their day connected to a school (sources [\[1\]](#), [\[2\]](#), [\[3\]](#)).
- America’s K-12 schools currently spend \$12.5 billion PER YEAR on energy [\[source\]](#).
- Schools in the United States produce emissions equivalent to 18 coal-fired power plants each year (sources [\[1\]](#), [\[2\]](#)).
- The educational sector consumes over 2,000 trillion BTUs of energy for all types per year, savings across a district could mean hundreds of thousands of dollars that can go back into the classroom or building itself [\[source\]](#).
- With public school square footage equating to **7,837 million SF**, and **130,930** public schools in the U.S., the average school is approximately 60,000 square feet. The average school produces about 320 MTCO<sub>2</sub>e of emissions and may spend \$100,000 or more on electricity and gas costs each year.
- According to the 2012 Energy Information Agency’s Commercial Building Energy Consumption Survey (CBECS), a typical school uses energy for space heating (35%), cooling (12%), computing and office equipment (9%), ventilation (8%), lighting (9%), water heating (8%), kitchen (7%), and other (10%) loads. [\[source\]](#)

- Educational buildings primarily use gas combustion for space heating, hot water heating and cooking.
- Current emissions associated with the operation of public K-12 buildings is estimated to be approximately 42 MMTCO<sub>2</sub>e [\[source\]](#).
- School buses represent the largest fleet of public transportation with about 480,000, largely diesel, buses in need of electrification [\[source\]](#).

**EDUCATION BUILDING ENERGY USE**  
(2012 CBECS Data)

- 35%** Space heating
- 12%** Cooling
- 9%** Computing
- 9%** Lighting
- 8%** Ventilation
- 8%** Water heating
- 5%** Refrigeration
- 2%** Cooking
- 2%** Office Equipment
- 10%** Other



Today our schools themselves reflect massive inequities that are the result of multiple layers of systemic racism and regressive and disparate systems for financing school infrastructure. The result is an environment that disproportionately harms students of color.

For example, students—disproportionately young people of color—miss approximately 14 million school days per year due to asthma caused by polluted air [\[source\]](#).

After years of injustice, our frontline communities deserve disproportionate investment to mitigate the impacts of climate change and to prepare for careers in the clean energy economy. One way we will begin to disrupt these harmful, inequitable, and unjust patterns is by taking action within our K-12 schools.

## Carbon Neutral Schools Are Achievable

- According to the most recent Intergovernmental Panel on Climate Change (IPCC) report, a “rapid and far-reaching” sustainable transition in land, energy, buildings, transport, and cities is needed to meet global carbon reduction goals. Buildings account for almost 40 percent of global energy-related CO<sub>2</sub> and will play a major role in a transformation to a carbon free future [\[source\]](#).
- The IPCC report calls for a reduction in energy demand and strong electrification of the building

sector, as well as a shift to high-performance lighting, appliances, and water heating equipment [\[source\]](#).

- Students are demanding change and attention to climate issues [\[source\]](#).
- More than a dozen school districts have carbon neutral resolutions. NBI compiled a list of these and offers a template resolution to consider. See [here](#) for a list of District Resolutions and [here](#) for a template resolution to customize.
- Energy management, including a net zero energy strategy for new and modernized facilities could save at least 25 percent of the cost of utilities—about \$3 billion per year [\[source\]](#).
- Achieving a carbon neutral portfolio will require transitioning new and existing school buildings to emissions-free electricity and away from on-site fossil fuel combustion. A decarbonization roadmap is helpful to achieve long term carbon neutrality goals. NBI has a guide, roadmap planner, and templates to support local efforts.
- One recent study found that college students who took a yearlong intensive climate course made individual decisions that resulted in a 2.86-ton reduction of carbon dioxide a year [\[source\]](#).



St James Intermediate | Myrtle Beach, SC  
Credit: SFL+a Architects

# Carbon Neutral Schools Are Healthier and More Productive

- Healthy, efficient, carbon-neutral schools benefit from improved ventilation, better indoor air quality and increased thermal comfort. They provide healthy learning spaces that contribute to the well-being of all occupants.
- With students spending approximately 1,000 hours per year in a school, transforming classrooms into healthy, efficient, carbon neutral spaces is of the utmost importance, especially when short-term and long-term health of students and staff is at risk [\[source\]](#).
- Research findings suggest that increasing classroom ventilation rates above the state standard would substantially decrease illness absence and produce economic benefits [\[source\]](#).
- Excess CO<sub>2</sub> makes student cognitive function slower, so they are less attentive, with memory and concentration levels significantly lower. Studies have shown that students and staff in poorly ventilated spaces have 50 to 70% more respiratory illnesses [\[source\]](#).
- A Harvard study showed that occupants in ventilated spaces with low CO<sub>2</sub> and low volatile organic compounds (VOCs) had improved scores in crisis response, information usage, and strategy ranging from 100 to 300% [\[source\]](#).
- Daylighting, which allows natural sunlight to permeate deep into interior spaces without glare, provides better health effects resulting from views and connection to nature, and access to natural light.
- Daylight affects student's concentration and general wellbeing. Students in classrooms with windows perform 20% faster on math tests and 26% faster on reading tests than students in windowless classroom [\[source\]](#).
- Students exposed to the noisiest HVAC systems underperformed on achievement tests relative to those utilizing quieter systems [\[source\]](#).



South Tahoe High School | South Lake Tahoe, CA Credit: LPA Inc.



Alice West Fleet Elementary School | Arlington, VA  
Credit: Alan Karchmer

## Carbon Neutral Schools Are Resilient

- Well before the pandemic, the climate crisis was already robbing students of class time. In just one semester in the fall of 2017, more than 9 million students missed at least some school because of extreme weather and natural disasters [\[source\]](#).
- Extreme heat in schools is responsible for an estimated 5 percent of the racial achievement gap in education [\[source\]](#).
- Last summer, schools in disparate geographical areas closed early because classrooms were too hot. Extending the school years into the summer may be difficult without air conditioning in school buildings (sources [\[1\]](#), [\[2\]](#)).
- Communities as a whole benefit from these climate-resilience measures since schools provide shelter, food, and medical services in times of crisis.
- The incidence and severity of extreme weather events are both increasing.
- A 2018 National Institute of Building Sciences (NBIS) study found that each \$1 spent on mitigation activities—such as strengthening buildings and improving drainage conditions—saves \$6 in response and recovery costs. Districts that do not invest in resilient infrastructure will have to spend more taxpayer resources to recover from damage and maintain continuity of operations [\[source\]](#).
- Resilient designs, technologies, materials, and methods can allow occupants to shelter-in-place by using durable materials, thoughtful site selection, rainwater collection, demand response, grid islanding, energy efficiency, onsite renewable generation and more.
- To support resilient buildings, ventilation systems should be prepared to address both outdoor hazards (such as wildfire smoke) and indoor hazards (for example, from COVID-19).
- Carbon neutral schools are carefully planned to utilize passive systems like daylighting and natural ventilation and have an overall reduced energy load. These systems can be islanded and remain functional continuing to provide light and space conditioning during an outage.

# The Financial Case For Carbon Neutral Schools

- Schools built to be healthy and energy efficient will have lower operating costs and over time, save money on energy bills that can be spent on educating students. Efficiency also means less dependence on volatile utility pricing and protection from the cost of compliance with future regulations, including building performance standards being passed by more states and jurisdictions across the country [\[source\]](#).
- Given that the educational sector consumes over 2,000 trillion BTUs of energy for all types per year, savings across a district could mean hundreds of thousands of dollars that can go back into the classroom or building itself [\[source\]](#).
- Districts and states can save money by pursuing “net-zero” in all new school construction and leveraging every renovation project to reduce building emissions and enhance climate resilience [\[source\]](#).
- Zero energy schools cost less to build, and they cost less to operate [\[source\]](#).
- The perception is that zero energy schools cost more than conventional schools. However, research by the U.S. Department of Energy confirms that zero energy schools cost less to construct and less to operate [\[source\]](#).
- The research analyzed costs associated with 88 schools recently constructed. In addition, net-zero schools typically require 65-80% less energy to operate and are likely to require less HVAC maintenance [\[source\]](#).
- Districts not making progress toward carbon neutral schools are increasingly at risk of mismanaging taxpayer funds by wasting energy in school facilities and not considering emerging regulations of buildings in many jurisdictions. Building Performance Standards require energy and emissions tracking and reporting in Washington State, New York City, NY, St. Louis MO, Boston, Denver, CO, Washington, DC and other jurisdictions.
- Districts that do not pursue high performance buildings like carbon neutral may spend at least 20-25% more over a 30-year life cycle based on increased energy and maintenance costs alone [\[source\]](#).
- Newly construction carbon neutral schools can cost less to operate because they require less HVAC maintenance. An analysis of schools in Fairfax County Virginia found that annual energy costs and annual HVAC maintenance costs in a net-zero school are expected to be \$0.68 per sq. ft as opposed to \$1.77 per sq. ft. for a conventional school building [\[source\]](#).







Socastee Elementary | Myrtle Beach, SC  
Credit: SfL+a Architects

## Roadmaps For Achieving Carbon Neutral Schools

- A decarbonization roadmap is lays out achievable goals and actionable steps to decarbonization in school district portfolios.
- Decarbonizing operations in an existing building is more challenging and more expensive than building to carbon neutral performance in new construction. Retrofits often require costly upgrades and buildings may need electrical system upgrades or other remediation due to years of inadequate funding and lack of maintenance.
- A decarbonization roadmap should emphasize the need for immediate adoption of requirements for carbon-neutral new construction and adaptive reuse projects, to future-proof and prevent the need for more costly upgrades in the future. A school district [Resolution](#) or [Owners Project Requirement \(OPR\)](#) are ways to document these requirements. You can find out more about this process in the [Decarbonization Roadmap Guide](#).
- Major events in a building's lifecycle are opportunities to reduce carbon emissions and manage costs. Although major building retrofits happen only about every 30+ years, they are seen as a primary opportunity for improvements, as are scheduled renovations and system replacements.
- Understanding the current building portfolio, the systems they use, and the fuel mixes serving them is critical to creating a plan that achieves carbon neutrality, protects the health and well-being of building occupants, minimizes costs, and ensures equitable outcomes.
- Common steps in a decarbonization roadmap include stakeholder engagement, portfolio assessment and benchmarking, goals and targets, healthy and efficient construction and renovation projects, occupant engagement, and annual reporting to school board.
- Portfolio-wide analysis of district buildings helps to identify where limited resources could be best spent to achieve the healthiest buildings while managing energy costs. Districts should review the development pipeline to leverage opportunities already in being considered in the district master plan as they naturally occur.
- Integrating air quality, energy targets, and carbon goals into the request for proposal and other contract language can ensure on time and on budget project delivery. Districts should be specific about goals when defining expectations and scopes of work with teams.
- To reach energy and carbon goals, it's important that efficiency practices be considered before and during the design phase, as well as in the operating phase once the building is completed.
- Focusing on one pilot school and then expanding on a larger scale over time via facilities master planning is an effective way to plan for portfolio-wide carbon neutrality.



The Kathleen Grimm School for Leadership and Sustainability | Staten Island, NY  
Credit: SOM

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New Buildings Institute (NBI) is a nonprofit organization driving better energy performance in buildings to make them better for people and the environment. We work collaboratively with industry market players—governments, utilities, energy efficiency advocates, and building professionals—to promote advanced design practices, innovative technologies, public policies, and programs that improve energy efficiency. The Getting to Zero website houses over 300 curated resources including guidance, educational webinars, policy models, research, case studies, and more to help all buildings achieve zero energy. Visit [gettingtozeroleadership.org](https://gettingtozeroleadership.org) to learn more.