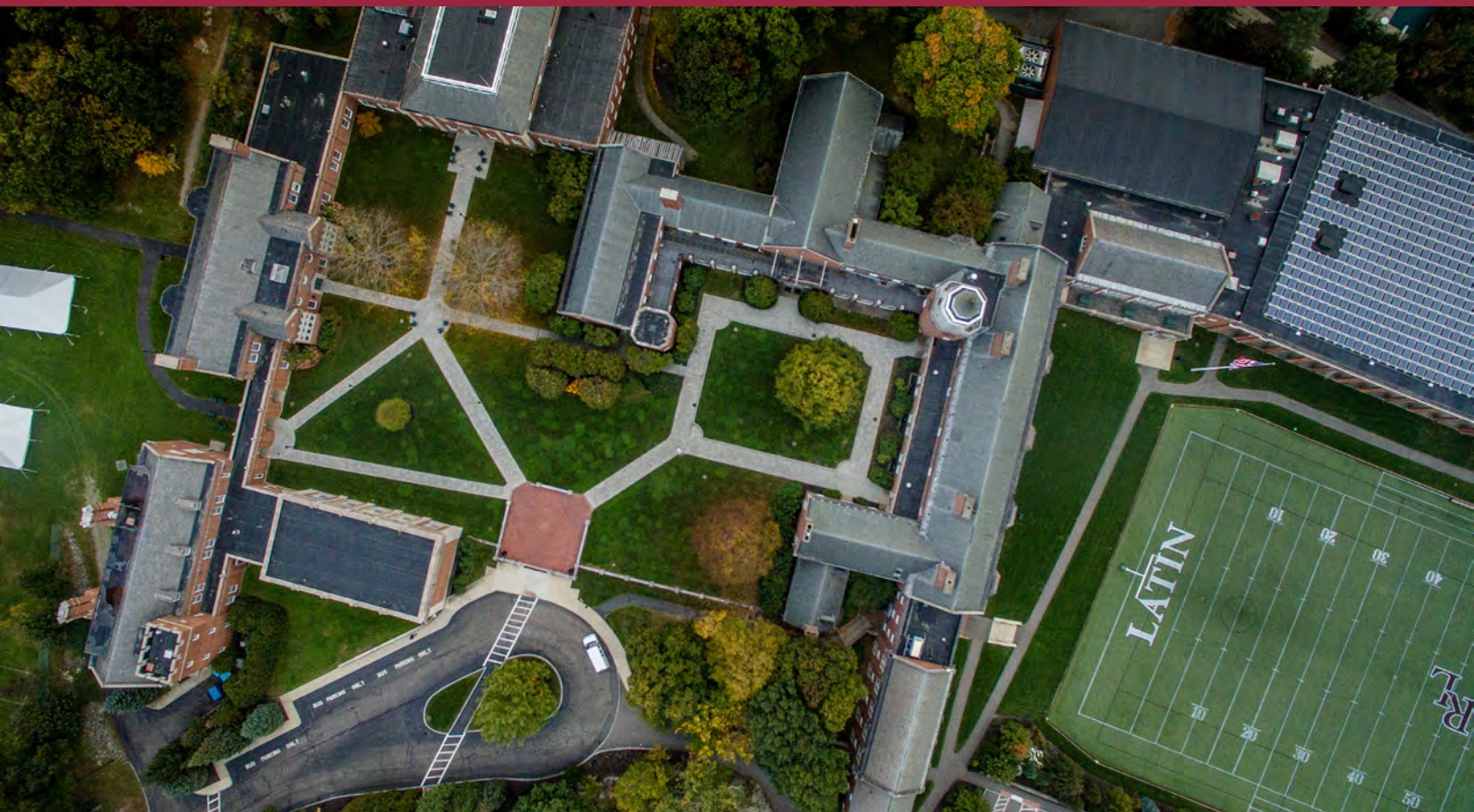




The Roxbury Latin School

PATH TO NET ZERO CARBON EMISSIONS



Overview

As part of a broader effort to reduce our ecological footprint, Roxbury Latin is firmly committed to achieving Net Zero Carbon Emissions in the coming years. This report provides an account of RL’s current carbon footprint, the important work we have already done to reduce our carbon emissions and our environmental impact, and the future mitigation strategies we are considering.

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COMMITMENT STATEMENT

Founded in 1645, Roxbury Latin prepares boys to “lead and serve.” We care most of all what kind of person a boy is, and our students commit themselves to serving others in a variety of ways throughout their time here. Environmental stewardship is a natural extension of Roxbury Latin’s core values and doing our part and more to address the threat of climate change is a priority.

Roxbury Latin is committed to aligning with the City of Boston’s Building Emissions Reduction and Disclosure Ordinance (BERDO), which has the goal of reducing emissions to net zero by 2050, and our considerable sustainability efforts to date have already put us far ahead of schedule in achieving these goals. In the coming years, we intend to continue on this path and be a leader among schools in achieving Net Zero Carbon Emissions well before the 2050 target date.

CURRENT CARBON FOOTPRINT

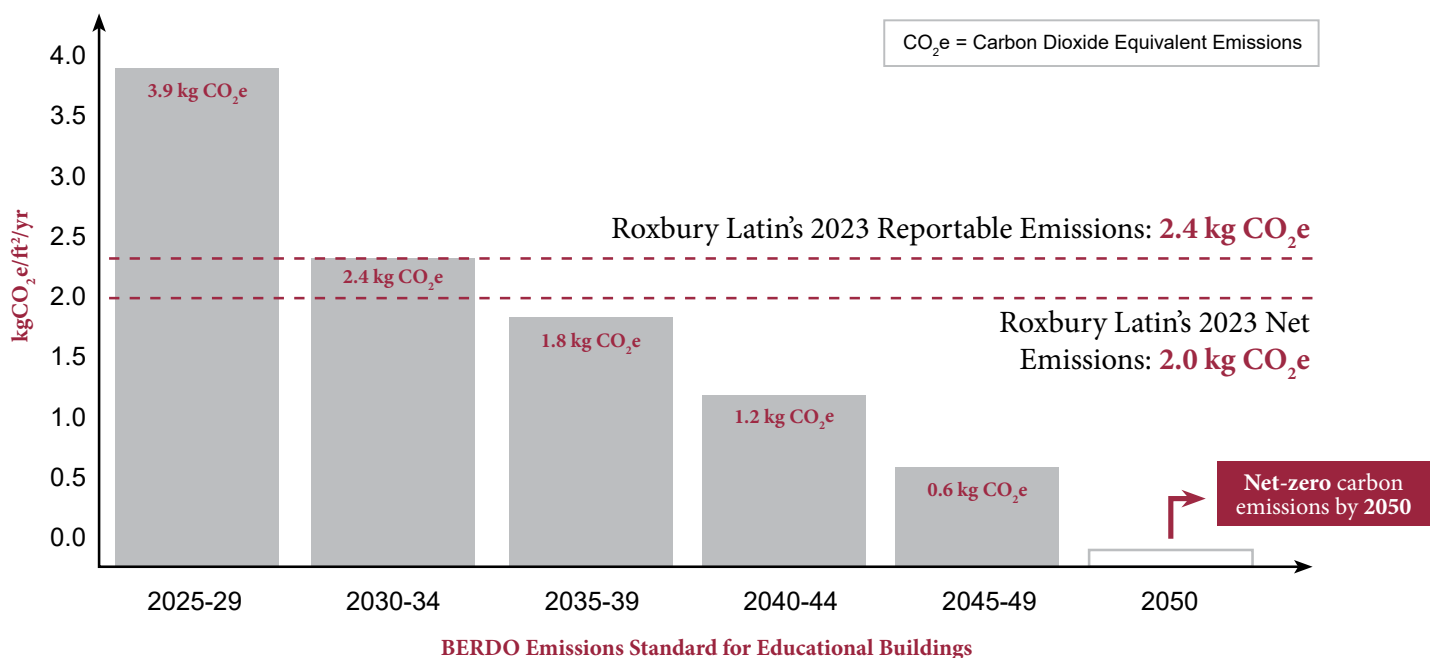
Roxbury Latin’s on-campus energy use is our most significant impact on the environment, but also the area where we have already made significant progress in reducing carbon emissions. We are compiling our energy data to fulfill BERDO’s annual benchmarking requirements. Starting in 2025, buildings in the City of Boston are required to meet annual greenhouse gas emission targets based on their building type. Due to Roxbury Latin’s early efforts to install two large solar arrays with a combined output of 540 MWh, along with our commitment to energy efficient lighting and other efficiency upgrades, our current emissions are 2.4 kg CO₂e/ft²/yr^[1] (which equates to total emissions of 570 mt CO₂e^[2] from 1,875 MWh of electricity and 2,023 MMBTU of natural gas in 2023). This puts Roxbury Latin well within the current BERDO requirements and even satisfies BERDO’s emissions targets for educational buildings through 2034. Our goal is to continue to outpace the BERDO requirements and get to Net Zero well in advance of the 2050 deadline.

What is not reflected in BERDO benchmarking but has a tremendous impact on Roxbury Latin’s carbon footprint, is the amount of carbon we offset annually, in the 48-acre forest that the school acquired in 2008. Based on sound estimates of the carbon sequestration value of private forests^[3], Roxbury Latin’s forest removes 112 tons of carbon dioxide from the atmosphere annually, lowering its true carbon footprint to a net 458 mt CO₂e per year or 2.0 kg CO₂e/ft²/yr.

^[1] kg CO₂e is kilograms of carbon dioxide equivalent, and a common metric for quantifying emissions that contribute to climate change.

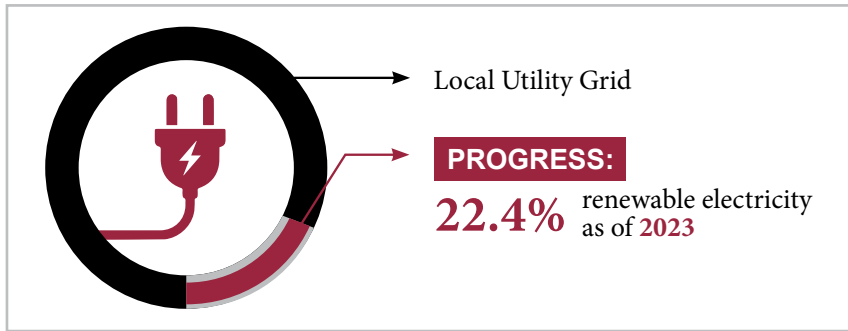
^[2] EPA 2023 eGRID NEWB Subregion for Electricity: 246.69 kg/MWh CO₂e, EPA 2022 Stationary Combustion for Natural Gas: 53.11 kg/MMBTU CO₂e

^[3] Massachusetts DCR. 2023. Estimating Carbon for Forest Stewardship Climate Plans.



Renewable Energy

The installation of two large solar arrays on the roofs of our sports facilities have been the most notable action in decreasing our carbon footprint.



Roxbury Latin installed the first solar array in 2012 on the Albert H. Gordon Field House, consisting of 560 panels with an annual production of 155 megawatt hours (MWh) of electricity. This is all of the energy needed to operate the Field House and the Palaistra, and at times generates surplus power that is directed to the school's HVAC system.

Roxbury Latin more than doubled its renewable electricity generation in 2020 with the installation of a second array on the Indoor Athletic Facility (IAF), consisting of 856 panels with an annual production of 385 MWh of electricity. This system generates about 50% of the energy that is needed to run the IAF and includes Tesla battery storage to capture surplus energy for later use. Together, these solar systems produce 540 MWh of electricity each year and help the school avoid 274 metric tons of CO₂e per year^[4].

The solar installations are also a powerful teaching tool. A Data Acquisition System (DAS) monitor, located in the hallway of the Bauer Science Center, provides information on how much energy the panels are generating at any point in time and aggregates data from past years. The DAS translates this power output into tons of CO₂e avoided and then equates the power generation numbers to relatable metrics such as how many cars that amount of energy could power, or how many computers it could run. Information provided by the DAS is integrated into both of Roxbury Latin's environmental science classes.



^[4] AVERT, 2022 Regional Emission Rate, New England, Distributed PV Avoided CO₂ Rate 1,118 lb/MWh.



1400+ solar panels on campus for 22.4% renewable electricity



274 metric tons of CO₂e avoided annually

Our 540-MWh annual solar array production is equivalent to the annual electricity needed to power:



77 homes in Massachusetts



180 cars



2,800 desktop computers

Transportation

Roxbury Latin is located in the West Roxbury neighborhood of Boston and is easily accessible via both the MBTA Bus system and Commuter Rail. Roxbury Latin also provides bus service for students who live in the City of Boston that transports boys from Roxbury, Dorchester, Hyde Park, Mattapan, and South Station. In 2023, Roxbury Latin added bus service for students living along the Route 3 and Route 24 Corridors.

For faculty, staff, and students who drive to campus, Roxbury Latin installed two 7.2 kW ChargePoint electric vehicle (EV) charging ports to allow for greater use of EVs within the school community.



STUDENT HIGHLIGHT

Roxbury Latin's Environmentally Concerned Organization of Students (ECOS) raised money for new bike racks to encourage more faculty members and students to bike to school.



Two **7.2 kW** ChargePoint EV charging stations



Increased ride sharing through expanded bus services

Waste

Roxbury Latin is firmly committed to reducing the volume of waste it sends to landfills and incinerators, and has robust recycling and composting programs. Students involved in ECOS play an important role in supporting these efforts by emptying recycling bins across campus and by organizing the collection and composting of food waste in the Refectory during lunch each day. They also educate the community through homeroom announcements and signage about the importance of recycling, composting, and reducing waste. As part of a recent campaign, ECOS has mounted posters next to all school printers, encouraging students and faculty to limit paper their use. RL has also replaced all water fountains with water filling stations and, using funds from ECOS' concession sales at school plays, purchased reusable water bottles for all members of the RL community in an effort to dramatically reduce plastic waste. Through its recycling and composting efforts, Roxbury Latin recycles approximately 22 tons of waste each year, and composts 7,600 pounds of food scraps. Together, these efforts prevent 64 metric tons of CO₂e from being released each year^[5].



Because of ECOS students, every year:



22 tons of waste are recycled



7,600 pounds of food scraps are composted



64 metric tons of carbon dioxide CO₂e avoided

^[5] EPA's Waste Reduction Model (WARM) Version 15, 2.88 metric tons CO₂e per ton of waste recycled, 0.12 metric tons CO₂e per ton of food waste composted

Land Use

In 2008, Roxbury Latin purchased 48 acres of undeveloped forest, located adjacent to the school's main campus. It is a mature, temperate deciduous forest dominated by oaks, maples, and pines, that contains more than 30 species of flora. In 2014, Roxbury Latin commissioned an ecological baseline study to better understand the forest's history and composition, and to identify opportunities to use the forest field site in various science courses.

Throughout the year, students in Biology, Introduction to Physical Science (IPS), Science & Technology, and Environmental Science use the RL forest as a living laboratory, observing and investigating the earth's ecological and physical systems. Students uncover the geologic and land-use history of the forest and take an in-depth look at the many ecosystem services it provides. These local forest explorations serve as an important springboard for learning about the earth's other major biomes and aquatic ecosystems and the range of human impacts on the environment.

In 2018, to support the course work that occurs in the RL forest, Roxbury Latin built an outdoor classroom. This beautiful space offers students and teachers the opportunity to formally gather and learn in the environment they are studying.



48 acres for
environmental
exploration



112 metric tons of CO₂e
sequestered per year

Education

All incoming seventh-grade students take a year-long Science & Technology course. The boys start the year in the Roxbury Latin forest where they learn about their local ecosystem and develop important observational, data collection, sketching, and note-taking skills. The course also includes units on solid waste and energy. During the waste unit, students explore the environmental impacts of landfills and incinerators, and the benefits of recycling and composting. In the energy unit, they discuss efficiency and conservation and the benefits of renewable energy sources including Roxbury Latin's solar panels. Placing this curriculum at the start of the students' time at RL helps to ensure that they really understand the issues and how they can do their part to address them while at RL.

In their eighth grade IPS course, RL students learn about aquatic ecosystems and water quality. These lessons about ecosystems and the biotic factors in them are further reinforced in Biology during a student's senior year. Roxbury Latin also offers a year-long senior elective in Environmental Science that looks at the impacts our growing population is having on the earth's resources and actions we can take to be more environmentally sustainable. Students in this course begin by investigating the biotic and abiotic systems in the RL forest and use this as a platform for learning about the world's major biomes. Other topics include energy, climate change, public health, waste management, agriculture, urbanization, and air and water pollution.

One of the distinctive aspects of Roxbury Latin's educational program is the Hall speakers who come to campus to address the faculty and student body. Over the past several years Roxbury Latin has hosted several notable experts on climate change and other environmental issues including U.S. EPA Administrator Gina McCarthy, McArthur Genius Grant Recipient Kate Orff, Harvard Professor of Environmental Science Dr. Michael McElroy, Executive Producers of NOVA Julia Cort and Chris Schmidt, Yale Professor of Climate Communications Anthony Leiserowitz, and United Nations Science Advisor Maria Ivanova.

Facility Upgrades

Roxbury Latin has implemented several energy efficiency measures over the years that have reduced the school's carbon footprint. New LED lighting has replaced incandescent lighting, using 90% less energy and lasting 25 times longer. Up to 80% of heat is reused from exhaust air in our HVAC systems through heat recovery units. Additionally, certain HVAC equipment now have variable speed drives, allowing equipment to run slower based on actual building demand. Upgrades to our building envelope, such as roofs and doors, have helped improve building efficiency. In addition to these efficiency measures, RL has also installed water filling stations throughout campus, preventing the use of thousands of single-use plastic water bottles, and further reducing the school's impact on the environment.

ROXBURY LATIN HAS INSTALLED:



New LED lighting in the gymnasium



Variable speed drives on water and heating pumps



New LED lighting in the Palaistra



High efficiency circulator pumps on plumbing systems



Water filling stations in all buildings



New insulated roofs on the Smith Arts Building and Administrative Building



Heat recovery systems on HVAC units







New exterior doors



FUTURE CARBON MITIGATION STRATEGIES

To operate our school in a more sustainable way, Roxbury Latin will continue its current mitigation strategies and explore new opportunities to further lessen the school's environmental impact. These strategies will reduce operational impacts, future-proof the campus infrastructure, and engage our students and community.

 <p>Energy Optimization Optimize existing building equipment and controls</p>	<p>ON-GOING/RETRO-COMMISSIONING: Evaluate building equipment through optimizing sequence of operations within the school building's controls.</p>	<p>VENTILATION OPTIMIZATION: Recommission ventilation rates by balancing current hourly air changes and differential pressures to meet the original Basis of Design and/or ASHRAE 62.1.</p>	<p>REPAIR & MAINTENANCE: Use commissioning findings to repair deficiencies in all mechanical and electrical equipment.</p>
 <p>Energy Efficiency Reduce wasted energy with high efficiency equipment</p>	<p>HEAT RECOVERY: Use Energy Recovery Units to recover energy from air that is currently being exhausted from buildings.</p>	<p>LIGHTING RETROFIT: Replace remaining fluorescent and incandescent lighting with LEDs that improve light quality and reduce heat gain.</p>	<p>PLUG LOAD EQUIPMENT REPLACEMENT: Outfit the kitchen with high efficiency food service equipment. Manage all plug loads with smart power strips.</p>
 <p>Infrastructure Build deep energy retrofits and renewable energy systems</p>	<p>BUILDING ENVELOPE RETROFIT: Replace windows and frames and add thermal insulation in all exterior walls, doors, roofs, and water pipes.</p>	<p>HVAC RETROFIT: Electrify all HVAC equipment such as heat pumps, electric boilers, and variable refrigerant flow (VRF) systems with new control systems.</p>	<p>RENEWABLE ENERGY SOURCES: Transition away from fossil fuels with carport solar photovoltaics, geothermal wells, thermal energy storage, and fuel cells.</p>
 <p>Engagement Embrace sustainability in all school functions</p>	<p>SUSTAINABILITY EDUCATION: Continue to build awareness of climate change impact on people and the natural world to our school community.</p>	<p>SUSTAINABILITY ACTION PLAN (SAP): Make future sustainability plans and resources available to all students, parents, faculty, staff, and alumni.</p>	<p>SUSTAINABILITY ACTION TEAM: Coordinate sustainability initiatives across all departments.</p>